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Urban Blossoms, Rural Thorns: Exploring Early Childhood Teachers' Perspectives on Technology Integration in Urban and Rural Indonesia

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Abstract. Technological advancements present substantial benefits across various domains of educational services, including in early childhood education (ECE) settings in Indonesia. This study examines the integration of technology in ECE environments in both urban and rural settings within the country, framed by socio-cultural theory. Utilizing the Focus Group Discussion (FGD) method with participation from early childhood teachers, the research provides empirical insights into the challenges and advantages of technological integration in these distinct geographical contexts. Findings reveal noticeable disparities between urban and rural ECE institutions, especially in terms of resource availability, operational proficiency, and stakeholder engagement. Urban ECE establishments demonstrate more effective adoption of technology, whereas rural counterparts encounter significant barriers that hinder the optimal utilization of technological innovations. This disparity highlights critical issues in ensuring equitable access to educational resources and opportunities, delivering high-quality education, and facilitating global connectivity. The study highlights the need for further research could investigate how key figures of educational institutions facilitate technology integration in rural early childhood education, thereby promoting inclusive, effective, and high-quality educational services for all children as mandated by the Sustainable Development Goals (SDGs) global framework, especially in Indonesia

Keywords: Technology integration, urban, rural, ECEC, FGD, teachers' perspectives, socio-cultural theory

1. Introduction

The United Nations (UN) has established several initiatives to advance education as part of the Sustainable Development Goals (SDGs), with Goal 4 specifically focusing on quality education. One effective strategy to achieve this goal is the integration of technology into education (Küfeoğlu, 2022; Msafiri et al., 2023; Thapa, 2022). The notion of technology integration approach, such as Science, Technology, Engineering, and Mathematics (STEM) framework, enhances the quality of education and supports sustainable development (Jamali et al., 2023). Integrating technology is crucial for achieving SDG-4 by improving access to quality education, especially in underserved and marginalized communities, thereby promoting inclusive and equitable education for all (Saini et al., 2023). Digital tools play a significant role in addressing diverse learning needs and fostering equitable educational opportunities, aligning with the objectives of SDG-4 (Balmes, 2022).

The SDG-4 aims to ensure that by 2030 all children worldwide have access to quality early childhood development, care, and pre-primary education, preparing them for primary education in the most suitable manner (The United Nation, 2015). The focus on 'quality' in education emphasizes the importance of making education accessible to all children globally. With the rapid technological advancements in recent years, integrating technology into education has become increasingly prevalent, including in early childhood education. Recently, digital literacy

has emerged as a critical competence and enabling supporting element, including in the field of education for young children (Milenkova & Lendzhova, 2021).

Global studies have consistently demonstrated the significant benefits of integrating technology into Early Childhood Education and Care (ECEC). The most notable point is its potential to enhance various aspects of children's cognitive and social development. Sidgel (2017) emphasizes the positive relationship between children's expertise and technology when it is used carefully, under the professional judgment of teachers. The study emphasizes that technology, when employed wisely, can address educational gaps and solve specific learning challenges. Importantly, Demetriou & Nikiforidou (2019) stresses that technology use in early childhood accommodated the individual needs of children, taking into account their cultural backgrounds and age-appropriate considerations.

Supporting this perspective, Salim (2024) argues that technology can significantly enhance cognitive skills, particularly in areas such as language development and problem-solving. The study reports that technology can serve as a powerful tool to foster cognitive growth when used in a balanced and age-appropriate manner. However, Salim (2024) also cautions that the misuse or overuse of technology can potentially harm a child's social and emotional development, underscoring the necessity of structured and supervised use of technology. This balance is crucial in promoting holistic and healthy cognitive development in young learners. Furthermore, reinforcing these benefits, research by Fernández-Gutiérrez et al. (2020) and Condie & Munro (2007) reveals that Information and Communication Technology (ICT) can lead to higher student outcomes and improved engagement. Similar to studies by Blackwell et al. (2013) and Kewalramani et al. (2020), technology supports early childhood education by providing interactive and engaging learning experiences, which are critical in the formative years. Additionally, Balmes (2022) and Blumenfeld et al. (1991) discuss how technology facilitates project-based learning and fosters transformative innovation in educational practices. Cook et al. (2020) further emphasize the role of assistive technologies in supporting students with disabilities, ensuring that all learners have access to tailored educational experiences. Iancu (2023) asserts that integrating educational software in early childhood education enhances attention, memory, and engagement, ultimately leading to improved learning outcomes.

Accordingly, it is evident that the integration of technology in early childhood education holds immense potential to enhance cognitive skills, foster engagement, and provide personalized learning experiences. When technology is adapted to the developmental needs of children and balanced with traditional learning activities, it can significantly improve outcomes in areas such as language acquisition, problem-solving, and creativity. Moreover, technology can play a critical role in reducing digital inequalities, particularly when integrated into teacher education. However, the effective use of technology requires careful consideration of each child's individual needs, cultural background, and age-appropriate practices to maximize its benefits.

In Indonesia, technology is becoming a key part of early childhood education, helping children get comfortable with digital tools from a young age (Widyawati, 2021). Tatminingsih (2022) points out that children are now becoming more prevalent using tablets and computers for interactive learning, making education more engaging and fun. Suprihadi and Pramudita (2019) add that computer-based tools are great for teaching at basics like the Latin and Arabic alphabets, numbers, and simple math, often using games and visuals to keep kids interested. The importance of technology became even common practice during the COVID-19 pandemic when distance learning made digital tools essential, as technology facilitated children's learning at home (Kumalasari et al., 2024). Overall, technology evidently boosted children' confidence, curiosity, creativity, and social skills, helping them grow in a well-rounded way (Sulistyaningtyas et al., 2023).

However, despite the numerous benefits of integrating technology into early childhood education, several significant barriers and challenges persist. Çelik et al. (2023) identify a range of obstacles, including a lack of administrative support, teacher beliefs and competencies, educational policies, and insufficient cooperation between parents and teachers. These challenges pose substantial impediments to the effective integration of digital technology in early childhood education settings. Naida (2024) highlights a specific challenge related to the dependency on guidance in play-based learning, which can hinder the effective use of technology. The study suggests that without proper guidance and support, young children may struggle to engage meaningfully with digital tools in a play-based learning environment. Moreover, Komen & Onginjo (2024) points out that the use of technology also require parental involvement, in which among less educated parents or those who have less access to technological tools, it then caused the educational process even more complicated. This disparity in parental engagement can exacerbate existing inequalities and limit the effectiveness of technology integration. While using technology, teachers also face significant challenges including poor internet connectivity and inadequate skills, which can threaten the pedagogical process to be ineffective (Chan, 2023). Furthermore, concerns about excessive screen time and the misuse of children's data raise ethical dilemmas in the digital landscape (Liu et al., 2023; Teichert & Salman, 2023; Vidal-Hall et al., 2020).

It accordingly becomes precise that while the integration of technology offers substantial benefits, several barriers and challenges emerged. Issues such as insufficient support, the lack of related technical competencies among teachers, and parental involvement presented significant obstacles to effective technology use in the educational settings. Additionally, concerns about excessive screen time, data privacy, and the ethical use of technology must be carefully managed. Addressing these challenges requires a more practical efforts from teachers, school administrators, and policymakers to create supportive environments that facilitate the responsible and effective integration of technology into early childhood education.

Given the above exposition, it seems clear that technology has become an integral part of our daily lives the early childhood education sector in Indonesia. Numerous studies have been conducted to explore the extent to which technology can be integrated into ECE institutions to improve the quality of educational process and child development in general. However, one aspect that has not been extensively explored is how geographical context affects the use and integration of this technology. This is crucial because the quality of education in Indonesia is not only assessed by the status of being public or private but also by geographical comparisons. In this regard, studies comparing the use of technology in ECE institutions in rural and urban areas would deliver a significant contribution considering that access to and acceptance of technology can vary greatly between urban and rural areas. Therefore, this research is highly relevant and urgent to understand how geographical context influences the use of technology in education. To guide the study, the research question that we proposed was: *How does the socio-cultural context in urban and rural areas influences the integration of technology in early childhood education?*

2. Methods

This study employed qualitative research, which is the approach used to gain a deep understanding of people's experiences, behaviours, and interactions among people (Creswell, 2007; Denzin & Lincoln, 1994; Patton, 2002). More concretely, this inquiry investigated the perspectives of early childhood teachers in Indonesia regarding technology integration in rural and urban settings. Focus Group Discussions (FGDs) were the primary method for data collection, chosen for their ability to foster dynamic interactions and bring out diverse perspectives that might not be captured in individual interviews (Denzin & Ryan, 2007; Krueger

& Casey, 2015). This method was particularly effective given the limited time participants had, allowing for multiple viewpoints to be gathered simultaneously (Fazeeha Azmi, 2023; Hennink & Leavy, 2014; Patton, 2002; Sim & Waterfield, 2019).

To recruit participants in the rural area, I engaged with the kindergarten supervisor in my sub-district, who facilitated the dissemination of invitations through the Association of Kindergarten Teachers (IGRA and IGTK). Consequently, in the rural area of Central Java, the FGD included five teachers (Ana, Bunia, Candra, Darsih, and Erna) representing four ECEC institutions. The location for the FGD was selected by the participants. In the urban area of Jakarta, the recruitment process was supported by the coordinator of the Kindergarten Principal Association, who assisted in spreading the invitation. Five teachers (Arni, Barla, Choirina, Duma, and Essa) from three kindergartens participated in the study. The venue for the FGD was also chosen by the participants. All FGDs were conducted with the participants' consent and were recorded to ensure accurate data capture. Additionally, detailed notes were taken during the discussions to complement the recordings and capture non-verbal hints and contextual situation. For participants' convenience, the session was conducted in Bahasa Indonesia. During the FGDs, we asked several key questions such as: *What types of technology does your institution use*? *What benefits have you experienced from using those technologies*? *How has using technology made things different from when you didn't use it? What challenges have you encountered in using these technologies*? *How key figures in your school support the use of technology?*

Following the FGD, the recorded discussions were transcribed verbatim into textual format. Transcribing FGDs verbatim is crucial for capturing the participants' responses, including non-verbal cues and the dynamics of the discussion (Scheelbeek et al., 2020). The transcripts were then subjected to thematic analysis, a method used to identify, analyse, and report patterns (themes) within the data. Thematic analysis involves familiarization with the data, coding, generating themes, reviewing themes, and defining and naming themes (Braun & Clarke, 2006). From the identified themes, key concepts were extracted to understand the core issues and experiences related to technology integration in early childhood education. This process involved a detailed examination of the themes to collect the most significant and recurrent ideas that emerged from the discussions (Ryan & Bernard, 2003).

The key concepts were then analysed using a socio-cultural perspective. Sociocultural theory, as proposed by Vygotsky (1978), emphasizes the importance of social interactions and cultural tools in the development of cognitive functions and perception. This theoretical framework was applied to understand how the integration of technology in early childhood education is influenced by cultural, institutional, and historical contexts. Sociocultural analysis helps in understanding the relationship between perception and the various cultural and institutional settings in which it occurs (Wertsch, 1997).

3.   Result
3.1. Advantages of integrating technology
Teachers in urban areas have observed that the use of technology has enhanced the learning dynamics of their teaching and significantly increased student engagement and participation in the classroom.

> *Since the switch to online learning, using technology has become a regular part of my teaching. I still use it a lot in my classes today. I try out many different tools, like Kahoot, and the kids always get really excited about it (Barla, a teacher in West Jakarta).*

> *Most children in my school have an iPad, tablet, laptop or computer at home. It made me easy to run the learning process when learn something using technological tools in the class (Arni, a teacher in South Jakarta).*

I put together a video with hundreds of pictures from our outdoor activities using some special apps. When we were discussing the topic about environment, I played the video on the classroom TV. The kids were so excited—they were shouting to each other, "Look, that's me!" and "Look, that's you!" They were really delighted (Choirina, a teacher in South Jakarta).

Another advantage was that the use of technology enabled teachers to provide more individualized learning approach, for example as narrated by Arni:

One child picked up math concepts really quickly. While other kids were still working on simple addition, like 4+4, he found it too easy and wanted to jump straight into multiplication. So, I used a specific app to help him learn at his own pace and keep up with his advanced skills (Duma, a teacher in West Jakarta).

Similarly, teachers in rural area found that the use of technology has influence on some aspect of their occupation including children's enthusiasm to go to school.

Before we started using laptops and YouTube videos, some children would cry when they arrived at school because they didn't want their parents to leave. Since we began using these tools, the kids have been much more excited and eager to come to school (Erna, a teacher in rural Central Java).

Another observation was that, with the assistance of technology, managing administrative tasks and handling document-related issues became significantly easier.

With the use of google drive, it is indeed I don't have to bring USB stick to save and manage my data. I can access them wherever and whenever I want (Bunia, a teacher in rural)

3.2. Challenges faced by teachers

Teachers in urban area mentioned their challenges when integrating technology in educational process.

Using technology has really pushed us to be creative. The kids learn so quickly and often ask to try things I'm not familiar with. For example, I didn't know much about virtual reality before, so I had to learn about it to help them out effectively (Essa, a teacher in South Jakarta).

In my school, students come from diverse socio-economic backgrounds, though most are from upper-class families. I feel particularly empathetic toward those from lower-class backgrounds, as they often seem shy and may not learn as quickly as their peers, especially when using technology. I make it a point to ensure that no child is left behind and that everyone gets the support they need (Choirina, a teacher from South Jakarta).

From the above data it seems that the primary challenges identified include the need for teachers to continually update their technological skills, addressing the diverse learning paces of students, and ensuring inclusive education for all students, particularly those from disadvantaged backgrounds.

Moreover, participants in rural area narrated different stories about challenges of utilizing technological tools in their occupation.

I didn't have a laptop of my own, so when the children asked to watch videos of dancing or singing, I couldn't fulfil their requests immediately. I had to wait for my son, who has a laptop, to come home from university once a month (Bunia, a-55-year-old teacher in Central Java)

When we had an intern from a university, they introduced me to tools like Canva and video editors to make our classes more engaging. It seemed interesting, but I felt overwhelmed trying to learn these new tools, especially since I wasn't familiar with how

to even turn on the laptop. As a result, I never ended up using those tools in my class (Darsih, a teacher in rural central java).

In our kindergarten, each of the three teachers faces distinct challenges. Two of us don't have a laptop, while I do have one but struggle with the high cost of internet data. For instance, when we tried to show a dancing video in class, we all ended up dancing along, only to have the video cut off abruptly. We initially thought it was buffering, but it turned out we had run out of data. As a result, we often stick to conventional methods rather than using technology (Ana, a teacher in Central Java).

We can see that teachers in rural Central Java encountered a range of challenges, including lack of access to laptops, difficulty learning new technologies, and high costs of internet data. These issues collectively contribute to a reliance on traditional teaching methods and hinder the effective use of technology in their classrooms.

3.3. Supports from the key figures in the institution

Some teachers in Jakarta explained about the supports provided by the key figures in their educational institutions.

I am very lucky that the school owner had enough resources to provide computer and smart tv, in our class. They perceived that such equipment as investment. Money is not a big issue for them. (Duma, a teacher in West Jakarta)

In my school internet connection was provided unlimited. The school paid for that. (Choirina, a teacher in South Jakarta)

Yeach… in my school too… I meant internet is free to use… (Essa, a teacher in South Jakarta).

In addition, teachers in rural area also shared their experience regarding the way school owners' (or school foundation figures) perceived the use of technology by teachers in teaching learning process.

*My school has no computer. it is impossible to ask for the school foundation or principal to buy that device. I sometimes used my son's laptop when I wanted to implement specific instruction regarding use of technology (*Bunia, a teacher in Central Java).

*Only during the first month of online learning the principal gave us data connection about 30 Giga bytes. After that they encouraged us to use normal method. As a result, we used that practice only no more than two months. It was too costly for us (*Erna, a teacher of an Islamic kindergarten)

*The school has different priority to spend our financial resources. and it is clear, internet, computer or such was not their priority (*Darsih, a teacher in a kindergarten).

*The school foundation gave us flexibility to do everything we planned, for example we would use laptop, or other devices for teaching learning process. but if it had financial consequence, she said that she could no nothing... I meant she did not want to spend money (*Ana, teacher in Central Java).

As can be seen from the data given above, support of educational infrastructure for teacher technology integration is very diverse in Indonesia between urban and rural. Unlike the case in a big city like Jakarta, where teachers benefit from well-established institutions and access to fast internet that would allow for effective online classes. On the other side, teachers in rural areas have a different problem with limited financial resources and lack of interest to invest on technology. This discrepancy illustrates the new face of a digital divide that separates urban and rural teachers, while lacking in institutional support to improve their practice with technological resources, they found it difficult to step forward as far as integration into educational practices.

4. Discussion

Teachers across urban and rural areas in Indonesian early childhood recognized the potential of technology to accelerate learning, enhance engagement, and support individualized instruction, as highlighted by Fernández-Gutiérrez et al. (2020), Iancu (2023), and Sidgel (2017), and aligned the previous studies in the country (Istiana & Widodo, 2023; Salim, 2024; Widyawati, 2021). However, this study presents distinct challenges depending on the context. Urban teachers face the challenge of keeping pace with students who are already familiar with advanced technological devices such as iPads and laptops, which they often use at home. This familiarity requires that teachers be highly innovative and creative to maintain student interest and engagement amidst the extensive array of information available outside of school. Urban teachers are thus under significant pressure to develop content that competes with the diverse and engaging experiences students encounter beyond the classroom. In contrast, rural teachers encounter substantial barriers related to technology access, supported previous studies (Ardiana, 2023; Hasanah & Aziza, 2024). High costs for data and limited availability of technological equipment restrict their ability to incorporate technology into their teaching practices. Furthermore, rural teachers often lack the necessary skills (Cholimah et al., 2024) and institutional support to effectively utilize these technologies. These constraints significantly prevented them from sustaining the use of technology and then limited the potential benefits of technology for enhancing students' learning experiences in rural settings.

Vygotsky's socio-cultural theory (1978) offers a useful framework for understanding these differences. In urban contexts, the higher economic status of students typically translates into greater access to technological tools at home, which facilitates their engagement with these tools and supports social interaction and cognitive development (Cicconi, 2014). Conversely, in rural areas, inadequate infrastructure and support structures pose tough challenges to technology integration. The lack of supports in these settings hinders students' opportunities for development related to technology (Whipp et al., 2005).

The integration of technology in education is also influenced by the skill of teachers and supports of educational institutions (Istiana & Widodo, 2023) but also parents' socio-economic backgrounds (Timotheou et al., 2023). In urban areas, students' familiarity with technology enables them to engage with tools like *Kahoot* effectively, reflecting their parents' economic status and setting high expectations for their teachers. In contrast, rural teachers face significant difficulties due to the high cost of technology, limited access, and minimal institutional support, which adversely affects their ability to implement technology effectively, even then preferred to implement the conventional approach, without use of technological tools in pedagogical process.

In addition, the concept of language as cultural tools (Vygotsky, 1978; Vygotsky et al., 2012) further explains these differing experiences between both. In urban settings, technology is perceived as a valuable tool that enhances teaching and learning, that to some extent construct the way teachers perceived it and enabled them easily integrated technological tools in educational process, as Whipp et al. (2005) suggest. Consequently, urban teachers, supported by their institutions' financial resources, view the integration of technology as beneficial, despite the high cost was not a big deal for them. In contrast, rural teachers often view technology as a costly and challenging tool, consistent with Harrel & Bynum's (2018) observations of how inadequate infrastructure and resources impact technology use. The perception of technology as an expensive and impractical tool in rural areas is influenced by the high costs associated with its implementation, which are beyond the financial reach of their institutions. As a result, the potential advantages and positive impacts of technology are overshadowed by its perceived cost, leading to less sustainable integration of technology in rural settings.

Last, the success of achieving Sustainable Development Goal 4 (SDG 4), which aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all, is highly dependent on the local context (Tonegawa, 2023), which to some extent indicating

contradictory features between urban and rural areas in Indonesia. Economic disparities play a significant role, as wealthier areas often have better infrastructure, more qualified teachers, and greater access to educational resources, including technology. In contrast, poorer regions may struggle with inadequate facilities and insufficient teaching materials. Cultural and social norms also influence educational outcomes, with some communities supporting educational initiatives more than others (Whipp et al., 2005). Community engagement is another vital factor, as local involvement can ensure that educational programs meet the specific needs of the population and foster a supportive learning environment (Bray, 2003). Additionally, access to technology varies widely, with urban areas typically having greater access to digital tools and the internet, while rural areas may lack the necessary infrastructure (Warschauer, 2003). Tailoring educational strategies to address these local factors is essential for promoting inclusive and equitable quality education for all.

5. Conclusion

Based on this study, the integration of technology in Indonesian early childhood education reveals an absolute contrast between urban and rural areas. This divergence, driven by disparities in accessibility and proficiency in using technological tools, has led to a significant gap in the quality of educational services. Urban areas, reinforced by advanced infrastructures, socio economic of parents, and conducive environments, have witnessed a substantial enhancement in educational quality through the successful integration of technology. For urban teachers, technology becomes a blossom, offering numerous benefits and opportunities for enhancing educational practices to obtain optimum outcome. Conversely, rural areas, constrained by limited access to technology and a deficiency in necessary skills, have struggled to keep pace. Despite acknowledging the potential benefits of technology, the problems they faced have proven to be serious obstacles. For teachers in rural areas, insisting on integrating technology into daily pedagogical practices may threaten the sustainability of the educational process due to a lack of resources. As a result, the integration of technology remains infrequent and was not a sustained practices among rural teachers. The advantage of technology even becomes a thorn, as they have very little likelihood of utilizing it effectively due to their socio-cultural context.

These disparities not only widen the gap in educational quality but also threaten the achievement of Sustainable Development Goal 4 (SDG 4), as children in rural areas are less likely to receive equitable and high-quality education compared to their urban counterparts, even though technology is not the only tool to enhance the quality of education. Addressing these challenges is critical to ensuring that all children, regardless of geographical location where they live, could benefit from the transformative power of technology in education.

Further research could be conducted to investigate the role of key figures and educational stakeholders in the educational institutions in facilitating the integration of technology in rural early childhood education. This research could explore how existing actors in the educational institution, social structures, and management can enhance the adoption of technological tools to promote inclusive, effective, and high-quality educational process to facilitate children grow and develop aligned with local, national and global dynamics such as Sustainable Development Goals (SGDs).

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