Volume 17 Number 2 (2025)
July-December 2025
Page: 1581-1596

E-ISSN: 2656-9779
P-ISSN: 1907-6355
DOI: 10.37680/qalamuna.v17i2.7910

QALAMUNA
JURNAL PENDIDIKAN, SOSIAL, DAN AGAMA

Web-Based ICT Training to Strengthen Early Childhood Teachers' Digital Competence in UIN Ponorogo Partner Kindergartens

Umi Rohmah [1], Waris [2]

[1] Universitas Islam Negeri Kiai Ageng Muhammad Besari Ponorogo, Indonesia; umi_rohmah@uinponorogo.ac.id
[2] Universitas Islam Negeri Kiai Ageng Muhammad Besari Ponorogo, Indonesia; waris_213@yahoo.co.id

Received: 11/08/2025 Revised: 28/11/2025 Accepted: 31/12/2025

Abstract

The growing emphasis on digital transformation in education highlights the need for teachers, including those in early childhood education (ECD), to develop stronger digital competencies. This study examined the effectiveness of a web-based ICT training program designed to enhance teachers' digital literacy, particularly in managing school websites as a medium of communication and promotion. The research employed a qualitative case study design through observation, interviews, and group discussions. The training was designed using the ADDIE model and combined theoretical input with hands-on practice in website management, including uploading news and promoting school activities online. Findings revealed significant improvements in teachers' digital literacy, confidence, and ability to participate actively in web-based communication. Schools that had previously shown little online activity became more engaged through their websites. These outcomes support prior research that stresses the value of practical ICT training in preparing teachers for digital readiness. Nevertheless, challenges remained regarding the short training duration and disparities in participants' digital proficiency. The study demonstrates that targeted ICT training can play a crucial role in enhancing teachers' professional development and facilitating their adaptation to the demands of the digital era.

Keywords Digital Literacy; Teacher Competence; Web-Based ICT Training

Corresponding Author
Umi Rohmah
Universitas Islam Negeri Kiai Ageng Muhammad Besari Ponorogo, Indonesia; umi_rohmah@uinponorogo.ac.id

1. INTRODUCTION

The pervasive development of digital technologies has exerted a transformative impact across virtually all facets of human existence. In modern society, people have become increasingly reliant on electronic devices connected to information technology in various domains, including economic transactions, public services, and education (Aydin, 2022; Glückler & Panitz, 2024; Lavanya et al., 2025; Setiawan, 2025). Within the educational sector, digitalization not only revolutionizes learning media but also demands a comprehensive transformation of the teachers' role. Teachers are no longer mere transmitters of information; instead, they are required to become facilitators, innovators, creators, and inspirers of the learning process (Alarfaj & Alrashidi, 2025; Utomo, 2019; Yunita & Indrajit, 2020).

This transformation has become a critical global concern, as reflected in the Sustainable Development Goals (SDGs), particularly SDG 4, which emphasizes the importance of inclusive, equitable, and high-quality education for all. In alignment with this global agenda, the Indonesian

Ministry of Education, Culture, Research, and Technology has promoted national policies such as the Merdeka Belajar initiative and the Digitalization of Schools. These policies underscore that digital literacy is a core competency required of 21st-century educators (Puspitasari, 2025). Consequently, strengthening teachers' skills in information and communication technology (ICT), especially among early childhood education (ECD) teachers, becomes highly relevant (Adeyinka & Thuketana, 2025; Khan & Trimble, 2025; Zeng et al., 2025). Web-based ICT training offers a strategic and sustainable response to both technological demands and national commitments to human capital development.

The urgency of this transformation is further amplified by the emergence of the Fourth Industrial Revolution (Industry 4.0), characterized by rapid and complex technological changes (Islam et al., 2025; Tantawi et al., 2025). The education system is expected to cultivate 21st century competencies such as digital literacy, critical thinking, leadership, and collaboration (Adera, 2025; Godwin et al., 2025; Lase, 2019; Ndibalema, 2025). Within this context, teachers must evolve into adaptive and innovative learning facilitators (Angkarini et al., 2025; Khairani et al., 2025; Reistanti et al., 2025). Yunita & Indrajit (2020) Identified five key competencies that educators should possess in the digital age: educational competence in globalization, competence in future strategies, and counselor competence. These competencies require the integration of technological mastery with pedagogical capabilities to address future challenges in a critical, contextual, and transformative manner.

Nevertheless, empirical conditions reveal a significant gap in teachers' digital readiness. According to data from the Ministry of Education and Culture (2015), the national average score of the Teacher Competency Test (UKG) was only 53.02 (Riastini et al., 2025), below the national minimum standard of 55 (Syaifullah et al., 2025). Specifically, the average pedagogical competency score was 48.94. Salahuddin Wahid (Kompas, March 16, 2018) further noted that the main cause of low educational quality is the insufficient number of qualified teachers. This situation is exacerbated by issues such as the low academic qualifications of ECD teachers, as only 47.79 % of them hold a bachelor's degree (Koran Jakarta, 2019), the lack of participation in Continuous Professional Development (PKB), and teacher requirement systems that do not prioritize competence-based selection (Utomo, 2019).

A preliminary study through an interview with Mr. Agus Efendi, a teacher at TK Muslimat 001 Ponorogo (January 20, 2025), revealed that several ECD teachers struggle with using information technology, particularly in uploading school news or content on the school website. Yet, such skills are part of the professional competencies required in today's digital learning environment. This highlights the urgent need for a structured and sustainable ICT training program for ECD teachers. Moreover, such a program represents the concrete contribution of the Early Childhood Islamic Education (PIAUD) Study Program, Faculty of Tarbiyah and Teacher Training, UIN Ponorogo, to its partner schools in the effort to improve educational quality.

Conceptually, training is defined as a structured process aimed at enhancing participants' competencies in a relatively short period, with an emphasis on practical skills (Ruppert et al., 2025). For ECD teachers, training is directed at strengthening four core competencies; pedagogical, personal, professional, and social (Fakhruddin, 2019). Pedagogical competence, for instance, is crucial in enabling teachers to design and implement learning aligned with the developmental needs of young children (Nuridaya et al., 2024). ICT mastery is embedded within this domain, especially in integrating technology into teaching practices (Kuznetsova et al., 2024).

The use of websites as a training platform has distinct advantages in terms of accessibility and interactivity (Dou et al., 2025). ICT proficiency includes mastery of both hardware and software, ranging from basic computer operations to advanced skills in multimedia processing (Iskandar, 2019; Tarihoran, 2019; Zulkarnain et al., 2023). The effectiveness of web-based training can be evaluated through cognitive, affective, and psychomotor improvements among participants (Budi et al., 2024; Pribadi, 2016) and can be designed through the ADDIE instructional model, encompassing five structured stages: Analysis, Design, Development, Implementation, and Evaluation (Attallah et al., 2025).

The legal basis for enhancing ICT competence among teachers is supported by Law No. 14 of 2005 on Teachers and Lecturers, which mandates the mastery of four professional competencies. In this context, pedagogical and social competencies necessitate the effective integration of information and communication technologies within educational practices. However, not all ECD teachers have adequate capabilities in this area, highlighting the importance of targeted professional development initiatives supported by adequate technological infrastructure.

Several prior studies have investigated the impact of ICT training on early childhood education teachers. Juanita et al. (2022) Found that training in Microsoft PowerPoint and Access improved teachers' ICT competence and was well-received. Dewi et al. (2022) Showed that teachers could develop technology-based media using applications such as Dinkins AR and Animaker. Suharni et al. (2022) Demonstrated the benefits of web-based e-learning training for enhancing teachers' technological literacy and classroom practice. However, few studied have explored systematic training on posting news and school information via websites within a university-school partnership framework. This study aims to fill this gap by assessing the effects of a web-based ICT training program implemented by the PIAUD Study Program at UIN Ponorogo for its partner institutions.

Therefore, this research aims to analyze the technological challenges encountered by ECD teachers at the partner school of UIN Ponorogo and to evaluate the impact of web-based ICT training on enhancing their professional competence. The findings of this study are anticipated to make meaningful contributions at both theoretical and practical levels to the professional development of early childhood educators in the digital era and to propose a replicable training intervention model that aligns with the goals of SDG 4, which promote inclusive and quality education.

2. METHODS

This study employed a qualitative research approach as articulated by Lim (2025), Merriam and Tisdell (2016), and Tracy (2024), with a specific adaptation of the Classroom Action Research (CAR) model (Mhagama et al., 2025). This approach was chosen because it enables the generation of rich descriptive data derived from verbal expressions, observed behaviors, participant actions, and contextual interactions, which are essential for understanding real-world phenomena in natural settings. The application of the CAR model enabled the study to comprehensively and holistically explore both the challenges faced by early childhood education teachers and the improvements in their digital competencies, particularly in relation to their ability to utilize web-based tools following targeted training interventions.

The subjects of this study were early childhood education (ECD) teachers from schools that partner with the PIAUD Study Program, Faculty of Tarbiyah and Teacher Training, UIN Ponorogo. The participating institutions included TK Muslimat 001 Ponorogo, TKIT Qurrota A'yun Ponorogo, TK Merak Ponorogo, and RA Aisyiyah Simo 1 Jenangan. These schools were selected based on two key considerations. First, they occupy a strategic position as official partner institutions of the PIAUD Study Program at UIN Ponorogo. Second, none of the institutions had an active or functional website, indicating that institutional communication and information dissemination were still conducted through traditional, offline means. A total of 40 teachers participated in the study, with equal representation from each of the participating institutions. Participant selection was based on the results of an initial assessment, which revealed generally low levels of digital literacy and information and communication technology (ICT) competence among the teachers.

The study relied primarily on qualitative data, including verbal responses, observed behaviors, participant actions, and documented materials. The primary data sources were the ECD teachers from the partner institutions. In contrast, secondary data sources included institutional documents, digital

materials produced during the training, and field notes derived from systematic observations conducted throughout the research process.

The research was carried out through a structured sequence of phases aligned with the principles of classroom action research, spanning from January 2024 to mid-2025. The initial phase involved a needs assessment conducted in late January 2024, which aimed to map the technological competencies of ECD teachers in partner institutions of the PIAUD Study Program at UIN Ponorogo. This assessment provided essential information related to participant characteristics, training logistics, and implementation strategies. During this phase, formal invitations were distributed to prospective participants, and technical coordination was undertaken with the Information Technology and Data Processing Unit (TIPD) of UIN Ponorogo to secure expert trainers and collaboratively design the training content.

The core training activities were implemented in June 2024 across the four partner institutions. Training sessions were held at TK Muslimat 001 Ponorogo on June 13, 2024, TKIT Qurrota A'yun Ponorogo on June 17, 2024, TK Merak Ponorogo on June 24, 2024, and RA Aisyiyah Simo 1 Jenangan on June 28, 2024. Each session commenced with a formal opening ceremony attended by school principals, members of the research team, and participating teachers. The training was facilitated by Mr. Virgiawan Eko Sunandito, S.Kom., from TIPD UIN Ponorogo, Dr. Umi Rohmah, M.Pd.I, and a research assistant. The training employed a combination of lecture-based sessions and demonstrations accompanied by hands-on practice. The lecture sessions provided foundational knowledge regarding website structure, functionality, and relevance for educational institutions. In contrast, the practical sessions enabled participants to actively create and manage digital content, including uploading school news and institutional information to web platforms. All training activities were conducted from morning until 16.00 WIB, with continuous real-time guidance provided to ensure effective skill acquisition among participants.

Following the completion of the training, a comprehensive post-training evaluation was conducted from July 2024 through mid-2025. This phase involved observations and Focus Group Discussions (FGDs) aimed at assessing the impact of the program on teachers' practical digital skills. Key indicators included participants' ability to independently upload content to school websites and the successful activation of fully functioning websites at each participating institution. Reporting activities began in early July 2024, followed by a research seminar in mid-July and final documentation submission in late July 2024. To strengthen the rigor and credibility of the findings, an extended phase of data analysis and verification was undertaken from January to June 2025, providing a solid foundation for scholarly publication and broader dissemination of the research outcomes.

Table 1. Training and Research Activity Timeline

Stage	Time Period	Description
Needs Assessment	January 2024	Mapping digital competence of ECD teachers at UIN Ponorogo partner school
Training: TK Muslimat 001 Ponorogo	June 13, 2024	First school-based training session
Training: TK IT Qurrota A'yun Ponorogo	June 17, 2024	Second school-based training session
Training: TK Merak Ponorogo	June 24, 2024	Third school-based training session
Training: RA Aisyiyah Simo I Jenangan	June 28, 2024	Final school-based training session
Report Preparation	Early July 2024	Compilation of results and documentation

Stage	Time Period	Description
Research Seminar	Mid-July 2024	Dissemination of findings and stakeholder discussion
Final Report Submission	Late July 2024	Submission of final report documentation
Extended Evaluation and Review	January-June 2025	In-depth verification of data and preparation for journal publication

This comprehensive procedure ensured that training was not only delivered effectively but also measured in terms of impact, sustainability, and alignment with digital competency goals for early childhood educators in the context of national education transformation.

Data in this study were collected using multiple techniques to ensure comprehensive and valid findings. Semi-structured interviews were conducted with selected teachers to gain a deeper understanding of their experiences and perspectives. Participant observation was also carried out during the training sessions to capture real-time interactions, behaviors, and learning processes. Additionally, a documentation review was conducted, encompassing an analysis of website content, user activity, and relevant institutional archives, to provide supporting evidence and contextual information. Focus Group Discussions were also held after the training to collectively reflect on participants' experiences and assess perceived changes in digital competence and institutional practices.

Throughout the research process, the researcher maintained an active presence from the preparatory stage through implementation and analysis. The researcher assumed multiple roles, serving as facilitator, observer, and evaluator, to ensure that participants were continuously guided, monitored, and supported throughout each stage of the study. This active engagement allowed the researcher to gain a nuanced understanding of both the process and outcomes of the intervention.

To ensure the rigor and trustworthiness of the data, several validation strategies were applied. Triangulation was employed through the use of multiple methods, including observation, interviews, and documentation; across different time frames by conducting data collection in multiple sessions over several weeks; and across sources by incorporating perspectives from teachers, principals, and facilitators. Additionally, member checking was conducted by sharing preliminary findings with participants through follow-up discussions, which allowed them to confirm, clarify, or correct the recorded data.

Data analysis followed the interactive model proposed by Miles and Huberman (Miles et al., 2018), which involves a cyclical process of data reduction, data display, and conclusion formulation and validation. Data reduction entailed filtering, selecting, and categorizing relevant findings from the collected data. The reduced data were then systematically displayed through thematic matrices and narrative descriptions to facilitate interpretation and understanding. Finally, conclusions were formulated and continuously validated by examining convergence across multiple data sources and aligning the findings with the research objectives.

3. FINDINGS AND DISCUSSIONS

This study aimed to investigate the effects of website-based ICT training on early childhood education (ECD) teachers at a partner school of UIN Ponorogo. The findings are presented across several key dimensions, including initial challenges, internal and external constraints, and the outcomes of the training intervention.

Pre-Training Conditions

Before the intervention, most participating schools either lacked a functioning school website or underutilized digital platforms. Communication with parents was primarily conducted through

WhatsApp or YouTube links. Teachers reported minimal prior exposure to website management or formal ICT-related training.

Constraints to ICT Mastery

The results of field research revealed several obstacles experienced by ECD teachers in UIN Ponorogo's partner institutions regarding their ability to operate technology, particularly in managing institutional websites. Field data revealed two categories of challenges affecting ECD teachers' ability to integrate digital technologies, particularly in managing school websites: internal (individual-based) and external (institutional/systemic). These were identified based on data obtained through in-depth interviews, direct observations, and focus group discussions (FGDs) across four partner institutions.

Internal (Individual-Based) Constraints

The internal factors relate to teachers' personal limitations and attitudes toward technology. These include low confidence and fear of damaging digital devices, limited comprehension of technical or English-language terms used in digital tools, and a lack of prior experience in managing websites. In several cases, senior teachers expressed dependence on younger colleagues for technology-related tasks, often due to anxiety about making mistakes or misunderstanding digital commands. These findings are detailed in Table 2.

Table 2. Internal Constraints Inhibiting Early Childhood Education Teachers' ICT Competence in Partner Institutions of UIN Ponorogo

Aspect/Issue	Description	Supporting Interview Excerpts
Low Awareness and Fear of Making Mistakes	Senior teachers feel anxious about making mistakes while using computers, which leads to reluctance in trying ICT tools	*"We teachers at this age find it a bit difficult to operate a computer, ma'am. We're afraid if we try, we might damage it…"* - Mrs. Hanik, TK Muslimat NU 001
Limited Experience in Website Development and Management	Although some teachers can operate a computer, they lack familiarity with website creation and management	*"Personally, I do understand some ICT t*o an extent… *but creating and managing a website is still new to me..."* - Mr. Agus Efendi, TK Muslimat NU 001
Dependence on Younger Teachers for ICT Tasks	Senior teachers tend to delegate ICT-related responsibilities to younger colleagues due to lack of familiarity	*"For ICT tasks or anything involving computers, we usually leave it to younger teachers who understand them better…."* – Mrs. Maria, TK Merak Ponorogo
Limited Technical Understanding of Website Content Management	Teachers are only able to upload pictures, but struggle to manage news content on the website, mainly due to language barriers	*"We only managed to upload pictures. As for the rest, we didn't know how because of the language used on websites and computers. Especially when it's in English..."* – Mrs. Nursyamsiyah, TK IT Qurrota A'yun

External (Institutional/Systemic) Constraints

In addition to individual-level barriers, the research also identified several external or systemic challenges that contributed to the limited integration of ICT among ECD teachers. These external factors emerged from the institutional environment, including a lack of infrastructure, the absence of a structured digital literacy program, and limited access to website development support. These constraints were often beyond the teachers' control, yet they had a significant impact on the teachers' ability to apply digital skills in daily school operations.

Many schools involved in the study had never developed or operated an official website before the training. Even when schools did have websites, they were often underutilized due to the lack of training and familiarity with platform features. Teachers reported difficulties in uploading content, navigating

menu options, and understanding the functional structure of school websites. In some cases, financial concerns discouraged schools from investing in digital development altogether, fearing that the tools would be unused due to a lack of competency.

These challenges were consistently reported across the four partner institutions and were corroborated through interviews, direct observations, and focus group discussions (FGDs). Table 3 provides a detailed overview of these external barriers, supported by direct quotations from the participating teachers.

Table 3. External Constraints Affecting Early Childhood Education Teachers' Limited Mastery of ICT in Partner Institutions of UIN Ponorogo

Aspect/Issue	Description	Supporting Interview Excerpts
Lack of Financial Resources	Schools do not have sufficient funds to procure or develop ICT facilities, such as websites	*"…the cost of developing a website is quite high, so we're reluctant to create one. We're afraid that once we've paid for it, we won't be able to operate it, and it would be a waste…"* – Mrs. Betty, TK Merak Ponorogo
Lack of Opportunities and Training	Teachers rarely receive opportunities or training on how to build or manage school websites	*"We've actually wanted a school website for a long time, ma'am, but we didn't know how to make one. So far, we've just relied on offline methods to promote our school and share children's activities via WhatsApp groups or YouTube videos."* – Mrs. Elsa, TK Merak Ponorogo
First-Time Website Ownership	Most partner schools had no prior website experience, resulting in unfamiliarity with basic functions like posting updates	*"This is our first time using a school website, so we still need time to adapt."* – Mrs. Fatmawati, RA Aisyiyah Simo I Jenangan

Research Design Training Outcomes and Effectiveness

The website-based ICT training conducted for ECD teachers across four partner institutions yielded significant improvements across three core domains of learning: cognitive, affective, and psychomotor. These results were assessed through direct observation during the training, analysis of participant outputs, and reflective interviews conducted after the intervention.

As illustrated in Figure 1, hands-on training sessions were conducted at each partner school site, namely TK Muslimat NU 001 Ponorogo, TK PKK Merak, TKIT Qurota A'yun, and RA Aisyiyah Simo 1 Jenangan. These sessions allowed participants to apply theoretical knowledge through real-time practice, supported by guided tutorials and immediate feedback from facilitators.

(**a**)

(**b**)

(**c**)

(**d**)

Figure 1. (a) Website-based ICT training at TK Muslimat NU 001 Ponorogo; (b) Training session at TK PKK Merak; (c) Website-training at TKIT Qurrota A'yun; (d) Training activity at RA Aisyiyah Simo 1 Jenangan

Cognitive Outcomes

Teachers demonstrated a marked increase in their understanding of fundamental concepts related to digital literacy following the training. Participants gained new knowledge about the basic architecture of a school website, including menus, submenus, and user interface design, as well as ethical considerations in publishing digital content, particularly the importance of accuracy, appropriate tone, and audience awareness when uploading school-related information. Additionally, teachers gained a clearer understanding of the role of digital media and online platforms in strengthening institutional identity and enhancing school visibility within the community. This improvement in cognitive capacity was particularly significant given that many participants had no prior exposure to structured ICT instruction. The use of guided learning materials and contextualized examples relevant to their educational environments enabled teachers to internalize digital concepts more effectively and apply them meaningfully in their institutional contexts.

Affective Outcomes

The training also had a significant impact on the emotional and attitudinal dimensions of the participants. Before the intervention, many teachers expressed anxiety and fear of making technical errors that could potentially damage digital systems, which limited their willingness to engage with technology. After the training, participants reported a stronger sense of empowerment and a noticeable reduction in technological apprehension. This shift was accompanied by an observable increase in their willingness to explore website tools independently, as well as greater openness toward integrating information and communication technology (ICT) into daily school administration and institutional communication practices.

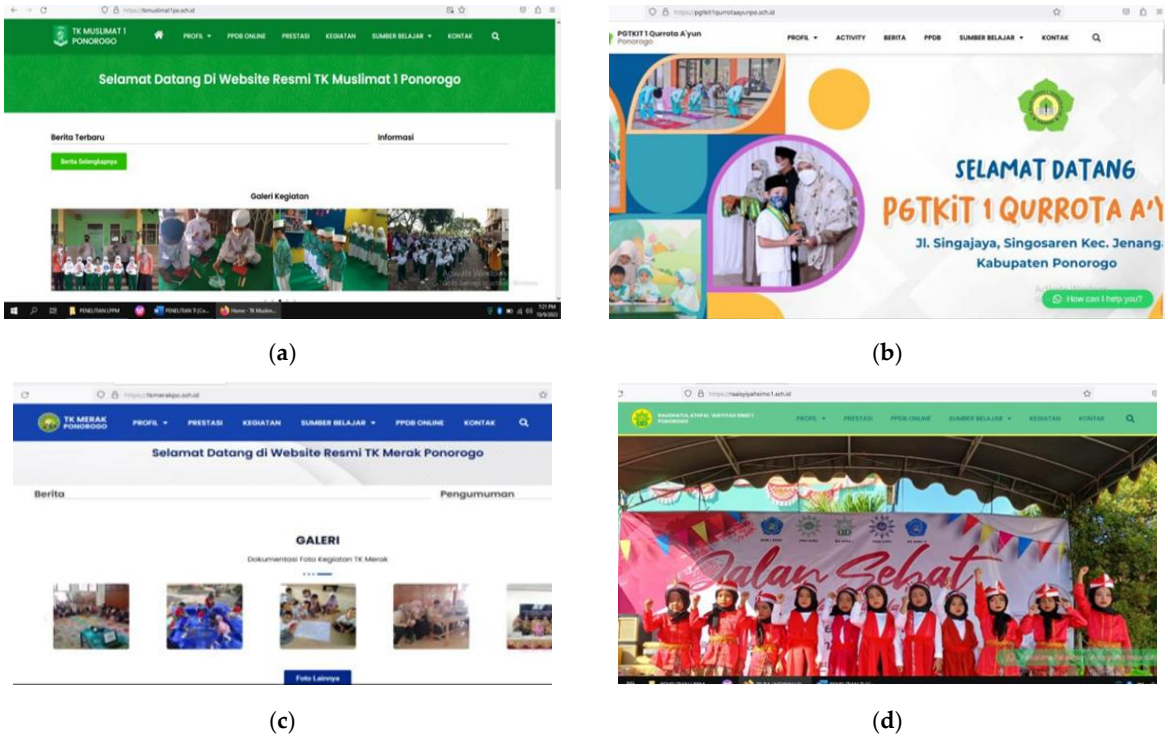
This shift is clearly reflected in the statement by Mrs. Hanik from TK Muslimat NU 001 Ponorogo: *"With this kind of training, especially with direct practice, we gain new insights. Bit by bit, we start to understand better. And we can immediately try it ourselves."* Similarly, Mrs. Suhartini from TKIT Qurota A'yun noted: *"Before this training, we already had a website, but it was still very plain because we didn't know how to make it visible to others. When I saw the many menus on the new site, I was still confused. But after the explanation from the trainer, I started to understand little by little."* This illustrates the importance of guided instruction in overcoming initial apprehension and promoting self-efficacy among teachers.

Psychomotor Outcomes

Participants acquired essential technical skills through practical, hands-on sessions that emphasized learning through direct application. These skills included the ability to upload digital content, such as photos and news related to school activities, navigate and customize menus within the school website, create announcements, and manage school profiles online. Immediate practice following each training session played a crucial role in reinforcing these competencies and ensuring skill retention. As expressed by Mrs. Nursyamsiyah from TKIT Qurota A'yun, the training experience

reflected a meaningful improvement in participants' confidence and practical ability to manage school websites. *"During this training, I learned how to manage the school website—such as writing news, posting activities, and making announcements. Because we practiced everything right away, the tutorials became easier to follow."* Mrs. Suhartini's earlier reflection also supports this domain, as she acknowledged the effectiveness of trainer-led explanations in helping participants navigate unfamiliar digital environments.

As depicted in Figure 2, the four participating institutions successfully developed and launched functional school websites as a result of the training. These platforms include core features such as activity galleries, announcements, school profiles, and digital menus. Each school tailored its website according to its institutional needs and technical capacity.



(**a**) (**b**)

(**c**) (**d**)

Figure 2. (a) Homepage of TK Muslimat NU 001's school website; (b) Website interface of TKIT Qurrota A'yun; (c) TK PKK Merak's school website homepage; (d) Final website of RA Aisyiyah Simo 1 Jenangan

The results of this study further affirm the value and effectiveness of web-based ICT training in enhancing the digital competencies of ECD teachers. Empirical evidence from training sessions at partner institutions of UIN Ponorogo indicates a significant improvement in participants' abilities to create, manage, and update school websites. These improvements are not only technical but also pedagogical, as they align with the evolving role of educators in the digital era as facilitators, creators, and digital communicators (Utomo, 2019; Yunita & Indrajit, 2020).

The structured training program addressed common limitations among ECD teachers, particularly low digital literacy and anxiety about using technology. This aligns with Nugroho (2015), who identified barriers such as lack of access to ICT infrastructure, geographic isolation, limited training opportunities, and the prevalence of conventional mindsets among senior teachers. These systemic and individual challenges were also observed in the current study, especially in schools where teachers had minimal or no experience managing digital platforms.

In the case of TK Qurrota A'yun, which had prior exposure to website platforms, the training served to refine and deepen teacher understanding and operational skills (Yuliana, 2023). Even among those who had managed websites previously, the practical emphasis aligns with recent research emphasizing competency-based and outcome-oriented training that prioritizes applicable skills within

a short period (Putri et al., 2025; Trinova et al., 2023).

Teacher feedback corroborated the effectiveness of this hands-on approach. Participants reported greater confidence and motivation in using website tools following real-time demonstrations and guided practice. This is supported by the work of Pribadi (2016), who emphasized the positive effect of practical learning methods on knowledge retention and workplace application. When skills are demonstrated and practices immediately, as done in this training, participants are more likely to absorb and apply them.

More broadly, the training aligns with the national agenda of improving digital literacy among educators. Puspitasari (2025) and Tarihoran (2019)It emphasizes that digital competencies are not optional but essential for 21st-century teachers, particularly in light of initiatives such as Merdeka Belajar and the digitalization of schools. The need for such competencies is further underscored by Lase (2019), who situates them within the context of Industry 4.0, where educators must cultivate not only digital literacy but also leadership, communication skills, emotional intelligence, entrepreneurial capacity, global citizenship, problem-solving competence, and collaborative teamwork.

The success of the training aligns with pedagogical theory. According to Fakhruddin (2019)Teacher competencies, especially pedagogical and professional, must be continuously developed through targeted interventions. Integrating ICT into educational routines, including school website management, reflects both pedagogical intention and professional responsibility. Furthermore, as highlighted by Zulkarnain et al. (2023) and Na et al. (2024)Digital literacy in teachers must encompass mastery of both hardware and software, from basic browsing and email to website design and content management. This study confirms that with adequate scaffolding, even teachers with minimal initial exposure can develop these skills effectively.

Moreover, the presence and usability of school websites improved institutional visibility (Andrei et al., 2024). Munib et al. (2022) Highlighted that digital marketing through the websites is now capable of promoting their institutions, sharing information with parents, and building a stronger community presence. Myori et al. (2019) Also emphasized that training programs that are perceived as beneficial can significantly contribute to participants' personal development and the overall improvement of their professional capacity

From a societal perspective, this study reflects the broader digital transformation discussed by Pratyusha & Varghese (2025), where every aspect of life, from public services to education, is being reshaped by technology. ECD teachers must therefore be equipped not just for classroom interaction but also for institutional communication and outreach. This requires not only infrastructure but also strategic training, as demonstrated in this research.

Aligned with Suharni et al. (2022), the incorporation of web-based learning platforms significantly enhances the technological awareness of ECD teachers and motivates them to explore other digital tools. Their study revealed similar patterns of improved knowledge and confidence following training, supporting the present findings and underscoring the replicability of such initiatives. Collectively, the outcomes of this study affirm the value of structured, web-based ICT training for ECD teachers as a strategic and scalable intervention for professional development in the digital age.

Research Contribution

This study offers substantive contributions to research on ICT training for early childhood education teachers by focusing specifically on web-based competencies, particularly the ability to operate and manage school websites. Unlike prior studies that focused on general ICT usage or specific educational applications (e.g., Suharni et al., 2022)This study addresses a gap by focusing on the creation of structured content, digital promotion, and enhancing institutional visibility through websites.

The practical approach adopted, combining theoretical material with guided, hands-on practice,

demonstrates a replicable model of professional development for ECD teachers, especially in underserved or digitally limited contexts. This contributes methodologically to the design of effective training interventions, reinforcing the importance of integrating adult learning principles into teacher training programs (Fakhruddin, 2019).

The findings also offer insights for policy and institutional stakeholders aiming to align local teacher development initiatives with national education goals and global priorities, such as SDG 4 and the Merdeka Belajar policy (Puspitasari, 2025). As such, the study enriches both theoretical and applied knowledge in the field of educational technology integration.

Limitations

Although the study's outcomes aligned with initial expectations, several important considerations merit further discussion. A primary limitation was the brevity of the training period, which restricted the depth with which more advanced technical content could be explored. This posed a particular challenge for participants with little to no prior experience using ICT tools, as additional time would have been beneficial for them to comprehend the material fully.

Moreover, the training was limited to partner institutions affiliated with UIN Ponorogo, thereby narrowing the study's contextual scope. This constraint raises questions about the generalizability of the findings to broader educational environments, especially those with differing cultural, infrastructural, or demographic characteristics. The absence of quantitative pre- and post-training assessments also limited the ability to evaluate knowledge or skill acquisition statistically; however, the qualitative data collected still offered meaningful insights into participant engagement and learning processes.

Suggestions

Future studies are encouraged to adopt a longitudinal research design to evaluate the long-term effectiveness of ICT training programs and monitor the progression of teachers' digital competencies within real classroom settings. Such research could also examine how improved web-based ICT skills contribute to broader educational outcomes, ranging from increased parental involvement and enhanced institutional transparency to trends in student enrolment.

Moreover, future training initiatives may benefit from incorporating flexible learning formats, such as mobile-accessible content, video tutorials, or blended learning models, to accommodate the diverse needs and schedules of teachers. Embedding these programs into national teacher competency standards would help institutionalize them as part of the formal professional development system. To maximize impact, it is essential to involve school leaders in the training process and collaborate with ICT professionals or local authorities to ensure ongoing support, particularly in under-resourced or rural settings.

4. CONCLUSION

The findings of this study confirm that structured ICT training, centered on school website management, significantly enhances the digital competencies of ECD teachers. By integrating theoretical instruction with hands-on practice, the training not only improved teachers' cognitive understanding but also their affective attitudes and psychomotor skills in managing digital platforms. Participants reported increased confidence, practical capability in updating school websites, and a clearer understanding of digital promotion strategies aligned with their institutional goals.

Importantly, the intervention responded to both internal and external challenges. Internally, many teachers, especially senior ones who struggled with technological anxiety, limited prior experience, and dependence on colleagues (Nugroho, 2015). Externally, systemic limitations such as inadequate

infrastructure, restricted access to training, and minimal institutional support further hindered the adoption of digital technologies (Munib et al., 2022).

This study underscores that web-based training offers a scalable and contextually adaptable model for advancing digital literacy in early childhood education, contributing directly to national education reform goals (Puspitasari, 2025) and the broader vision of 21st-century teaching competencies (Lase, 2019; Yunita & Indrajit, 2020). As such, this research reinforces the critical role of sustained, accessible, and context-sensitive professional development programs in equipping teachers to thrive in an increasingly digital educational ecosystem.

REFERENCES

Adera, N. (2025). Innovative Learning Spaces and Blended Learning: Quest for 21st Century Competency Teaching and Learning Approaches. In Creating Dynamic Space in Higher Education: Modern Shifts in Policy, Competencies, and Governance (pp. 139–174). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-6930-2.ch006

Adeyinka, B. O., & Thuketana, N. S. (2025). The Teachers' Perception of the Use of Technology in Teaching and Supporting Early Childhood Learners: A Case Study of Selected Primary Schools in Lagos State, Nigeria. Journal of Educational Research on Children, Parents & Teachers, 6(1), 147–162.

Alarfaj, A., & Alrashidi, M. (2025). Revolutionizing gifted education : enhancing teachers ' digital competence through fourth industrial revolution training. Discover Sustainability, 6(159), 1–23. https://doi.org/10.1007/s43621-025-00946-y

Andrei, T., Mirica, A., & Stoica, I. E. (2024). An Analysis of the Web Visibility of Non-Tertiary Educational Institutions in Romania. "Ovidius" University Annals, Economic Science Series, 24(2), 118–124.

Angkarini, T., Widyawati, W. Y., & Suharyati, H. (2025). The Effectiveness of Teacher Learning to Improve Teaching Capability in The Society 5.0 Era : An Epistemological Perspective. Journal of English Language Teaching, 9(2), 643–652. https://doi.org/https://doi.org/10.1007/s13187-025-02637-8

Attallah, H. S., Abdelghani, R., & Hamed, O. (2025). Enhancing Radiation Oncology Delineation Skills Through Simulation-Based Learning (SBL): A Five-Step Practical Approach Using the ADDIE Model. Journal of Cancer Education, 0123456789, 1–6. https://doi.org/10.1007/s13187-025-02637-8

Aydin, Ö. (2022). The Impacts of Digital Transformation. İzmir Akademi Derneği. https://www.researchgate.net/publication/360630985_The_Impacts_of_Digital_Transformation

Budi, S. C., Galih, D., Putri, P., Puspitasari, K., & Sena, A. R. (2024). Implementation of the Digital Health Approach to Support Learning for Health Students Based on Bloom's Taxonomy : A Systematic Review. Healthcare Informatics Research, 30(4), 387–397. https://doi.org/https://doi.org/10.4258/hir.2024.30.4.387

Dewi, F., Justicia, R., & Bayuni, T. C. (2022). Pelatihan media berbasis teknologi untuk meningkatkan kompetensi guru PAUD. MARTABE: Jurnal Pengabdian Kepada Masyarakat, 5(1), 291–300. https://jurnal.um-tapsel.ac.id/index.php/martabe/article/view/4869

Dou, A., Xu, W., & Xu, L. (2025). Interactive Learning Environments : A Systematic Review of Mobile Instant Messaging. International Journal of E-Collaboration, 21(1), 1–16. https://doi.org/10.4018/IJeC.369815

Fakhruddin, A. U. (2019). Menjadi Guru PAUD: Panduan Guru PAUD berdasarkan Permendikbud No.137 Tahun 2014. Gramedia.

Glückler, J., & Panitz, R. (2024). Knowledge and Digital Technology. Springer Nature.

Godwin, A. M. N., Atah, C. A., Nsan, N. N., Iroegbu, N. F., Lawrence, O. A., Olom, P. A., Otum, N. I., Anthony, G. B., Ushie, G. B., Umo, U. A., Akerele, B. O., Okon, A. Ben, Abang, M. B., Beyin, U. T., Patrick, E. O., & Esidene, A. G. (2025). The Impact of University Theoretical Frameworks on Graduates ' Preparedness for the 21st-Century Global Workforce and the Sustainability of Educational Systems. Journal of Educational and Social Research, 15(3), 455–470. https://doi.org/https://doi.org/10.36941/jesr-2025-0111

Iskandar. (2019). Pemanfaatan media pembelajaran berbasis teknologi informasi dalam meningkatkan minat belajar peserta didik kelas VIII.2 di MTs Negeri Pinrang. Institut Agama Islam Negeri Parepare.

Islam, T., Sepanloo, K., Woo, S., & Woo, S. (2025). A Review of the Industry 4.0 to 5.0 Transition : Exploring the Intersection, Challenges, and Opportunities of Technology and Human–Machine Collaboration. Machines, 13(4), 1–34. https://doi.org/10.3390/machines13040267

Juanita, S., Novita, I., & Anif, M. (2022). Peningkatan Kompetensi Teknologi Informasi dan Komunikasi bagi Guru PAUD dengan Pelatihan Microsoft Powerpoint dan Access. Jurnal Komunitas: Jurnal Pengabdian Kepada Masyarakat, 5(1), 5–11. https://doi.org/10.31334/jks.v5i1.2307

Khairani, M., Huda, N., Razak, F., & Wulan, D. R. (2025). From Teacher to Facilitator : The Role of Educators in Supporting Heutagogical Practices in Higher Education STAI Samarinda, Indonesia Universiti Utara, Malaysia Universiti Malaya, Malaysia Politeknik AUP, Indonesia Keywords : heutagogy, facilitator. Journal Noesantara Hybrid Learning, 3(1), 1–9. https://doi.org/10.70177/jnhl.v3i1.2173

Khan, F., & Trimble, D. (2025). Enhancing ICT Utilization in Early Childhood Development (ECD) in South Africa. 9(3), 1727–1734. https://doi.org/10.47772/IJRISS

Kuznetsova, H., Danylchenko, I., Zenchenko, T., Rostykus, N., & Lushchynska, O. (2024). Incorporating innovative technologies into higher education teaching : Mastery and implementation perspectives for educators. Multidisciplinary Reviews, 7(e2024spe027), 1–8. https://doi.org/10.31893/multirev.2024spe027

Lase, D. (2019). Pendidikan di era revolusi industri 4.0. Jurnal Sundermann: Jurnal Ilmiah Teologi, Pendidikan, Sains, Humaniora, Dan Kebudayaan, 1(1), 28–43. https://doi.org/10.36588/sundermann.v1i1.18

Lavanya, A., Navamani, J. D., & Zahira, R. (2025). Introduction to the Internet of Things. In IoT for Smart Grid: Revolutionizing Electrical Engineering (pp. 1–16). John Wiley & Sons, Ltd.

Lim, W. M. (2025). What Is Qualitative Research ? An Overview and Guidelines. Australian Marketing Journal, 33(2), 199–229. https://doi.org/10.1177/14413582241264619

Merriam, S. B., & Tisdell, E. J. (2016). Qualitative Research: A Guide to Design and Implementation (4th ed.). Jossey-Bass.

Mhagama, W., Wang'uba, J., Nsyengula, S., & Haule, E. (2025). Questioning the Role that Storytelling Can Play in Preparing Children for Primary Education in Tanzania. 4(1), 1–6. https://doi.org/10.52622/jcar.v4i1.247

Miles, M. B., Huberman, A. M., & Saldaña, J. (2018). Qualitative Data Analysis: A Methods Sourcebook (4th ed.). SAGE Publications.

Munib, Sarif, A., & Aini, F. L. (2022). Implementasi pemasaran pendidikan melalui media sosial dalam meningkatkan mutu pelayanan di SMKN 1 Sampang. Al-Allam Jurnal Pendidikan, 3(2), 1–21. https://ejournal.kopertais4.or.id/madura/index.php/alallam/article/view/5884

Myori, D. E., Chaniago, K., Hidayat, R., Eliza, F., & Fadli, R. (2019). Peningkatan kompetensi guru dalam penguasaan teknologi informasi dan komunikasi melalui pelatihan pengembangan media pembelajaran berbasis android. JTEV (Jurnal Teknik Elektro Dan Vokasional), 5(2), 102–109. https://doi.org/https://doi.org/10.24036/jtev.v5i2.106832

Na, M., Jill, L. S. S., Noor, H. M., Qi, F. J., & Ying, W. (2024). A pre-service art teacher's digital literacy framework for digital literacy in pre-service art teacher education in China. Asian Journal of University Education (AJUE), 20(2), 235–247. https://doi.org/https://doi.org/10.24191/ajue.v20i2.27007

Ndibalema, P. (2025). Digital literacy gaps in promoting 21st-century skills among students in higher education institutions in Sub-Saharan Africa : a systematic review. Cogent Education, 12(1), 1–15. https://doi.org/10.1080/2331186X.2025.2452085

Nugroho, I. D. (2015). Hambatan dalam penguasaan teknologi informasi dan komunikasi guru kelas IV sekolah dasar di Kecamatan Ponjong. 1(4), 1–14. https://journal.student.uny.ac.id/index.php/pgsd/article/viewFile/129/122

Nuridaya, A. R. S., Azisah, S., Ibrahim, M. M., & Rahman, U. (2024). Teacher pedagogical competence in the application of science and technology in society in Raudhatul Athfal, Rappocini District, Makassar City. Journal of Research and Multidisciplinary, 7(2), 886–895. https://journal.alhikam.net/index.php/jrm/article/view/95

Pratyusha, Y. B., & Varghese, B. (2025). A Learner-Centered Educational Landscape: Era of Education 5.0 and Disruptive Technologies. In Mitigating Learner Disadvantages in Teaching and Learning (pp. 159–180). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-8623-1.ch006

Pribadi, B. A. (2016). Desain dan Pengembangan Program Pelatihan Berbasis Kompetensi: Implementasi Model ADDIE. Prenada Media Group.

Puspitasari, E. (2025). SDGs-based adaptive curriculum model to improve education quality in the digital age. Inovasi Kurikulum, 22(1), 1–12. https://doi.org/https://doi.org/10.17509/jik.v22i1.75791

Putri, D., Husna, K., Fahrezi, M. A., & Darmansah, T. (2025). Peran pelatihan berbasis kompetensi dalam meningkatkan produktivitas tenaga pendidik di era digital. . . Lokawati: Jurnal Penelitian Manajemen Dan Inovasi Riset, 3(1), 13–24. https://doi.org/https://doi.org/10.61132/lokawati.v3i1.1399

Reistanti, A. P., Irchamni, A., Permatasari, K. G., & Sule, M. M. (2025). 21st-century teachers from the perspectives of modern and Islamic education: addressing the challenges of the digital era and globalization. Journal of Pedagogy, 18(1), 34–43. https://doi.org/https://doi.org/10.63889/pedagogy.v18i1.311

Riastini, P. N., Mahayanti, N. W. S., Dharmayanti, P. A., Widiartini, N. K., Tuilan, J., & Mukminin, A. (2025). Elementary school teachers' competencies: an in-service training model for integrating content, culture, and technology. Journal of Ecohumanism, 4(1), 384–395. https://doi.org/https://doi.org/10.62754/joe.v4i1.5392

Ruppert, J., Krüger, R., Göbel, S., Wolfhard, S., Lorenz, L., Weimer, A. M., Kloeckner, R., Waezsada, E., Buggenhagen, H., Weinmann-menke, J., & Weimer, J. M. (2025). The effectiveness of e-learning in focused cardiac ultrasound training : a prospective controlled study. BMC Medical Education, 25(806), 1–16. https://doi.org/10.1186/s12909-025-07409-y

Setiawan, S. (2025). Transforming Human Resource Practices in the Digital Age: A Study on Workforce Resilience and Innovation. 2(1), 84–92.

Suharni, Novitasari, Y., & Wahyuni, S. (2022). Pelatihan penggunaan aplikasi e-learning berbasis web untuk guru PAUD di kecamatan Rumbai Kota. Jurnal Pengabdian Kepada Masyarakat, 3(1), 12–16. https://doi.org/. https://doi.org/10.33369/abdipaud.v3i1.22374

Syaifullah, Yusuf, R. M., Pujiwati, A., & Hidayah, Z. (2025). Optimizing Madrasah Teacher Performance: The Role of Training and Total Quality Management. JKBM (Jurnal Konsep Bisnis Dan Manajemen), 11(2), 113–124. https://ojs.uma.ac.id/index.php/bisman/article/view/13851/6285

Tantawi, K., Fidan, I., Huseynov, O., Musa, Y., & Tantawy, A. (2025). Advances in Industry 4.0: From Intelligentization to the Industrial Metaverse. International Journal on Interactive Design and Manufacturing (IJIDeM), 19, 1461–1472. https://doi.org/10.1007/s12008-024-01750-0

Tarihoran, E. (2019). Guru dalam pengajaran abad 21. 4(1), 46–58. https://doi.org/10.53544/sapa.v4i1.68

Tracy, S. J. (2024). Qualitative Research Methods: Collecting Evidence, Crafting Analysis, Communicating Impact (3rd ed.). John Wiley & Sons, Inc.

Trinova, Z., Wahab, A., Susilo, C. B., Cakranegara, P. A., Ichsan, I., & Arifin, A. (2023). The Effectiveness of ICT-Related Training in Increasing the Competence of Vocational School Teachers. Al-Ishlah: Jurnal Pendidikan, 15(3), 3530–3537. https://doi.org/10.35445/alishlah.v15i3.2503

Utomo, S. S. (2019). Guru di era Revolusi Industri 4.0. Format Pendidikan Untuk Meningkatkan Daya Saing Bangsa, 1(1), 70–83. https://core.ac.uk/download/pdf/226948862.pdf

Yuliana, A. C. (2023). Kompetensi kewirausahaan kepala sekolah dalam peningkatan mutu pendidikan di TK Islam Terpadu 2 Qurrota A'yun Ponorogo [Universitas Islam Negeri Kiai Ageng Besari Ponorogo]. https://etheses.iainponorogo.ac.id/26200/1/ULANG_502210007_ARISKA CANDRA YULIANA_MANAJEMEN PENDIDIKAN ISLAM.pdf

Yunita, N. P., & Indrajit, R. E. (2020). Digital Mindset: Menyiapkan Generasi Muda Indonesia Menghadapi Disrupsi Teknologi. Andi.

Zeng, B., Geng, Z., Zhu, D., & Guo, L. (2025). The Future Has Arrived: An Exploration of Computational Thinking Readiness Among Chinese Early Childhood Education Teachers. Education and Information Technologies, 30(7), 9371–9404. https://doi.org/https://doi.org/10.1007/s10639-024-13192-y.

Zulkarnain, M. Q., Remmanng, H., & Setiawan, L. (2023). Peran Teknologi Informasi dan Peningkatan Kinerja Pegawai (F. Menne (ed.)). CV Berkah Utami.