



Teacher Rediness in Utilizing ICT for Learning in the Digital Era at Elementary School

Lisa Retnasari¹, Annisa Hikmatul Ulya², Ella Kusuma Wardani^{3*}

^{1,2} Universitas Ahmad Dahlan, Indonesia

³ Universitas Negeri Yogyakarta, Indonesia

*Correspondence: E-mail: ellakusuma.2024@student.uny.ac.id

ABSTRACT

Technological advances require teachers to adapt and demonstrate their readiness to integrate ICT into the learning process. This qualitative descriptive study aims to investigate teachers' readiness to use ICT at Muhammadiyah Macanan Elementary School, as well as the supporting and inhibiting factors. The research participants included the principal, six classroom teachers, and six students. Data were collected through observation, interviews, and documentation, then analyzed through the stages of collection, reduction, presentation, and conclusion drawing. The findings show teachers' readiness in four areas of competence: 1) Creativity, as demonstrated by active use of ICT, mastery of basic digital skills and online tools, and the ability to independently create or modify ICT-based learning media; 2) Critical Thinking, as seen in consistent lesson planning, use of ICT for teaching and administration, and independent problem solving; 3) Communication, demonstrated by the clear delivery of information, both verbally and in writing, using various types of media (audio, visual, audiovisual); and 4) Collaboration, reflected in effective cooperation with students and colleagues. The main supporting factors include adequate facilities, teacher motivation and commitment to continuous learning in ICT, and participation in training.

ARTICLE INFO

Article History:

Submitted/Received 11 Sep 2025

First Revised 22 Nov 2025

Accepted 27 Dec 2025

First Available online 30 Dec 2025

Publication Date 01 Jan 2026

Keyword:

Digital era,
Elementary school,
ICT teacher,
Readiness.

1. INTRODUCTION

Technological advancements continue to evolve and have transformed people's lifestyles and communication methods. This is consistent with a survey by the Indonesian Internet Service Providers Association, which recorded internet usage in Indonesia reaching 78.19%. This figure represents a 2.67% increase from the previous period in APJII, 2023. This means that the development of information and communication technology has experienced significant progress from 2021 to 2023 and has expanded across Indonesian society, from traditional to modern (Ngao et al., 2022). In education, internet usage has increased at all levels, particularly elementary and equivalent levels. Within two years, the number of elementary school students accessing the internet increased to 35.97% in 2020 compared to the previous year (Park & Son, 2022).

The emergence of the digital era is marked by the development of information and communication technology and the birth of the internet, which makes it easier for people to receive information more quickly. This has resulted in a paradigm shift in 21st-century education, which demands that teachers be prepared and skilled in the field of information and communication technology. A paradigm shift in education is needed to provide a set of 21st century skills needed by students and educators to face the challenges of every aspect of global life (Kazu & Yalçin, 2022).

This technological development presents a unique challenge for teachers, ensuring that students continue to consider their primary learning resource. Teachers must be able to adapt to every change that occurs in order to lead and guide students. A teacher must be able to carry out their role well to always be the person needed to direct, mentor, motivate, and design learning that will be used in the classroom. Teacher readiness is a determining factor in creating a quality education. As stated by Trilling and Fadel (Pramesti et al., 2023; Putra, 2024) one of the skills that 21st-century teachers must possess is learning and innovation skills. These skills include creativity, critical thinking, communication, and collaboration.

The function of using ICT in learning is as an aid for teachers and students during the learning process. The aid for students in question is to facilitate understanding of learning such as processing words, graphics, and portfolios. Meanwhile, for teachers, ICT can facilitate the achievement of learning objectives such as: presenting material in audio, visual, or audio-visual forms to make it more interesting and easier for students to understand (Jamun et al., 2023). If teachers master technology, they are ready to provide learning to students. Therefore, mastery of technology is very important for a teacher to have. Although in its implementation teachers will face challenges, a teacher must be willing or not to be ready to accept all the risks and must still behave professionally.

However, the reality on the ground is not yet supported by advances in human resources that can keep pace with changes in learning activities in the educational sector. Many teachers are still unprepared to keep up with advances in information and communication technology in learning. This is evidenced by a survey conducted by the Center for Information and Communication Technology (Pustekkom) and the Ministry of Education and Culture (Manongga, 2021), which showed that only 40% of teachers were ready to use information and communication technology (Yulianti, 2024). This is evident in the ineffectiveness of online learning, which results in students experiencing *learning loss*. In line with (Kazu & Yalçin, 2022;

Ngao et al., 2022) which says that teachers are still comfortable with verbal learning methods so that teachers rarely use information and communication technology when teaching.

Therefore, socialization and training of teachers in the use of ICT in learning is crucial and mandatory. Considering that teachers are the primary determinant of success in the learning process, all teachers must be prepared and understand the use of ICT. This understanding of ICT in learning will enable them to take actions that align with the aims and objectives of 21st-century learning. Therefore, teacher preparedness in using ICT in learning in this digital era is crucial for success and goal achievement.

Based on Slameto's theory (Polly et al., 2023), readiness can be seen in three aspects, one of which is skills. This study focuses on one aspect, namely skills, to assess teachers' readiness to use ICT. The skills aspect was chosen to describe teachers' readiness to use ICT in learning as part of their professional competence. Therefore, this study focuses on one aspect to achieve consistent research results.

2. METHODS

2.1. Types and Approaches of Research

This study uses descriptive research with a qualitative approach. This approach was chosen because it is suitable for describing in depth the phenomenon in its natural context, namely the readiness of teachers to integrate Information and Communication Technology (ICT) at Muhammadiyah Macanan Elementary School.

2.2. Research focus

The focus of this research is to capture and analyze the level of teachers' readiness in using ICT for learning, which is measured based on four indicators of 21st-century competencies: Creativity, Critical Thinking, Communication, and Collaboration. In addition, the research also identifies supporting and inhibiting factors that influence this readiness from a multi-source perspective (teachers, students, and principals).

2.3 Research Subject

The research subjects consisted of six classroom teachers, one principal, and six students from SD Muhammadiyah Macanan, who were selected purposively based on the criterion of direct involvement in the learning process.

2.4. Data Collection

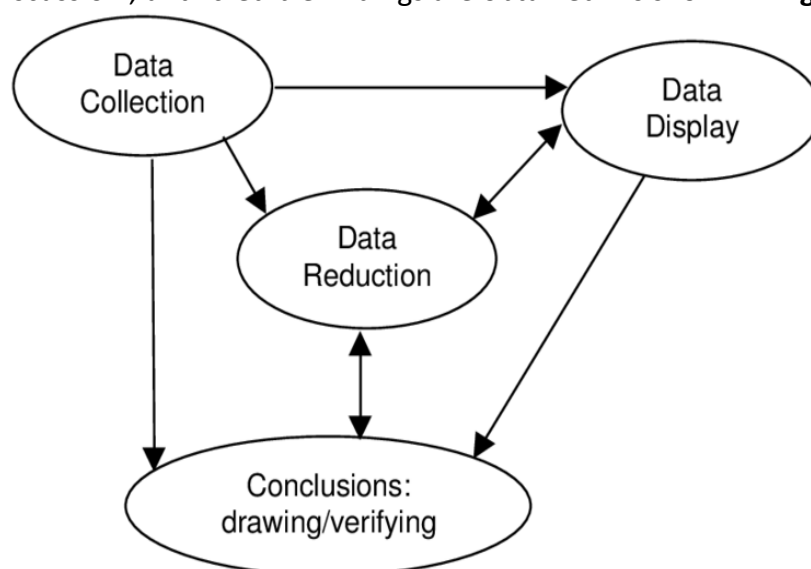
Data were collected from these three sources to obtain triangulation and a holistic understanding. Data Collection Instruments and Techniques Data collection was carried out using three main techniques, with instruments developed based on the research focus indicator grid in **Table 1**.

Table 1. Data collection instrument grid based on research focus

Research Focus	Measurement Indicators
Teacher Readiness (4C)'	Creativity in utilizing and creating ICT media Critical Thinking in Planning & Evaluating the Use of ICT Communication through various digital media Collaborate with students & colleagues via digital platforms
Supporting Factors	Availability of ICT facilities & infrastructure Self-motivation & training School leadership support
Inhibiting Factors	Digital divide

2.5. Data Analyze

The data was analyzed using the interactive model of Miles and Huberman in (Lee & Hwang, 2022) which includes four stages, namely (1) data reduction, raw data from all sources is selected, focused, and simplified by coding *based* on established themes and indicators; (2) data display, the reduced data is presented in the form of descriptive narratives and thematic matrices to facilitate pattern identification; and (3) conclusion drawing/verification. These conclusions are then continuously verified through triangulation of sources and methods, as well as peer discussion, until credible findings are obtained. As shown in **Figure 1**.

**Figure 1.** Qualitative Data Analysis Flow

3. RESULTS AND DISCUSSION

3.1. Teacher Readiness to Use ICT in Learning in the Digital Era

Teacher readiness was analyzed based on four 21st-century competency indicators (4Cs) with data collected from observations, in-depth interviews with 6 teachers, 6 students, and 1 principal, and documentation studies. **Table 2** summarize the distribution of teacher abilities based on these indicators.

Table 2. Distribution of teachers' ability in using ICT based on the 4C indicators

Readiness Indicators	Ability Level	Examples of Specific Activities & Subjects
Creativity	High (4), Medium (2)	Grade 5 Science: Modifying a YouTube video about the water cycle by adding narration and an interactive quiz using Canva.
Critical thinking	High (5), Medium (1)	Grade 4 Math: Analyze online quiz results on Quizizz to identify topics (such as fractions) that need remediation.
Communication	Height (6)	Indonesian Language Grade 6: Delivering the material "Composing Stories" using a presentation that combines text, images, and audio.
Collaboration	Medium (4), Low (2)	Arts and Culture Project: 5th grade teachers collaborated with 6th grade teachers to create a digital question bank together to prepare for exams.

1) Creativity

The findings indicate that teacher creativity primarily emerges through modification, rather than creation from scratch. Four out of six teachers actively modify existing media. As stated by Teacher A (interview, May 10, 2023), *"I often search for PPT templates online, then I change the language and add images relevant to my students' situations."* This activity aligns with the definition of creativity as the ability to develop existing products or ideas a concrete example is seen in Grade 5 science, where a teacher modified a YouTube video about the water cycle by adding Indonesian narration and a short quiz mid-video using the Canva editor feature (Pantjawati et al., 2024; Syofyan et al., 2025). However, this creativity is still limited to mastery of familiar tools. Two senior teachers tended to use standard PowerPoint without much modification, indicating that mastery of digital tools is a prerequisite for the actualization of ICT-based creativity (Aisyah et al., 2024; Pantjawati et al., 2024).

2) Critical Thinking

Teachers' critical thinking skills were evident in two aspects: data-driven planning and evaluation. All six teachers developed lesson plans with ICT integration in mind. More critically, five teachers used data from digital platforms for evaluation. In Grade 4 Mathematics, teachers analyzed automated reports from Quizizz, which showed that 70% of students were incorrect in adding fractions with unlike denominators. This data served as the basis for designing specific remedial activities the following day. This practice reflects indicators of critical thinking in data-driven problem-solving (Handayani et al., 2022; Syofyan et al., 2025). All teachers also used ICT for administration (such as processing grades in Excel), is not only efficient but also minimizes the risk of losing important data (Sana et al., 2024; Pramesti et al., 2023). The commitment to continuous learning, particularly from the three teachers over 50 who actively participated in online training, represents a form of self-criticism in addressing the challenges of the digital era (Jamun et al., 2023).

3) Communication

Teachers demonstrated strong communication skills by utilizing a variety of media. All teachers (100%) used PowerPoint or Google Slides as their primary presentation medium can enhance students' cognitive abilities (Lasut et al., 2023; Sana et al., 2024). Furthermore, five teachers supplemented communication with audio-visual media. In the 6th grade Indonesian language lesson, teachers included audio recordings of poetry reading examples with good intonation into presentation slides on "Poetry Reading Techniques." The use of platforms such as Quizizz (by four teachers) and Canva (by three teachers) also enriched the variety of communication. External communication with parents (six teachers) relied entirely on WhatsApp Groups, used to convey assignments, convey learning progress, and discuss topics as a form of ICT utilization for effective distance communication (Wahyu & Purnawarman, 2024; Kamala, 2022).

4) Collaboration

Collaboration between teachers occurs, but its intensity and depth vary. Four teachers reported collaborating in Teacher Working Groups (KKG) to share lesson plans and digital teaching materials via Google Drive. However, collaboration involving co-teaching or cross-class project development remains rare. At the student level, three teachers reported using ICT to facilitate student collaboration, for example, in a Grade 5 social studies group project to create a digital poster about cultural diversity using Canva, where students shared design and research tasks online. This aligns with the importance of collaboration for developing students' social skills (Syofyan et al., 2025). The findings suggest that ICT primarily serves as *an enabler* of administrative collaboration between teachers, while its potential to foster deeper pedagogical collaboration between teachers and students or students remains underexplored.

3.2. Supporting and Inhibiting Factors of Teacher Readiness to Use ICT

Teachers' readiness to use ICT in learning is certainly influenced by several supporting factors. These include facilities and infrastructure, as well as school support.

The facilities and infrastructure owned by schools are one of the supporting factors for the use of ICT in learning. Every school as an educational institution currently has facilities and infrastructure to support the implementation of the learning process, namely internet access and ICT tools. The completeness of facilities and infrastructure consists of several types of equipment and facilities that have primary functions and functions to assist in carrying out work (Moenir in Rinaldi et al., 2024). In accordance with the results of observations, interviews, and documentation that have been carried out, several facilities and infrastructure owned by schools related to teacher readiness to use ICT in learning are computers, LCD projectors, speakers, printers, Wi-Fi.

However, the findings of this research reveal that the availability of infrastructure alone does not automatically guarantee an increase in Generation Z's participatory citizenship skills. Further discussion shows that effective innovation in Citizenship Education requires a more strategic approach in the use of ICT, see **Figure 1**. This aligns with the main argument which emphasizes that transforming civic learning in the digital age requires more than just access to technology. The article highlights the need for pedagogical designs that intentionally leverage technology to create dialogic, collaborative, and action-oriented spaces such as the use of digital platforms for simulated public policy debates, social awareness campaigns, or

virtual collaborative projects. Therefore, facilities such as computers and Wi-Fi available in schools should be seen as entry points for implementing these innovative models. School support should not only include providing devices but also developing teachers' capacity to design interactive civic learning experiences that are relevant to students' digital lives, so that the ultimate goal of strengthening Generation Z's participatory civic skills can be achieved.



Figure 1. Learning activities using ICT

Another supporting factor is school support. Teacher readiness certainly requires support from various parties to continue to be implemented well. This support can come from within the teacher or from the surrounding environment. Interview findings and documentation revealed that the school has provided support to teachers, particularly through the principal's role in providing guidance to teachers in implementing ICT-based learning. Furthermore, school support also includes teacher participation in training. According to interviews, the principal participates in four types of training. First, teachers participate in training organized by the local education office. Second, teachers participate in training organized by related institutions such as universities and others. Third, teachers participate in training by inviting expert speakers in their fields, the budget for which is covered by the school. Fourth, the school encourages teachers to participate in training independently. Training can improve teacher readiness and skills in teaching (Sana et al., 2024; Nirmala et al., 2023).

Teachers face various obstacles in implementing ICT-based learning, not just support. One obstacle teacher face in implementing ICT-based learning is time. Teachers' lack of free time to create learning media leads to their infrequent use of ICT in their teaching. Furthermore, teachers have limited free time stems from numerous other activities, such as administrative tasks and other commitments. Outside of school, they also engage in business activities, trading, and other activities. As a result, they lack the time to complete schoolwork to support the learning process, such as creating learning media. This is especially true for teachers who are married and feel they don't have time to create learning media due to their busy household chores.

Another obstacle identified is the digital divide in education regarding teachers' mastery of ICT. Not all teachers are capable of integrating ICT into the learning process, especially senior teachers. This age factor affects teachers' memory, which may have decreased, making it difficult to learn and remember steps taken in developing learning, such as teaching materials, ICT-based learning media, and many other things.

4. CONCLUSION

The results of the research on teachers' readiness to use ICT in learning in the digital era at Muhammadiyah Macanan Elementary School are: 1) Teachers show that they are ready in terms of creative skills, seen from teachers who have used ICT in learning, know basic digital skills and online tools, are able to create or modify ICT-based learning media independently, 2) Teachers show that they are ready in terms of critical thinking skills, seen from teachers who always make plans before carrying out learning, use ICT not only for learning purposes but also for making administration, and solving problems faced independently, 3) Teachers are ready in terms of communication skills, seen from teachers who are able to convey information well and clearly both verbally and in writing by using various types of media, namely audio media, visual media, and audio-visual media, 4) Teachers are ready in terms of collaboration skills, seen when teachers are able to collaborate with students, in addition to developing their skills, teachers have also collaborated with the relevant education office and collaborated with elementary school teachers in the sub-district, which is named KKG.

Supporting factors for teachers' readiness to use ICT in learning in the digital era at Muhammadiyah Macanan Elementary School include adequate facilities and infrastructure. Other supporting factors include teacher motivation and commitment to continue learning in using ICT. Teachers are supported by the school through training and the principal's role in consistently supporting teachers to actively utilize ICT in learning. An inhibiting factor is the digital divide caused by age.

5. ACKNOWLEDGMENT

Thank you to Muhammadiyah Macanan Elementary School for providing facilities and support for the implementation of this research.

6. REFERENCES

- Aisyah, S., Sholeh, M., Lestari, I. B., Yanti, L. D., Nuraini, N., Mayangsari, P., and Mukti, R. A. (2024). Peran penggunaan teknologi dalam pembelajaran ips di era digital. *Jurnal Inovasi, Evaluasi dan Pengembangan Pembelajaran (JIEPP)*, 4(1), 44–52. <https://doi.org/10.54371/jiepp.v4i1.382>
- Handayani, F., Yulianti, N., and Erita, Y. (2022). Desain pembelajaran IPS dan PKn berbasis teknologi informasi di tingkat sekolah dasar serta penggunaan media teknologi informasi dalam proses pembelajaran. *Jurnal Basicedu*, 6(1), 767–781. <https://doi.org/10.31004/basicedu.v6i1.2034>
- Jamun, Y. M., Ntelok, Z. R. E., and Ngalu, R. (2023). Pentingnya penggunaan teknologi informasi dan komunikasi dalam menunjang pembelajaran sekolah dasar. *EDUKASIA: Jurnal Pendidikan dan Pembelajaran*, 4(2), 2149–2158. <https://doi.org/10.62775/edukasia.v4i2.559>
- Kamala, I. (2022). Pendampingan guru dalam praktik pembelajaran berbasis ICT pada program pendidikan profesi guru. *Jurnal Pengabdian dan Pemberdayaan Nusantara (JPPNu)*, 4(1), 28–36. <https://doi.org/10.28926/jppnu.v4i1.96>
- Kazu, İ. Y. and Yalçın, C. K. (2022). The relationship between secondary school teachers and

- students' readiness of using flipped classroom. *Journal on Efficiency and Responsibility in Education and Science*, 15(1), 1–9. <https://doi.org/10.7160/eriesj.2022.150101>
- Lasut, E. M. M., Supit, D., and Lotulung, M. S. D. (2023). Pemanfaatan TIK dalam pembelajaran di sekolah dasar. *Jurnal Educatio FKIP UNMA*, 9(3), 1401–1408. <https://doi.org/10.31949/educatio.v9i3.5426>
- Lee, H. and Hwang, Y. (2022). Technology-Enhanced education through vr-making and metaverse-linking to foster teacher readiness and sustainable learning. *Sustainability*, 14(8), 4786. <https://doi.org/10.3390/su14084786>
- Manongga, A. (2021). Pentingnya teknologi informasi dalam mendukung proses belajar mengajar di sekolah dasar. *Prosiding Seminar Nasional Pendidikan Dasar*. <https://ejurnal.pps.ung.ac.id/index.php/PSNPD/article/view/1041/755>
- Ngao, A. I., Sang, G., and Kihwele, J. E. (2022). Understanding Teacher educators' perceptions and practices about ICT integration in teacher education program. *Education Sciences*, 12(8), 549. <https://doi.org/10.3390/educsci12080549>
- Nirmala, S. U., Agustina, A., Robiah, S., and Ningsi, A. (2023). Penerapan media pembelajaran berbasis teknologi informasi dan komunikasi pada kurikulum merdeka di sekolah dasar. *Ideguru: Jurnal Karya Ilmiah Guru*, 9(1), 182–187. <https://doi.org/10.51169/ideguru.v9i1.746>
- Pantjawati, A. B., Juanda, E. A., Ardiansyah, N. P., Rizulloh, M. A., and Nurhakim, R. (2024). Inovasi Pembelajaran guru SMP Negeri 1 Cimerak Pangandaran: Pemanfaatan pelatihan Microsoft Office Specialist (MOS) di era industri 4.0. *Jurnal Dharma Bhakti Ekuitas*, 8(2), 182–194. <https://doi.org/10.52250/p3m.v8i2.735>
- Park, M. and Son, J.-B. (2022). Pre-service EFL teachers' readiness in computer-assisted language learning and teaching. *Asia Pacific Journal of Education*, 42(2), 320–334. <https://doi.org/10.1080/02188791.2020.1815649>
- Polly, D., Martin, F., and Byker, E. (2023). Examining pre-service and in-service teachers' perceptions of their readiness to use digital technologies for teaching and learning. *Computers in the Schools*, 40(1), 22–55. <https://doi.org/10.1080/07380569.2022.2121107>
- Pramesti, I. A., Faujiyah, N., Rahmawati, P., Hamid, A., and Hafiyusholeh, Moh. (2023). Pemanfaatan media pembelajaran berbasis ICT dalam pengembangan kompetensi profesional guru pendidikan agama islam. *JURNAL PENELITIAN*, 17(1), 169. <https://doi.org/10.21043/jp.v17i1.21841>
- Putra, D. P. (2024). Analisis keterampilan berbahasa dan literasi ilmiah siswa sekolah dasar melalui discovery learning dan media iCT. *Jurnal Pelita: Jurnal Pembelajaran IPA Terpadu*, 4(1), 70–79. <https://doi.org/10.54065/pelita.4.1.2024.444>
- Rinaldi, R., Fahmi, K., and Masyitah, M. (2024). Tinjauan literatur: Pemanfaatan teknologi augmented reality sebagai media pembelajaran interaktif di tingkat sekolah dasar. *Likhitaprajna Jurnal Ilmiah Fakultas Keguruan dan Ilmu Pendidikan Universitas Wisnuwardhana*, 26(1), 20–28. <https://doi.org/10.37303/likhitaprajna.v26i1.279>

- Sana, N. N., Arini, and Aliyyah, R. R. (2024). Penerapan information and communication of technology (ICT) pada pembelajaran abad 21 sekolah dasar. *Karimah Tauhid*, 3(9), 10267–10280. <https://doi.org/10.30997/karimahtauhid.v3i9.14593>
- Syofyan, W., Suhardi, A., and Sukarno, S. (2025). Design of ICT-based animated video learning media to improve learning motivation of elementary school students. *Attadrib: Jurnal Pendidikan Guru Madrasah Ibtidaiyah*, 8(2), 504–516. <https://doi.org/10.54069/attadrib.v8i2.1004>
- Wahyu, P. I. and Purnawarman, P. (2024). Teacher's Perspective on the Use of ICT in the Classroom: Teacher Elementary School Context. *Inspiring: English Education Journal*, 7(1), 49–65. <https://doi.org/10.35905/inspiring.v7i1.7096>
- Yulianti, Y. (2024). Peran teknologi dalam pembelajaran matematika sekolah dasar. *Indonesian Journal of Islamic Elementary Education*, 4(1), 45–53. <https://doi.org/10.28918/ijjee.v4i1.2312>