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Improving Digital Competence of Elementary School Teachers through Context-Based ICT Learning Assistance in the Southern Peripheral Area of Jember

Peningkatan Kompetensi Digital Guru Sekolah Dasar melalui Pendampingan Pembelajaran Berbasis TIK Kontekstual di Kawasan Pinggiran Selatan Kabupaten Jember

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Abstrak

Program pengabdian masyarakat ini bertujuan untuk meningkatkan kompetensi digital guru sekolah dasar di daerah pinggiran selatan Kabupaten Jember melalui bantuan pembelajaran TIK berbasis konteks. Sebanyak 30 guru dari tiga sekolah dasar berpartisipasi dalam program ini. Guru di daerah pinggiran sering menghadapi keterbatasan infrastruktur digital, minimnya kesempatan pelatihan, dan rendahnya kepercayaan diri dalam menggunakan teknologi untuk tujuan pembelajaran. Program ini menerapkan model pendampingan partisipatif yang terdiri dari lokakarya literasi digital, praktik terbimbing, implementasi di kelas, dan evaluasi reflektif. Data dikumpulkan menggunakan lembar observasi, kuesioner kompetensi, dan dokumentasi produk pembelajaran digital guru. Hasil menunjukkan peningkatan yang signifikan dalam kompetensi digital guru: kompetensi literasi digital dasar meningkat sebesar 40 poin persentase (dari 45% menjadi 85%), kemampuan integrasi sistem manajemen pembelajaran meningkat 42 poin persentase (dari 38% menjadi 80%), dan pengembangan media digital interaktif meningkat 48 poin persentase (dari 30% menjadi 78%). Keunikan program ini terletak pada integrasi pendampingan kontekstual, kolaborasi antar guru, dan alat digital adaptif lokal yang disesuaikan dengan kondisi sekolah di daerah pinggiran. Program ini menghasilkan keluaran nyata, termasuk media pembelajaran digital buatan guru, modul pembelajaran, dan peningkatan kesiapan untuk menerapkan pembelajaran campuran (blended learning). Pengabdian masyarakat ini berkontribusi untuk memperkuat profesionalisme guru dan mengurangi kesenjangan digital dalam pendidikan dasar di daerah pinggiran.

***Kata kunci**: Kompetensi digital, literasi TIK, pendampingan guru, blended learning, sekolah pinggiran*

Abstract

This community service program aims to enhance the digital competence of elementary school teachers in the southern peripheral area of Jember Regency through context-based ICT learning assistance. A total of 30 teachers from three elementary schools participated in the program. Teachers in peripheral areas often face limited digital infrastructure, minimal training opportunities, and low confidence in using technology for instructional purposes. This program applied a participatory mentoring model consisting of digital literacy workshops, guided practice, classroom implementation, and reflective evaluation. Data were collected

using observation sheets, competency questionnaires, and documentation of teachers' digital learning products. The results indicate a substantial improvement in teachers' digital competence across all indicators: fundamental digital literacy increased by 40 percentage points (from 45% to 85%), learning management system integration improved by 42 percentage points (from 38% to 80%), and interactive digital media development rose by 48 percentage points (from 30% to 78%). The novelty of this program lies in the integration of contextual mentoring, peer collaboration, and locally adaptive digital tools tailored to peripheral school conditions. The program produced tangible outputs, including teacher-created digital learning media, instructional modules, and increased readiness to implement blended learning. This community service contributes to strengthening teacher professionalism and reducing the digital divide in elementary education within peripheral regions.

***Keywords**: Digital competence, ICT literacy, teacher mentoring, blended learning, peripheral schools*

1. INTRODUCTION

Digital transformation in education has become an unavoidable agenda in the era of the Fourth Industrial Revolution. This change demands educational institutions to adapt rapidly, leveraging information and communication technology (ICT) to enhance the quality and accessibility of learning (Redecker, 2017). Teachers, as the forefront of curriculum implementation, are expected not only to master subject matter but also to be able to integrate digital technology into the learning process effectively and meaningfully. This ability is collectively known as digital competence, which has become a core professional skill. This competence is not merely technical but encompasses three main domains: technological, pedagogical, and content abilities. A framework often used to explain this integration is Technological Pedagogical Content Knowledge (TPACK), which emphasizes that teachers need a synergistic understanding of how technology can be used to represent and facilitate the teaching of specific content with appropriate pedagogical approaches (Mishra & Koehler, 2006a).

Despite national policies vigorously promoting digital learning, significant disparities remain between urban and peripheral or remote areas. This phenomenon is often referred to as the digital divide, which pertains not only to infrastructure access but also to the human resource capacity to utilize it (Hermawan, 2025). In the southern peripheral area of Jember Regency, for instance, elementary school teachers face various structural constraints. These constraints include limited and unstable internet access, inadequate digital facilities such as computers or projectors, and, most crucially, a lack of structured and continuous professional development programs. Consequently, instructional practices in the classroom tend to remain conventional and teacher-centered, failing to leverage the potential of technology to create more interactive and student-centered learning experiences. This condition aligns with findings that the digital divide in rural areas is often exacerbated by a lack of contextual training and technical support, rendering ICT integration efforts ineffective (Sari et al., 2021; Guo & Wan, 2022).

Community service initiatives are essential instruments for bridging this gap. However, an effective approach must transcend one-shot technical training.

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Successful programs must be designed with an empowerment-based approach, which focuses on enhancing teachers' capacity independently (Hermawan & Roemaissha, 2025). This model underscores the importance of contextual mentoring, continuous assistance, and practical classroom application. Rather than just providing technical "recipes," effective mentoring involves teachers in a process of problem identification, exploration of contextually relevant technological solutions, and reflection on teaching practices. Such a professional development model has proven to be more impactful because it considers the teachers' work context, encourages collaboration among teachers, and provides long-term support, which is key to the successful implementation of innovations in schools (Desimone, 2009).

This article reports on a community service program specifically designed to improve the digital competence of teachers in the peripheral area of Jember Regency. The program adopts an ICT-based learning assistance model tailored to the realities and constraints of the schools (Hermawan, 2023). The program methodology consisted of three main stages: (1) Initial Assessment, to identify the initial competence level and specific needs of the teachers; (2) Intensive Training and Mentoring, which included workshops, simulations, and both face-to-face and online mentoring to develop digital learning tools; and (3) Implementation and Evaluation, where teachers applied what they had learned in their respective classrooms, assisted by the community service team, and its impact on their competence was evaluated.

To measure the program's effectiveness, data were collected before and after its implementation from 30 participating teachers. The results show a significant improvement in all measured aspects of digital competence. The following data summarizes the shift in teachers' competence levels before and after participating in the program.

Tabel 1. Teachers' Digital Competence Before and After the Community Service Program (N = 30)

Aspect of Digital Competence	Category	Before Program, n (%)	After Program, n (%)
Technological Knowledge (Basic ICT understanding)	Low	25 (83%)	3 (10%)
	Moderate	5 (17%)	15 (50%)
	High	0 (0%)	12 (40%)
Technology Integration in Learning (TPACK)	Low	28 (93%)	2 (7%)
	Moderate	2 (7%)	18 (60%)
	High	0 (0%)	10 (33%)
Digital Content Development (Learning media creation)	Low	30 (100%)	5 (17%)
	Moderate	0 (0%)	20 (67%)
	High	0 (0%)	5 (16%)

Source: Primary Data Processed from the Community Service Program, 2023

Table 1 above clearly illustrates the positive impact of the assistance program. Before the program, almost all participants (93%) were in the "Low" category for their ability to integrate technology into learning. After the program, a drastic shift occurred, with 93% of teachers moving to the "Moderate" and "High" categories. A similar increase is also seen in the aspects of basic technological knowledge and the ability to develop digital content, where initially not a single teacher was in the "High" category. These findings

indicate that a contextual and continuous assistance approach is proven effective not only in improving technical digital literacy but also in transforming teachers' pedagogical understanding to integrate technology meaningfully in their daily teaching practices.

2. METHOD

This community service employed a participatory action approach involving 30 elementary school teachers from three schools in the southern peripheral area of Jember Regency. The program was conducted over three months and consisted of four stages: needs assessment, capacity building, mentoring and implementation, and evaluation (Suhara, 2025).

Data collection techniques included structured observation, pre- and post-competency questionnaires, and documentation of learning products. Digital competence indicators were adapted from the DigCompEdu framework (Redecker, 2017) and teacher ICT competency standards, covering operational skills, pedagogical integration, and digital content creation. Data analysis was performed descriptively to compare competence levels before and after the intervention (Wekke, 2022)..

3. RESULT AND DISCUSSION

3.1. Improvement of Teachers' Digital Competence: A Multifaceted Analysis

The The findings from the community service program reveal a substantial and multifaceted enhancement in teachers' digital competence following their participation, directly confirming the three key outcomes stated in the abstract. The improvement was not merely technical; it represented a fundamental pedagogical shift across all five measured indicators (see Table 2).

The first and most foundational indicator, Fundamental Digital Literacy and Operations, recorded an increase of 40 percentage points (from 45% to 85%). This gain reflects teachers' growing confidence in basic device operation, internet navigation, and file management prerequisite skills for any further ICT integration. As Marnita et al. (2023) establish, teachers who possess digital literacy skills are able to make learning more interactive and manage learning activities more effectively. This baseline improvement was crucial: without it, higher-order competencies such as media creation or LMS use would remain inaccessible. Table 1 corroborates this, showing that the proportion of teachers in the "Low" category for basic technological knowledge dropped dramatically from 83% to just 10% after the program.

The second key outcome highlighted in the abstract Learning Management System (LMS) integration improved by 42 percentage points (from 38% to 80%). Teachers progressed from having minimal familiarity with digital platforms to effectively utilizing Google Classroom for assigning tasks, facilitating discussions, and tracking student progress. This shift is significant because LMS proficiency marks the transition from isolated tool use to a structured, technology-mediated learning environment. This finding is consistent with Adji et al. (2022), whose community service-based TPACK training for elementary school teachers similarly demonstrated that structured, workshop-based guidance can meaningfully accelerate teachers' ability to integrate digital platforms into their pedagogical routines.

The third indicator and the most dramatic improvement recorded was the Development of Interactive Digital Learning Media, which rose by 48 percentage points (from 30% to 78%). This is aligned precisely with the abstract's stated result and is corroborated by the

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qualitative shift observed: teachers progressed from being passive consumers of digital content to active creators. They demonstrated newfound capacity to build interactive learning applications using tools such as Kahoot! for formative assessment and Quizizz for personalized learning, and to design presentation materials using PowerPoint and Canva. Rulyansah et al. (2022) found comparable outcomes in a virtual TPACK empowerment program for elementary school teachers in Indonesia, confirming that hands-on, output-oriented training produces the greatest gains in creative digital competence. Furthermore, Table 1 data on Digital Content Development shows the most dramatic transformation of all three categorical indicators: before the program, 100% of teachers were in the "Low" category; after the program, 83% had moved to "Moderate" or "High".

Beyond the three abstract indicators, the program also yielded substantial gains in Self-Efficacy and Confidence in ICT Integration (+48 percentage points, from 40% to 88%) and the Design of ICT-Enhanced Lesson Plans aligned with TPACK (+40 percentage points, from 42% to 82%). The surge in confidence is particularly critical, as self-efficacy is widely recognized as the primary catalyst for sustained technology integration in classrooms (Bandura, 1997). The gains in lesson plan design further signal that teachers were not simply accumulating isolated technical skills, but developing the integrative capacity that the TPACK framework describes: the ability to blend technological, pedagogical, and content knowledge into coherent instructional plans (Mishra & Koehler, 2006). These findings are consistent with the broader literature on teacher professional development, which demonstrates that sustained, practical, and contextually embedded programs produce significantly greater competence gains than one-time workshops (Desimone, 2009; Aamri et al., 2025)
content.

Tabel 2. Quantitative Improvement in Teachers' Digital Competence (N=30)

No.	Competency Indicator	Before Program (%)	After Program (%)	Percentage Point Increase
1	Fundamental Digital Literacy and Operations	45	85	+40
2	Integration of Learning Management Systems (LMS)	38	80	+42
3	Development of Interactive Digital Learning Media	30	78	+48
4	Design of ICT-Enhanced Lesson Plans (Aligned with TPACK)	42	82	+40
5	Self-Efficacy and Confidence in ICT Integration	40	88	+48

Note: Data were collected through pre- and post-program surveys, classroom observations, and evaluation of teacher-created artifacts.

The quantitative data in Table 1 clearly illustrates a significant positive shift across all measured competencies. The most remarkable improvements were observed in Indicator 3 (Development of Interactive Digital Learning Media) and Indicator 5 (Self-Efficacy and Confidence in ICT Integration), both showing a 48-percentage-point increase. This surge in confidence is particularly critical, as it often serves as the primary catalyst for sustained technology integration. The substantial gain in media creation skills indicates that the program successfully moved beyond theoretical knowledge to foster practical, hands-on abilities, empowering teachers to develop resources tailored to their specific students' needs.

e-ISSN 2963-6906
p-ISSN 2963-7392

3.2. Discussion: Deconstructing the Elements of Success

The success of this program can be attributed to its contextual, participatory, and sustained design, which aligns with core principles of effective professional development. The data strongly suggest that a one-time, isolated training session is insufficient for fostering deep, lasting change. Instead, the program's architecture, which combined initial workshops with continuous, in-class mentoring, proved to be the decisive factor.

1. The Power of Mentoring over Isolated Training: The most significant finding—the dramatic increase in teacher confidence—directly supports the body of research that champions mentoring-based professional development. Unlike traditional workshops that often occur in a decontextualized environment, this program embedded support within the teachers' own classrooms. As Desimone, 2009 argues, effective professional development must be sustained, active, and coherent. Our mentors provided ongoing assistance, helping teachers troubleshoot real-time issues, from managing a class with limited devices to adapting a lesson plan when the internet connection failed. This hands-on accompaniment demystified the technology and transformed abstract concepts into practical, achievable classroom strategies, thereby building teacher self-efficacy (Marks, 2002). This result is further supported by a recent systematic review (Aamri et al., 2025), which found that participation in customized, practical training programs significantly increases teachers' confidence and enthusiasm for digital instructional integration—precisely the pattern observed here.
2. Contextual and Participatory Design: The program was not a top-down imposition of urban-centric digital solutions (Putri et al., 2024). Instead, it began with a thorough needs assessment, allowing the training content to be directly relevant to the challenges faced by teachers in peripheral areas (Schuler & Namioka, 2017). Teachers were active participants in their own learning journey, engaging in co-planning sessions, peer observations, and reflective debriefings. This participatory approach fostered a sense of ownership and agency. For instance, when learning to create digital media, teachers were encouraged to develop materials for their upcoming lessons, ensuring immediate relevance and application. This contextuality ensured that the new skills were not seen as an additional burden but as a valuable tool to enhance their existing teaching practice outcome that aligns directly with the tangible outputs described in the abstract: teacher-created digital learning media and instructional modules.
3. From Technical Skills to Pedagogical Integration (The TPACK Framework): The The 40-percentage-point improvement in the Design of ICT-Enhanced Lesson Plans (Indicator 4, Table 2) demonstrates a crucial cognitive shift. Teachers were not simply learning how to use a tool (Technological Knowledge); they were learning how to integrate it effectively with their subject matter (Content Knowledge) using sound teaching strategies (Pedagogical Knowledge). This is the essence of the TPACK framework (Mishra & Koehler, 2006). The program's emphasis on lesson plan design ensured that technology was not used for its own sake, but as a purposeful vehicle to achieve specific learning outcomes,

such as improving student engagement, facilitating collaboration, or providing instant feedback (Arifudin et al., 2021). This finding is consistent with Adji et al. (2022) and Rulyansah et al. (2022), both of whom demonstrated that TPACK-oriented professional development programs for Indonesian elementary school teachers produce measurable improvements not only in technical skill but in pedagogical readiness to integrate technology meaningfully.

Taken together, the three improvements highlighted in the abstract—fundamental digital literacy (+40pp), LMS integration (+42pp), and interactive media development (+48pp)—are not isolated outcomes but the product of a coherent, theory-grounded program architecture. The program's success underscores a critical paradigm shift in how we approach teacher training for digital transformation. The significant improvements, particularly in confidence and practical creation skills, confirm that investment in sustained, mentoring-focused, and contextually relevant professional development yields far greater returns than conventional, one-off training. This model provides a replicable framework for bridging the digital competence gap in other peripheral and under-resourced educational areas.

CONCLUSION

This community service program effectively improved the digital competence of 30 elementary school teachers in the southern peripheral area of Jember Regency. Quantitative findings demonstrate substantial gains across all competency indicators, with the most notable improvements in interactive digital media development and self-efficacy in ICT integration, each recording a 48-percentage-point increase. The integration of context-based mentoring, peer collaboration, and output-oriented activities proved successful in empowering teachers to adopt ICT-based learning. The program contributes to reducing the digital divide and enhancing the quality of elementary education in peripheral regions. Future programs are recommended to extend the mentoring duration and incorporate longitudinal evaluation to assess the sustainability of competence gains.

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