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Portrait of the Utilization of ICT-Based Learning Media in Outlying Areas: Identification of Kindergarten Teachers

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ABSTRACT

The utilisation of Information and Communication Technology (ICT) in early childhood education is crucial for enhancing the quality of learning that is both interactive and engaging. This study aims to analyse the level of ICT-based learning media utilisation among kindergarten teachers in Bangkalan and identify the factors that support and hinder it. A quantitative descriptive method was employed using an online questionnaire that had been tested for validity and reliability (α = 0.89). The study involved 305 kindergarten teachers as respondents. Data were analysed using descriptive statistics through percentages and categorisation of utilisation levels. The results show that 96.7% of teachers have used ICT, with mobile phones being the most dominant medium (78%), indicating overutilisation. The main supporting factors are teacher motivation and school support, while obstacles include limited funding, network issues, and low teacher confidence. The findings imply the need for training and infrastructural support to enhance teachers' digital competence.

INTRODUCTION

The development of information and communication technology (ICT) has become a major driver of transformation in various sectors of life, including education. In the era of Society 5.0, the integration of ICT into learning has become an unavoidable demand because it plays a crucial role in creating interactive, adaptive, and contextual learning (Muhtadin et al., 2023). Amalia and Fitri (2024) emphasised that the use of digital technology in early childhood learning not only increases learning interactivity but also fosters children's critical and collaborative thinking skills from an early age. In the context of early childhood education (PAUD), the use of ICT is highly urgent, given that today's children are a digital generation growing up in a technology-adjacent environment. ICT enables the presentation of engaging learning materials through audio-visual media, educational games, and exploratory activities that stimulate children's cognition and imagination (Yang & Hong, 2022).

According to the Zone of Proximal Development theory (Vygotsky, 1978), effective learning occurs when children receive support from adults or an environment that is appropriate to their developmental level. In this context, ICT has the potential to serve as a digital scaffolding that facilitates children's learning through meaningful interactions and visual experiences. Furthermore, the TPACK (Technological Pedagogical Content Knowledge) theoretical framework emphasises that teachers need to integrate technological, pedagogical, and content competencies to design learning that is relevant to children's needs (Mishra & Koehler, 2006). However, implementing these two approaches in early

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childhood education in Indonesia still faces various challenges, particularly related to teacher readiness and supporting infrastructure. A study at Trimardisunu Kindergarten found that digital media has the potential to be an engaging and relevant alternative to traditional play-learning activities, particularly in developing fine motor skills such as grasping, picking, and cutting. This is especially true if there is appropriate teacher support and the proper media selection (Sa'adah & Windiarti, 2023).

Nationally, data from the Ministry of Education, Culture, Research, and Technology (2023) shows that more than 65% of early childhood education units in Indonesia lack adequate internet access, and approximately 72% lack basic digital devices such as laptops or projectors. This situation is further complicated in non-urban areas, such as Bangkalan Regency, where the majority of early childhood education (PAUD) institutions are private and independent, with limited operational funds. Initial studies conducted by researchers in several schools have found that teachers predominantly use conventional media, such as books, pictures, and manual teaching aids. In contrast, digital media, including learning videos and educational apps, are still rarely used. Teachers cited the main obstacles as limited equipment, unstable internet connections, and a lack of technical training (Field Documentation, 2024). Sari and Dewi (2022) noted that the primary obstacles to implementing digital media in PAUD stem from the limited availability of equipment and teachers' lack of skills in designing and managing ICT-based learning media.

These findings align with research by Yuniarni (2022) and Fitriani & Mastuah (2023), which showed that digital literacy among early childhood education (PAUD) teachers remains low, and any training they have received is generally formal and discontinuous. This challenge is also related to the low level of digital literacy among teachers, which remains a significant barrier to the innovation of technology-based learning (Lestari & Rahmawati, 2023). Regarding innovation diffusion, Rogers (2003) explains that individual, social, and institutional factors, including perceived benefits, environmental support, and structural barriers, influence the adoption of technology. In the context of early childhood education (PAUD), teachers often face psychological factors that hinder the adoption of ICT, such as a fear of making mistakes and a lack of self-confidence (Fahyuni, 2017). Putra and Wahyuni (2023) found that ongoing training and principal support significantly increase teacher confidence in using educational technology. Furthermore, teachers' intrinsic motivation and principal support are crucial factors that accelerate the adoption process.

Although various studies have discussed the use of ICT in early childhood education (Agustini & Meisak, 2021; Priyanti & Haryanto, 2023), most of these studies focus on institutions in urban areas with adequate facilities. Few studies specifically address the challenges faced by teachers in rural areas, such as Bangkalan Regency, which have limited resources yet still face the demands of integrating ICT-based learning. This gap underpins this research. The use of digital technology in early childhood education also needs to be guided to maintain a balance between screen-based activities and real-life social activities. UNESCO (2023) emphasises the importance of educator supervision to ensure technology use remains oriented toward pedagogical values and child well-being.

This study specifically aims to identify the level of ICT-based learning media utilisation among kindergarten teachers in Bangkalan Regency and analyse the factors that support and hinder its use. This research is expected to make theoretical contributions to the application of the TPACK model and the theory of diffusion of innovation in the context of early childhood education, as well as provide practical contributions in the form of recommendations for developing teacher training and policies that enhance digital literacy, tailored to local characteristics.

METHOD

This study employed a quantitative approach with a descriptive survey method. This approach was chosen because it provides an objective and measurable picture of the level of utilisation of Information and Communication Technology (ICT)-based learning media by kindergarten teachers in Bangkalan Regency. A descriptive quantitative approach was deemed appropriate because the study's purpose was not to test a hypothesis, but to describe the phenomenon of ICT utilisation based on empirical data collected from a large number of respondents.

The data collected included primary data obtained directly from respondents through an online

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questionnaire, which contained information on the level of utilisation of ICT-based learning media, supporting factors, and inhibiting factors in the learning process.

The data collection method employed a survey technique using a closed-ended questionnaire based on a five-point Likert scale, developed in accordance with relevant theories from Yaumi (2018), Fahyuni (2017), and Mustari et al. (2023). The questionnaire instrument outline is presented in Table 1.

Table 1. Questionnaire Instrument Grid

No.	Aspect Measured	Indicator	Item Question
1.	Utilization of ICT-Based Learning	Media Utilization of ICT as a Learning Medium	*Fav:* *I often use ICT-based learning media (such as educational videos, interactive images, and educational apps) to make learning more interesting for children.* *Non-fav:* *I rarely use ICT-based learning media because I feel they are ineffective in learning activities in kindergarten.*
		Utilization of ICT as a Learning Resource	*Fav:* I often search for learning resources online to find materials that suit children's needs. *Non-fav:* I rarely search for relevant and appropriate learning resources online for use in kindergarten learning.
		Utilization of ICT as a Learning Resource	*Fav:* I easily utilize ICT devices outside of class, such as laptops or tablets, as additional learning resources for children. *Non-fav:* I find it difficult to utilize ICT as a learning resource outside of class time.
		Utilization of ICT to Improve Teacher Professionalism	*Fav:* I regularly participate in training or online courses to improve my knowledge and skills as a teacher. *Non-fav:* I rarely participate in online training or courses because I have difficulty managing my time.
2.	Supporting factors in the use of ICT	ICT-based learning media training	*Fav:* I feel that the training on the use of ICT-based learning media that I attended was very helpful in improving my teaching skills. *Non-fav:* I feel that the training on ICT-based learning media that I attended had little positive impact on improving my teaching skills.
		Learning media development.	*Fav:* I easily develop and use various types of ICT-based learning media to support children's learning. *Non-fav:* I find it difficult to develop ICT-based learning media that meet the needs of children in the classroom.
		Infrastructure readiness.	*Fav:* The school provides adequate infrastructure, such as computers and internet connections, to support the use of ICT in learning. *Non-fav:* The school does not have sufficient infrastructure, such as computer equipment or a stable internet connection, to support the use of ICT in learning.
3.	Inhibiting factors in the use of ICT	Technical issues (internet connection, electricity network)	*Fav:* The internet connection and electricity network at the school are quite stable, making it easier to use ICT in learning. *Non-fav:* I often experience disruptions to the internet connection or electricity, which hinders the use of ICT in learning..
		Psychological aspects (challenges to innovation)	*Fav:* I feel motivated to continue innovating in the use of ICT for learning and enjoy trying new technology. *Non-fav:* I feel anxious and lack confidence in trying new technology due to fear of failure or difficulty operating it.

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No.	Aspect Measured	Indicator	Item Question
		Limited operational staff	*Fav:* There are sufficient operational staff to assist in managing ICT equipment at the school. *Non-fav:* Limited operational staff make it difficult for me to manage the ICT equipment used in learning.
		Age factor	*Fav:* y age is not a barrier to utilizing ICT technology for learning because I always strive to continue learning and adapting. *Non-fav:* My age sometimes hinders me from optimally utilizing ICT technology, as I find it difficult to operate new devices or applications.
		Financing issues	*Fav:* The school provides sufficient funds to purchase ICT equipment and update the infrastructure needed for learning. Non-fav: Limited funds available at the school make it difficult to purchase ICT equipment and maintain the infrastructure needed for ICT-based learning.

The population of this study was all kindergarten teachers in Bangkalan Regency, with 305 respondents selected using a simple random sampling technique. The questionnaire was distributed indirectly via Google Form, which was then shared with the teachers via WhatsApp.The instrument's validity was assessed through content validity, involving expert lecturers from the Early Childhood Education Study Program at Trunojoyo University, Madura. The validation results showed a V_h value of 85%, indicating that the questionnaire was valid and suitable for use, with only minor revisions required. Reliability testing was conducted using Cronbach's Alpha formula with SPSS version 26, resulting in a reliability value of 0.951, indicating that all items in the questionnaire were highly reliable (Alpha value > 0.94).

Data analysis was conducted using descriptive statistics, including frequency calculations, percentages, means, and standard deviations. This analysis aimed to describe the distribution of responses, identify trends in ICT utilisation, and compare supporting and inhibiting factors. The analysis results are presented in tables and diagrams to facilitate reading and interpretation. The research flow consists of five main stages. Figure 1 is a flowchart that systematically illustrates the research flow, from planning to reporting the research results.

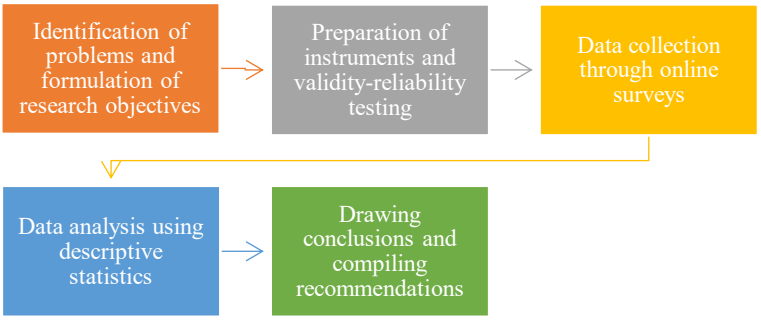

Figure 1. Research Flowchart

RESULTS AND DISCUSSION

This study was conducted to determine the extent to which teachers in institutions utilise Information and Communication Technology (ICT)-based learning media and to identify supporting and inhibiting factors. A total of 305 kindergarten teachers participated in this study, spread across various

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urban, semi-urban, and rural areas. Based on gender, the majority of respondents were 300 females and five males (1.6%). Based on age, the largest group was in the 31–40 year age range, with 115 teachers (37.7%) (Figure 2). Based on their most recent education, the majority were PGPAUD (Early Childhood Education Teacher Education) graduates (157) with a bachelor's degree (51.5%) (Figure 3). In terms of teaching experience, 30% of respondents had taught for more than 16 years, while the rest had teaching experience ranging from less than 1 year to 15 years.

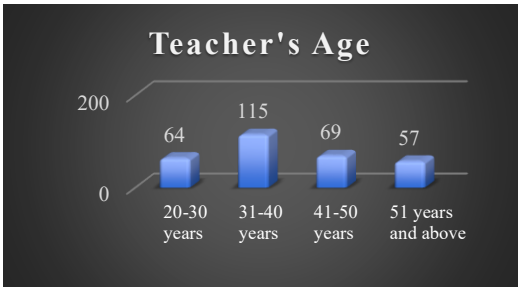

Figure 2. Age Characteristics

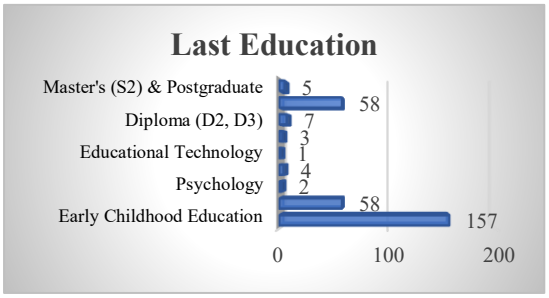

Figure 3. Last Education Characteristics

Research on the use of ICT-based learning media indicates that 96.7% of kindergarten teachers have utilised ICT-based media in teaching and learning activities, with a moderate utilisation rate (mean = 3.05; SD = 0.49). The majority of teachers (78%) use ICT once or twice per week, generally during the delivery of learning materials. Table 2 shows that the most commonly used media type is mobile phones (78%), followed by speakers (76%) and laptops/computers (53%). Interactive media, such as projectors (19%) and digital learning applications (9%), are still rarely utilised.

Table 2. Types of ICT media and their level of use

ICT Media Type	Number of Users	Percentage (%)
Mobile Phones	237	78%
Speakers	232	76%
Laptops/Computers	163	53%
Educational Videos	117	38%
Projectors	57	19%
Interactive Images	49	16%
Learning Applications	27	9%

Further analysis revealed variations in ICT utilisation levels across teacher groups. Teachers aged ≤35 years and under had an average ICT utilisation score of 3.37, higher than teachers aged ≥45 years and over, who had an average score of 2.81. Furthermore, teachers in urban areas demonstrated a higher level of ICT utilisation (3.42) compared to teachers in rural areas (2.88). Based on teaching experience, teachers with less than 10 years of experience tended to use ICT more frequently than those with more than 15 years of experience.

These findings suggest that younger teachers and those in areas with better access to infrastructure adapt more quickly to ICT use, in line with Rogers' (2003) Diffusion of Innovations theory, which posits that technology adoption is easier for individuals with high exposure to digital

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environments and positive perceptions of its benefits. The results of the Likert scale calculations show that ICT is most often used as a learning resource (mean = 3.49), followed by as a learning medium (3.13), a place to learn (2.96), and a tool for improving teacher professionalism (2.59).

Table 3. Aspects of ICT Utilization by Kindergarten Teachers

ICT Utization Aspects	Average Total	Category
As a learning medium	3,13	Medium
As a learning resource	3,49	High
As a place to learn	2,96	Medium
To improve teacher professionalism	2,59	Low
Overall average	3,05	Medium

The use of ICT as a learning resource (e.g., searching for educational images, songs, and videos) is the most common practice. However, only a few teachers use ICT for reflection or learning evaluation activities. This finding suggests that ICT use is still in the early stages of adoption, rather than full integration, as described in the TPACK model, where technology mastery is not yet fully connected to the pedagogical dimension and learning content. The three main factors driving teacher ICT use include teacher motivation, ICT training, and school support. Teacher motivation received the highest score (mean = 4.02), indicating that intrinsic motivation is the primary factor in ICT use. Details of the data obtained from each supporting factor are presented in Table 4.

Table 4. Average Supporting Factors

Supporting Factors	Number of Respondents	Percentage (%)	Average Score
Teacher Motivation	240	79%	4,02
ICT Training	225	74%	2,99
School Support	195	64%	3,08

There are five main inhibiting factors that influence the low utilization of ICT by kindergarten teachers in Bangkalan. The following table displays the average results for each inhibiting factor.

Table 5. Average Inhibiting Factors

Barrier Indicator	Average Favorabel	Average Unfavorabel	Average Total
Limited school funding	4,01	2,46	3,23
Limited operational staff	3,86	2,78	3,32
Technical issues (network/electricity)	3,21	2,56	2,89
Psychological aspects (lack of self-confidence)	2,92	2,37	2,65
Age factor	2,78	2,10	2,44

The comparison results indicate that teachers in rural areas experienced the most significant barriers (mean total barriers = 3.41), compared to teachers in urban areas (mean = 2.87). Teachers over 45 also reported higher levels of psychological and technical barriers than younger teachers. This study shows that kindergarten teachers' utilisation of Information and Communication Technology (ICT)-based learning media falls within the moderate category, with an average score of 3.05 and a standard deviation of 0.49. This means that most teachers have incorporated ICT into their learning activities, but its utilisation has not been comprehensive across all learning stages, including planning, implementation, and evaluation.

This finding aligns with a study by Sauda et al. (2023), which found that ICT use in early childhood education (PAUD) is still limited to delivering material. However, this study provides a new insight: some teachers in Bangkalan have begun developing simple digital media independently, for example, through PowerPoint presentations or educational videos. This indicates a transition from users to creators of digital learning content, although it remains limited. Most teachers in Bangkalan rely on devices such as mobile phones, speakers, and laptops because they are easily accessible. This phenomenon suggests that accessibility remains a crucial factor in the use of ICT. This reinforces the findings of Fitriani & Mastuah (2023) that early childhood education in Indonesia is still dominated by

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one-way media with minimal interactivity. In a constructivist context (Vygotsky, 1978), early childhood learning ideally emphasises exploration and social interaction, so ICT media needs to be directed towards more participatory and collaborative forms.

Compared to research by Febrialismanto (2020) in Riau and Kurniawati (2022) in Yogyakarta, the level of ICT utilisation in Bangkalan is relatively low. Teachers in Yogyakarta have begun using interactive digital learning platforms, such as Google Classroom and LearningApps, whereas in Bangkalan, usage still focuses on simple audio-visual media. This comparison highlights the digital divide between areas with adequate infrastructure and semi-urban areas, such as Bangkalan.

Menariknya, guru di Bangkalan menunjukkan motivasi tinggi dalam memanfaatkan TIK sebagai Learning resources. They actively seek out learning materials such as videos, images, or educational songs. This confirms Herawati's (2023) finding that ICT provides dynamic and flexible learning resources for teachers. However, this study also found that some teachers still copy digital materials without adapting them to local contexts and the characteristics of their students. This situation confirms Yuniarni's (2022) warning that the ability to process and modify digital materials is key to ensuring the effectiveness of ICT-based learning.

The use of ICT as a learning tool remains limited to specific conditions, such as during the pandemic. This indicates that ICT use has not yet become a sustainable learning culture. In line with the Diffusion of Innovation theory (Rogers, 1995), the adoption of educational technology requires consistent social support and policies. Teachers need adaptation time, supporting facilities, and continuous familiarisation so that technology is not used only during emergencies but becomes an integral part of daily learning activities.

The main supporting factor in this study was teacher motivation. High motivation indicates an intrinsic awareness of innovation, as Prasetyo (2020) and Munir (2017) suggest, stating that personal motivation is a fundamental element in digital learning innovation. Teachers are beginning to transform into creative media designers, utilising tools like PowerPoint, Canva, and basic video editing software. This demonstrates the potential for developing digital competencies at the individual level, despite the lack of strong institutional support. The ICT training received by teachers has contributed positively to skill improvement, although the results have not been optimal. This aligns with Sauda et al. (2023), but this study criticised the fact that most of the training remains theoretical (Putri et al., 2022) and is not based on field practice. Therefore, future training should be designed to meet the needs of teachers, incorporating a hands-on learning approach and ongoing mentoring.

School support is also a crucial factor, but it is not yet optimal. Only 64% of teachers feel fully supported by their schools. These results align with Rogers' (1995) theory, which posits that the success of technological innovation depends not only on individual readiness but also on the organisational ecosystem. Principal support and a collaborative work culture have a significant influence on the sustainability of innovation. Priyanti & Haryanto (2023) emphasised the importance of periodic supervision and evaluation so that the use of ICT is not merely ceremonial.

Conversely, the main obstacles are limited school funding and a shortage of technical staff. This situation was also found in research by Alfiani (2022) and Surahman (2021). Teachers often use personal devices because schools lack a dedicated budget for technology. Furthermore, the lack of technical staff makes it difficult for teachers to address device operational issues. This obstacle is exacerbated by network and electricity disruptions, particularly in rural Bangkalan. Similar problems were also found in the 3T (United Territories) areas according to Muhdi (2020) and Widianto (2021), who emphasised that infrastructure gaps are key factors hindering equitable digital education.

Psychological and age factors also cannot be ignored. Teachers over 45 years of age tend to feel less confident in using technology. This research aligns with Yuniarni (2022), who stated that psychological barriers are a significant challenge in the digital transformation of education. Within the TPACK framework (Mishra & Koehler, 2006), mental readiness and an open attitude toward technology are as important as technical skills themselves. The results of this study have important implications for the development of early childhood education policies at the regional level. The Bangkalan Regency Government needs to increase practice-based training relevant to the needs of PAUD (Early Childhood Education) teachers.

Furthermore, digital literacy needs to be integrated into the PAUD curriculum so that the use of

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ICT serves not only as a tool but also as part of the learning process, fostering children's creativity and collaboration. The government also needs to allocate a dedicated budget for the procurement of ICT facilities and technical personnel in schools, especially in semi-urban and rural areas. Furthermore, collaboration across institutions such as the Education Office, HIMPAUDI (Indonesian Teachers' Association), and teacher communities needs to be continuously encouraged in the implementation of sustainable ICT mentoring programs. ICT-based policies in PAUD must be directed not only at increasing device access but also at transforming the learning culture toward a digital pedagogical model that is contextualised to the characteristics of early childhood.

This study has several limitations that require consideration. First, data were collected through an online questionnaire, so the results are highly dependent on teachers' honesty and subjective perceptions. Second, this study is descriptive in nature and therefore cannot explain the causal relationship between supporting factors and the level of ICT utilisation. Third, the scope is limited to Bangkalan Regency; therefore, generalising the results to other regions should be done with caution. Nevertheless, this study makes an important empirical contribution to understanding the dynamics of ICT use in early childhood education (PAUD) in semi-urban areas. Further studies employing a mixed-methods approach are recommended to explore the psychological and sociocultural factors influencing ICT adoption among PAUD teachers in greater depth.

CONCLUSION

This study shows that the use of Information and Communication Technology (ICT)-based learning media by kindergarten teachers has been implemented, but has not yet reached an optimal level. Most teachers have used ICT as a learning resource and tool, particularly in searching for educational images, songs, and videos to support children's learning activities. However, this use remains one-way and has not been fully integrated into all stages of learning, resulting in ICT's potential as an interactive and collaborative medium not being fully utilised. Teachers' high motivation to independently develop media is a key supporting factor indicating significant potential for improving digital literacy at the early childhood education (PAUD) level. On the other hand, limited facilities, funding, technical personnel, and psychological barriers, such as a lack of self-confidence, remain obstacles to the widespread and sustainable implementation of ICT. Therefore, applicable training, ongoing mentoring, and policies responsive to the needs and characteristics of PAUD teachers are needed so that the use of ICT becomes not merely a tool but an integral part of a creative, interactive, and contextual learning process.

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