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Utilization of ICT-Based Learning Media by Teachers for Improving Teaching Effectiveness in SD Negeri 19 Palembang

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Abstract: This study analyzes the utilization of Information and Communication Technology (ICT)-based learning media by teachers at SD Negeri 19 Palembang through three integrated management dimensions: planning, implementation, and evaluation (P–I–E). The relevance of this study lies in the unique challenges faced by elementary schools in Palembang, particularly disparities in ICT infrastructure, limited teacher digital literacy, and the central role of school leadership in managing technology adoption. Using a qualitative descriptive approach, data were obtained through interviews, classroom observations, and document analysis. The findings show that ICT planning is influenced by resource availability and teacher competence; implementation is shaped by internet instability, varied digital skills, and shared access to devices; and evaluation remains informal, relying on teacher reflection rather than structured monitoring tools. The study highlights the essential managerial role of the principal in providing facilities, supervision, and policy support. This research contributes a three-dimensional ICT management model (P–I–E) for elementary school contexts and recommends strengthening digital training, improving ICT infrastructure, and developing standardized evaluation instruments to enhance ICT-based learning effectiveness.

Keywords: *ICT utilization, learning media, school management, teaching effectiveness, elementary education*

A. Introduction

The integration of Information and Communication Technology (ICT) in education has become a key driver in transforming instructional practices toward more interactive, student-centered, and effective learning environments. ICT-based learning media enable teachers to clarify abstract concepts and enhance student engagement Martínez-Soto & Prendes-Espinosa (2023). ICT also supports differentiated learning by accommodating diverse student needs Lérida-Ayala et al. (2023). Evidence from primary education shows that ICT enhances instructional clarity and improves learning outcomes (Smith and Brown, 2024). Evidence from primary education shows that ICT enhances instructional clarity and improves learning outcomes (Smith and Brown, 2024). Digital learning media further strengthen students' conceptual understanding through visual and interactive formats (Chen and Yang, 2023).

However, the successful utilization of ICT requires more than the availability of devices. It must be supported by structured school management, including planning, implementation, and evaluation processes (Olofsson, Lindberg and Fransson, 2023). Effective ICT integration also depends on supportive policies, supervision, and leadership that strengthen teachers' readiness and confidence in using technology (S. Becker and Park, 2022).

In Indonesia, ICT adoption in elementary schools remains uneven due to disparities in infrastructure, variations in teachers' digital literacy, and inconsistent policy implementation across regions (Nurjanah, Masithoh and Zulfaidah, 2024). These issues are particularly evident in Palembang, where elementary schools face limited access to digital devices and unstable internet connectivity (Kharisma and Purwanto, 2023). Local educational reports indicate that many public elementary schools in Palembang fall below national ICT readiness standards, especially regarding the availability of functional ICT equipment and internet stability (Nurmelita, 2024). International studies also emphasize that digital inequity significantly influences the success of ICT-supported learning (Pedersen and Rasmussen, 2022).

Previous studies on ICT integration have primarily focused on student engagement (As, Nur and Mustamin, 2024). Other researchers have examined teacher digital competence as a key factor influencing ICT-based instruction (Lee and Kim, 2023). Several studies highlight common barriers, such as limited infrastructure and inadequate teacher confidence in operating digital tools (Ummah, 2019). Research in Indonesia further indicates that variations in digital literacy among teachers directly affect the quality of ICT implementation (Gupta and Sharma, 2022). International findings similarly show that ICT adoption is strongly influenced by teacher readiness and school support systems (Ferdiansyah and Noverina, 2018).

Therefore, this study aims to analyze the utilization of ICT based learning media at SD Negeri 19 Palembang using the integrated framework of Planning-Implementation-Evaluation (P-I-E) while emphasizing the managerial role of school leadership in supporting and sustaining ICT practices. The findings are expected to contribute theoretically by offering a comprehensive ICT management model for elementary school contexts and practically by providing recommendations to strengthen teacher competence, infrastructure, and supervisory mechanisms.

B. Methods

This study employed a qualitative descriptive approach to obtain an in-depth understanding of how teachers at SD Negeri 19 Palembang utilize ICT-based learning media in classroom activities. The research was conducted in the natural school setting during the 2024/2025 academic year to ensure that the data represented authentic teaching practices.

Data were collected using three techniques. First, semi-structured interviews were conducted with the principal, vice principal, classroom teachers, and several students involved in ICT-assisted learning. These interviews explored planning practices,

implementation processes, challenges, and evaluation mechanisms related to ICT use. Second, classroom observations were carried out to document how teachers integrated ICT during instruction, including how they prepared learning media and interacted with students while using technology. Third, document analysis was performed by reviewing lesson plans, school supervisory notes, schedules, and ICT-related policy documents to strengthen and validate the findings.

Data analysis followed the interactive model of Miles and Huberman, consisting of data reduction, data display, and conclusion drawing. Data reduction was conducted by filtering interview and observation transcripts into thematic categories based on the planning, implementation, and evaluation dimensions. These themes were then presented systematically to provide a clear description of the ICT utilization process. The conclusions were formulated by identifying recurring patterns and linking them to the managerial practices at the school.

To ensure the credibility of the findings, this study applied triangulation of sources and techniques by comparing interview data, observational notes, and documentation. This process ensured that the findings reflected actual conditions and strengthened the validity of the qualitative analysis.

C. Results

The findings of this study indicate that teachers at SD Negeri 19 Palembang have begun integrating ICT-based learning media as part of their instructional process, although the extent of utilization varies depending on teacher competence, infrastructure readiness, and school-level managerial support. In the planning stage, teachers demonstrated awareness that ICT could enhance lesson clarity and improve content organization (Smith and Brown, 2024). Teachers prepared digital slides, videos, and simple animations that were intended to make learning more interactive and visually accessible to students (Chen and Yang, 2023). These practices align with recent studies emphasizing that well-prepared digital resources support structured learning design in primary schools (Roza *et al.*, 2023). Teachers' lesson plans reflected global trends showing that ICT integration is increasingly essential for content delivery and conceptual understanding (Paper, 2024).

Despite this awareness, planning was constrained by limited ICT devices and the need for shared equipment across classrooms, a situation commonly found in Indonesian elementary schools (Nurmelita, 2024). Similar shortages of equipment have also been identified in Southeast Asian schooling systems with moderate ICT readiness (Singh, 2022). Teachers frequently needed to revise their ICT plans due to unstable internet conditions, a barrier widely reported in low-resource contexts (Pedersen and Rasmussen, 2022). This constraint mirrors the persistent digital inequity that affects instructional continuity in many developing regions (Burdette, 2024). Teachers with higher digital competence were able to design more interactive materials, consistent with evidence that teacher skill shapes the creativity and depth of ICT planning (Lee and Kim, 2023). Meanwhile, teachers with limited competence often relied on basic slides or offline materials, reflecting earlier literature that low digital confidence restricts ICT innovation

(Gupta and Sharma, 2022). Newer studies reaffirm that digital competence strongly influences planning quality in ICT-based instruction (Lv *et al.*, 2024).

During classroom implementation, teachers used ICT to improve student engagement, motivation, and conceptual understanding (Martínez-Soto and Prendes-Espinosa, 2023). Observations showed that students were more attentive when exposed to multimedia elements such as animations or short educational videos, a finding consistent with the pedagogical value of multimodal learning (Adam and Syastra, 2022). ICT tools supported varied learning styles and facilitated comprehension, especially for younger learners (Zhao and Zhang, 2023). Implementation quality strongly depended on teacher ICT readiness. Teachers with higher digital skills incorporated interactive features, reinforcing the argument that competence and confidence are critical predictors of ICT integration success (Lerida-Ayala, 2023). Teachers with lower digital competence relied on static slides, confirming that limited skills constrain the depth of ICT usage (Paper, 2024).

Internet instability frequently disrupted ICT use, requiring teachers to switch to offline resources (Zakaria *et al.*, 2023). Device-sharing also affected implementation scheduling, reflecting broader findings that access inequality hampers ICT-based instruction in Indonesian schools (Kharisma and Purwanto, 2023). Despite these barriers, teachers maintained a positive attitude toward ICT because they believed it enhanced learning quality, consistent with evidence that teacher perceptions strongly influence ICT adoption in the classroom (S. A. Becker and Park, 2022). Studies further show that intrinsic teacher motivation sustains ICT practices even when infrastructure is limited (Mailani, Ikrima, M. Nazir, 2023).

In the evaluation stage, ICT utilization was assessed informally through teacher reflections on student engagement, participation, and comprehension (Hasanah *et al.*, 2024). Teachers relied on classroom observations rather than structured assessment tools, consistent with patterns in Indonesian schools where ICT evaluation frameworks are still limited (Aini, Novitasari and Nadlir, 2024). School documentation also showed that there were no ICT-specific indicators in supervision processes, a gap consistent with global findings that many primary schools lack formal mechanisms for monitoring ICT effectiveness (UNESCO, 2022). This absence reflects the broader issue of weak governance in ICT implementation (S. A. Becker and Park, 2022). Evaluation inconsistency across teachers was influenced by differences in digital literacy, confirming previous findings that competence affects not only implementation but also assessment accuracy (Lee and Kim, 2023). Recent frameworks on ICT monitoring emphasize that evaluation must be systematic to ensure improvement and accountability (Smith and Brown, 2024).

Overall, the findings reveal that ICT utilization at SD Negeri 19 Palembang has progressed but remains limited by infrastructure constraints, varied teacher competence, and inadequate evaluation systems. These conditions reflect broader research showing that successful ICT integration in primary schools depends on resource availability, teacher readiness, and leadership support (Olofsson, Lindberg and Fransson, 2023). Effective principal leadership is therefore essential to sustaining ICT initiatives and ensuring that

planning, implementation, and evaluation are aligned to educational goals (S. Becker and Park, 2022).

D. Discussion

The results of this study demonstrate that the utilization of ICT-based learning media at SD Negeri 19 Palembang is shaped by the interplay between teacher competence, infrastructure readiness, and managerial support from school leadership. These findings are consistent with the growing body of literature emphasizing that the success of ICT integration in primary education depends not only on the availability of technology but, more importantly, on the management processes that guide its use (Olofsson et al., 2023; Becker & Park, 2022).

The planning stage in this study reflects similar challenges identified in previous research, where disparities in infrastructure and unequal digital literacy among teachers limit the depth and creativity of ICT integration (Mailizar & Fan, 2019; Nurjanah et al., 2024). Teachers at SD Negeri 19 Palembang often adapted their plans because devices such as projectors were shared among classes. This aligns with Gupta & Sharma (2022) who argue that limited access to ICT tools remains a structural barrier in many Indonesian elementary schools.

During implementation, teachers' varying levels of digital competence strongly influenced instructional practices. Some teachers used ICT to enrich explanations and improve student engagement, while others relied on basic presentation tools. These findings support Zhao & Zhang (2023), who emphasize that differences in digital competence directly shape the quality of ICT-mediated instruction. The frequent internet disruptions reported in this study also mirror the challenges noted by Pedersen & Rasmussen (2022), who highlight infrastructure inconsistency as a major obstacle in elementary-level digital learning.

A notable finding relates to the role of the principal in facilitating ICT use. School leaders influenced ICT integration by coordinating device access, providing encouragement, and conducting supervision. This is consistent with Olofsson et al. (2023), who found that school leadership plays a decisive role in ensuring continuity and consistency in ICT adoption. However, the absence of structured evaluation tools at SD Negeri 19 Palembang reveals a management gap. Although supervision occurs, it does not yet include ICT-specific indicators. This supports UNESCO (2022) recommendation that systematic ICT monitoring instruments are essential for ensuring quality and accountability in digital learning environments.

The evaluation process described in this study largely informal and reflective aligns with Hasanah et al. (2024), who observed that many Indonesian elementary schools have not yet developed standardized frameworks for assessing ICT utilization. The reliance on teacher reflection alone may lead to inconsistent interpretations of effectiveness, indicating a need for more systematic evaluation aligned with school policy.

In summary, the findings reinforce the argument that ICT integration in elementary education must be viewed as a management process rather than a purely technological

practice. The Planning-Implementation-Evaluation (P-I-E) model presented in this study offers a holistic way to understand how ICT can be optimized through structured management, competent teachers, and strong leadership. Strengthening digital literacy programs, improving infrastructure, and developing formal evaluation tools will be critical steps toward maximizing the benefits of ICT for teaching and learning.

E. Conclusions

This study concludes that the utilization of ICT-based learning media at SD Negeri 19 Palembang is shaped by a continuous management process involving planning, implementation, and evaluation (P-I-E). Teachers consistently attempted to integrate ICT into their lessons, but their efforts were constrained by limited infrastructure, varying levels of digital competence, and unstable internet connectivity. As a result, ICT integration was often practical rather than innovative, with teachers prioritizing accessible and reliable media to ensure that learning could continue despite technical challenges.

One of the key findings of this study is the pivotal role of school leadership. The principal's support through supervision, coordination of device usage, and encouragement to use ICT contributed to sustaining digital learning practices. However, the absence of structured evaluation tools indicates that ICT utilization has not yet been fully institutionalized within the school's management system. Evaluation remains informal and relies heavily on teachers' interpretations of student engagement and comprehension.

The novelty of this research lies in its integrated analysis of ICT utilization through the three-dimensional P-I-E framework, offering a holistic understanding of how ICT is managed in a real elementary school context. This framework provides a practical lens for identifying where support is needed and how ICT initiatives can be strengthened at the school level.

To maximize the benefits of ICT for teaching and learning, several recommendations are proposed. First, teacher digital literacy should be improved through targeted professional development programs that focus on pedagogical and technical skills. Second, the school needs to enhance its ICT infrastructure, including providing more devices and ensuring more stable internet connectivity. Third, the development of a structured monitoring and evaluation tool specific to ICT integration is essential to guide supervision, improve accountability, and maintain consistent standards. Strengthening these areas will help ensure that ICT becomes an integral and effective component of teaching practices in elementary education.

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