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Transformation of Elementary School Learning in the Digital Age: Digital Literacy, 4Cs, and Modern Pedagogy

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ABSTRACT

This community service program has successfully improved the competence of 25 elementary school teachers in the PD Persis Karawang area in facing the challenges of learning in the digital age. The program focuses on strengthening digital literacy, 21st-century skills (4Cs), and the application of modern student-centered pedagogy. Through intensive training, ongoing mentoring, and the provision of digital learning resources, the program showed significant improvements. The average digital literacy score of teachers increased from 3.24 to 3.93 (a 21.3% increase) based on a comparison of pre-test and post-test results. Classroom observations showed an increase in the integration of 4C skills and the adoption of student-centered pedagogy. A total of 90% of teachers have utilized WhatsApp for learning communication, and 30% of teachers can create interactive digital media using Canva and PowerPoint. This program has successfully changed teaching practices, with teachers shifting from a lecturing role to a facilitator role, and has had a positive impact on student learning experiences. This activity also produced training modules and scientific articles as a form of dissemination of the results of the community service program.

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INTRODUCTION

The digital age has brought fundamental changes to the global education ecosystem, demanding a paradigm shift from merely transferring information to strengthening digital literacy and adopting modern pedagogy. Recent literature shows that integrating technology into learning is not just an option, but an urgent need to create a learning environment that is responsive to the characteristics of 21st-century learners. A study by Timotheou et al. (2022) confirms that although the use of technology has the potential to improve learning outcomes, its success is highly dependent on the quality of implementation, learning design, and school capacity. In this context, digital literacy is no longer understood as merely the technical ability to operate devices, but also includes higher-level cognitive skills: critically accessing, evaluating, and producing content, as well as communicating ethically through digital media (Silvester et al., 2024; Zaimina, 2024). For basic education, digital literacy is a crucial foundation for students to be able to process knowledge meaningfully amid the massive flow of information.

In line with the strengthening of digital literacy, global education transformation also places 4C skills (Critical thinking, Creativity, Collaboration, Communication) as core competencies that students must master. Cross-domain research proves that strengthening the 4Cs in a digital learning environment contributes significantly to students' critical thinking and problem-solving abilities, especially when accompanied by constructive learning designs such as Project-Based Learning (PjBL) or multimodal approaches (Kintoko & Mulianingsih, 2022; Sahidah & Sulistyani, 2022). Relevant modern pedagogy emphasizes multiliteracies—the use of diverse representations of knowledge—to stimulate student creativity, for example, through the use of STEAM comics or interactive modules (Hapidin et al., 2022; Papadopoulos & Bisiri, 2020). Therefore, the biggest challenge today is not the availability of technology itself, but the readiness of the educational ecosystem—especially teachers—in designing learning that harmoniously integrates digital literacy and 4C.

In Indonesia, the urgency of this transformation has been addressed through the Merdeka Belajar (Freedom of Learning) policy, which gives teachers greater autonomy to develop inclusive and innovative learning environments. This curriculum requires teachers to no longer act as the sole source of knowledge, but rather as facilitators who are able to design project-based learning experiences and media literacy (Desiga & Liswati, 2025; Novia, 2025). However, this transition requires a massive increase in professional capacity. Elementary school teachers are required to master collaborative digital tools (such as Microsoft Teams and OneNote) and be able to develop teaching modules that are visually and content-wise appealing, for example, using the Canva platform (Julianda et al., 2025). Professional development programs, such as the Training of Trainers (TOT) in 21st Century Learning Design, are crucial to ensure that teachers are able to translate macro policies into micro practices in the classroom that are relevant to students' needs.

Furthermore, in the context of value-laden national education, especially in Islamic-based schools, digital literacy must also be interpreted as a means of strengthening character. Research shows the importance of teachers' ability to combine character values with technology, so that the learning process fosters digital ethics (Rosfiani et al., 2025). Although the policy framework and theoretical support are available, implementation in the field often faces structural and cultural obstacles. The gap between the demands of the Merdeka curriculum and the actual competencies of teachers in the field remains a major issue that requires specific intervention, especially in developing private schools. This condition is clearly reflected in the environment of the Karawang Regional Leadership of the Islamic Union (PD Persis). As an organization committed to educating the nation, PD Persis Karawang currently manages

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three main elementary school education units, namely SD Quran Terpadu Nurul Islam (East Karawang), SDIT As Sunah (Kutawaluya), and SDIT Ar Rasyidi (Lemahabang). Although the spirit of educational transformation in this environment has begun to grow massively, there are significant variations in characteristics between schools in terms of access to technology and human resource readiness. Based on a preliminary study involving interviews with principals from four elementary schools under the PD Persis network (including one pilot/partner unit), as well as a brief survey of teachers, a gap was found between the idealism of the Merdeka curriculum and the reality of classroom learning.

Initial observations indicate four fundamental problems that hinder learning transformation in the partner environment. First, indications of low digital literacy among teachers; preliminary data show that most teachers do not yet have adequate ICT competency certification, and participation in digital literacy training is still minimal. Second, the lack of integration of 4C skills in learning. Preliminary evaluations show that teaching methods are still dominated by a one-way approach, resulting in students being poorly trained in critical thinking and collaboration. Third, learning methods are not innovative enough. The use of interactive teaching media is still limited, with many teachers not optimizing digital platforms to create materials that appeal to elementary school students. Fourth, infrastructure limitations in some schools. Although some schools have adequate facilities, disparities in internet access and devices are technical obstacles that slow down the adoption of technology. As a result, the learning process becomes less relevant to the needs of students in the digital age (Husniyah & Asrizal, 2023; Partono et al., 2021).

In response to these issues, this Community Service activity aims to carry out strategic interventions to improve the competence of elementary school teachers in the PD Persis Karawang environment. The main focus of the activity includes: (1) intensive digital literacy training; (2) assistance in designing 4C-based learning; and (3) the application of modern pedagogy through the creation of interactive teaching modules. This activity is integrated with the Merdeka Belajar Kampus Merdeka (MBKM) program, in which students are directly involved in providing concrete solutions in the field. This is in line with the achievement of the university's Key Performance Indicators (IKU), particularly IKU 2 (graduate quality), IKU 6 (partnership), and IKU 7 (participatory learning). Through this activity, it is hoped that an adaptive and innovative learning ecosystem will be formed at PD Persis Karawang, capable of producing students who are ready to face the challenges of the 21st century.

METHODS

This section describes the activity design, participant profiles, intervention procedures, instruments, and data analysis techniques used to measure the success of this community service program.

Research Design

This community service activity uses a pre-experimental design with a one-group pre-test and post-test approach. This approach was chosen to measure the measurable improvement in teacher competence before and after the intervention in the form of intensive training and mentoring. This design allows the community service team to evaluate the direct impact of the program on the variables of digital literacy and modern pedagogical understanding of the participants.

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Participants

The participants in this activity were 25 elementary school teachers from three educational units under the auspices of PD Persis Karawang, namely: (1) SD Quran Terpadu Nurul Islam (East Karawang); (2) SDIT As Sunah (Kutawaluya); and (3) SDIT Ar Rasyidi (Lemahabang).

Participants were selected using purposive sampling with the following criteria: active classroom teachers, motivated to improve their digital competence, and recommended by their school principals. The demographic characteristics of the participants were mostly in the productive age range, with varying levels of teaching experience and diverse backgrounds in technology exposure (from beginner to intermediate).

Intervention Procedure

The intervention program will be implemented in a hybrid format (a combination of face-to-face and online) during the period from October to December 2025. The intervention will be carried out in three main stages, with facilitators consisting of a team of expert lecturers and student assistants:

- Preparation Phase: Includes coordination with PD Persis and initial needs analysis.
- Training Implementation Phase (Core): Consisting of [specify number, e.g., 4] sessions with the following materials:
  - ✓ Digital Literacy: Basics of ICT use, cyber security (internet safety), and online platform management (Google Classroom/LMS).
  - ✓ 21st Century Pedagogy: Introduction to the 4C concept (Critical Thinking, Creativity, Collaboration, Communication), student-centered learning methods, and strategies for integrating 4C into the Lesson Plan (RPP).
  - ✓ Digital Media Production: Practices in creating educational videos, designing interactive presentations using Canva, and creating digital quizzes (Quizizz/Kahoot).
- Mentoring Stage: Technical coaching sessions (coaching clinics) where participants are guided to produce one real teaching material product that is ready to be used in the classroom.

Data Collection Tools

To measure the effectiveness of the program, the following instruments are used:

- Pre-test and Post-test: A questionnaire containing [specify number, e.g., 30] multiple-choice questions to measure cognitive knowledge about digital literacy and 4C pedagogy. This instrument has undergone content validation by a team of experts.
- Class Observation Sheet: Used to observe changes in teachers' behavior and teaching practices after training, particularly in terms of applying interactive methods and using digital media.
- Satisfaction Survey: Likert scale questionnaire (1-4) to measure participants' perceptions and satisfaction with the quality of the material, facilitators, and implementation of activities.
- Documentation: Photographs, videos of activities, and artifacts of teachers' work (teaching modules/videos) as supporting data.

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Data Analysis Procedures

Quantitative data obtained from pre-test and post-test scores were analyzed using a paired sample t-test with the help of statistical software (SPSS) to determine the significance of the difference in means before and after the intervention. In addition, N-Gain calculations or effect size measurements were performed to measure the effectiveness of the program. Meanwhile, qualitative data from observation results and satisfaction surveys were analyzed descriptively to identify patterns of change in teaching practices and provide a narrative overview of the success of the activities.

Ethical Considerations

This activity was carried out in accordance with the principles of ethical service and research. Official permission to carry out the activity was obtained from the Regional Leadership (PD) of Persis Karawang and the principal of the partner school. All participants participated voluntarily, were explained the program's objectives (informed consent), and were guaranteed the confidentiality of their personal data.

RESULTS AND DISCUSSION

This community service activity was successfully implemented and showed a significant increase in teacher competence within the PD Persis Karawang environment. The following are the details of the quantitative and qualitative findings from the intervention carried out:

Improvement in Teachers' Digital Literacy

Based on statistical analysis using a paired sample t-test on the pre-test and post-test scores of 25 teacher participants, a statistically significant increase was found in the digital literacy variable. The average score increased from 3.24 (SD = 0.68) at the pre-test to 3.93 (SD = 0.54) at the post-test.

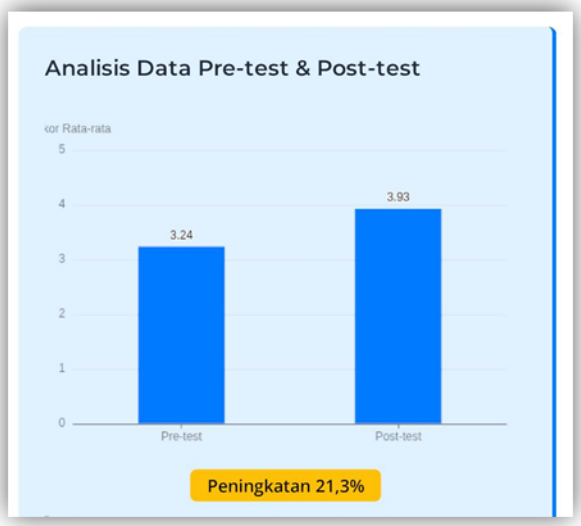

FIGURE 1. Pre-test and Post-test Data Analysis

The statistical test results showed a t value of 24 = 5.61, $p < 0.001$. Calculation of the effect size using Cohen's d resulted in a value of 1.12, indicating that this training program had a large effect on improving teacher competence. This 21.3% increase in the average score confirms that the basic and

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advanced training materials provided were effective in strengthening teachers' technical understanding

TABLE 1. Comparison of Pre-test and Post-test Scores for Digital Literacy (n=25)

Measure	Pre-test Mean (SD)	Post-test Mean (SD)	t	P	Effect Size (Cohen's d)
Digital Literacy	3.24 (0.68)	3.93 (0.54)	[5.61	<0.001	[1.12]

Utilization of Digital Learning Platforms and Media

After participating in a series of training sessions, there was a significant change in behavior in the adoption of learning technology. Post-activity survey data shows that 90% of 25 teachers (approximately 22-23 teachers) now actively use WhatsApp as a medium for coordination and delivery of structured material, a sharp increase from before. In addition, 10% of teachers (the early adopter group) began experimenting with using Zoom for synchronous learning.

In terms of content production, 30% of teachers (around 7-8 teachers) successfully produced interactive digital media independently using Canva, PowerPoint, or Google Classroom applications. This figure meets the program's success indicator target. Teachers' access to digital learning resources (e-books, educational videos) also increased to nearly 40%.

TABLE 2. Level of Technology Adoption by Teachers (n=25)

Digital Platform/Tool	Usage Before (%)	Post-Use (%)	Change Description
Communication (WhatsApp)	60	90	Significant
Video Conference (Zoom)	0	10	New initiatives emerge
LMS (Google Classroom)	8	15	Increased
Creative Media (Canva/PPT)	8	15	Increased

Application of 4C Skills and Modern Pedagogy

Qualitative analysis through classroom observation sheets and documentation of training activities shows that teachers are beginning to successfully integrate 4C skills (Critical Thinking, Creativity, Collaboration, Communication) into their teaching practices. Key findings include:

- RPP Transformation: Teachers no longer just compile administrative RPP, but have begun to design learning scenarios that stimulate students to ask questions and solve problems.
- Application of Learning Models: Some teachers are beginning to move away from purely lecture-based methods and are shifting to Project-Based Learning (PjBL) or differentiated learning models.
- Impact on Students: Teachers reported that students became more confident in expressing their opinions and more active in group work.

As a specific example, one of the teachers at SDIT Ar Rasyidi began implementing a simple science project that required students to work in teams (collaboration) and present their results (communication), a practice that was rarely done before.

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DISCUSSION

The findings of this study are consistent with global literature that emphasizes that strengthening digital literacy and 4C skills are key pillars in improving the quality of learning in elementary schools (Timotheou et al., 2022; Zaimina, 2024). The significant improvement in teachers' digital literacy (21.3% increase in scores and positive effect size) underscores the effectiveness of a structured training model—ranging from theory and technical practice to mentoring. This finding aligns with the results of Julianda et al. (2025), who noted that proficiency in tools like Canva enhances teachers' ability to design engaging learning experiences. When teachers overcome technical barriers (as shown in Table 2), they gain more confidence to innovate in pedagogy.

Furthermore, the paradigm shift from teacher-centered learning to student-centered learning with the integration of 4C confirms the relevance of this intervention. Observation data showing an increase in student collaborative activities supports the thesis of Kintoko & Mulianingsih (2022) and Sahidah & Sulistyani (2022), that constructive learning design is effective in fostering critical thinking from an early age. The ability of PD Persis Karawang teachers to adopt PjBL and differentiated learning, albeit gradually, is an indicator of the successful transformation of the teacher's role from merely a " r of material" to a "facilitator," as required in the Merdeka Curriculum (Desiga & Liswati, 2025).

Implicitly, the results of this activity send a positive signal for PD Persis Karawang. The competency gap that was previously identified (lack of ICT certification and conventional methods) has begun to be addressed. The success of 30% of teachers in producing independent teaching media shows that with the right infrastructure and training support, technological barriers can be minimized. However, the Zoom adoption rate, which is still at 10%, indicates that the transformation to full synchronous learning still requires time and more equitable internet infrastructure support across all partner schools.

Therefore, the sustainability of the program through the formation of a teacher learning community is crucial to maintaining the momentum of this change, ensuring that the good practices that have emerged are not lost, but rather develop into a school culture that is adaptive to the times.

FIGURE 2. Training at SDIT Ar Rasyidi Lemahabang

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FIGURE 3. Training at SDIT As Sunah Kutawaluya

CONCLUSION

The community service activities in the PD Persis Karawang environment successfully achieved their goal of improving the competence of elementary school teachers. This program significantly improved the digital literacy of 25 teachers by 21.3%, with an average pre-test score of 3.24 to a post-test score of 3.93. Teachers became more confident in using ICT, utilizing online platforms, and developing interactive digital learning media, as shown by 90% of teachers using WhatsApp for communication and 30% creating digital media. Real changes were also seen in how teachers designed and implemented learning, with increased integration of 4C skills (critical thinking, creativity, collaboration, communication) in lesson plans and the adoption of modern student-centered pedagogy. As a result, students showed more active engagement in the learning process. This transformation contributed positively to strengthening the quality of learning in partner schools and the relevance of education in the digital age.

RECOMMENDATIONS

Based on these findings, several recommendations are made:

- For Partner Schools: Encourage the sustainability of good practices through the formation of teacher learning communities and continued investment in ICT infrastructure.
- For PD Persis Karawang: Institutionalize similar training programs regularly for teachers at all levels of education, and advocate for policy and budgetary support from local governments.
- For Teacher Practitioners: Consistently apply the skills and pedagogy that have been trained, and be proactive in exploring innovative learning technologies and strategies.

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RESEARCH LIMITATIONS & FUTURE RESEARCH

This study has several limitations, including a relatively small sample size (25 teachers) and a limited intervention duration, so the findings should be generalized with caution. In addition, the absence of a control group limits the ability to isolate the single impact of this program.

For future research, it is recommended to:

- Test the effectiveness of the program with a larger sample and a research design that includes a control group.
- Conducting long-term studies to evaluate teacher skill retention and the direct impact on student learning outcomes.
- Exploring other factors that influence technology adoption and modern pedagogy implementation in elementary schools, such as school leadership support and resource availability.

REFERENCES

Desiga, H. I., & Liswati, K. N. (2025). Great Teachers in the Digital Age: Tracing the Development of Competencies Through Literature Studies. J-Simbol Journal of Indonesian Language and Literature Education, 13 (2), 850–858. https://doi.org/10.23960/simbol.v13i2.927

Hapidin, A., Natsir, N. F., & Haryanti, E. (2022). The Challenge of Science in Islamic Education in Era 4.0. Alwatzikhoebillah Journal of Islamic Studies, Economics, and Humanities, 8 (1), 41–57. https://doi.org/10.37567/alwatzikhoebillah.v8i1.995

Husniyah, R., & Asrizal, A. (2023). Meta-Analysis of Information Technology-Based Science Learning to Develop 21st Century Skills in Students. Edu Sains Journal of Science & Mathematics Education, 11 (1), 10. https://doi.org/10.23971/eds.v11i1.3643

Julianda, N., Lubis, A. P., & Latiffani, C. (2025). Creating Interactive Teaching Modules Based on Canva as a Strategy for Developing Elementary School Teacher JPSTM, 5 (1), 303. https://doi.org/10.54314/jpstm.v5i1.3920

Kintoko, K., & Mulianingsih, F. (2022). Building the Character of Junior High School Students in West Bangka Through Digital Literacy in the Midst of 21st Century Education. Jurnal Terapan Abdimas, 7 (1), 106. https://doi.org/10.25273/jta.v7i1.10919

Mahendra, Y., Mulyawan, G., & Putri, V. K. (2023). Transformation of Sociology Learning: The Role of 4C Skills in the 21st Century. P2m Stkip Siliwangi, 10 (2), 120–131. https://doi.org/10.22460/p2m.v10i2.4188

Muttaqin, M. F., & Rizkiyah, H. (2022). The Effectiveness of Literacy Culture in Improving 4C Skills of Elementary School Students. Dawuh Guru Jurnal Pendidikan Mi/Sd, 2 (1), 43–54. https://doi.org/10.35878/guru.v2i1.342

Novia, L. (2025). Strengthening TeacherTOT 21st Century Learning Design in the Implementation of the Merdeka Curriculum. Bakti Budaya, 8 (2). https://doi.org/10.22146/bakti.20030

Papadopoulos, I., & Bisiri, E. (2020). Fostering Critical Thinking Skills in Preschool Education: Designing, Implementing and Assessing a Multiliteracies-Oriented Program Based on Intercultural Tales.

https://doi.org/10.35568/abdimas.v9i1.7467
©LPPM Universitas Muhammadiyah Tasikmalaya

Multilingual Academic Journal of Education and Social Sciences, 8 (1). https://doi.org/10.46886/majess/v8-i1/7263

Partono, P., Wardhani, H. N., Setyowati, N. I., Tsalitsa, A., & Putri, S. N. (2021). Strategies for Improving 4C Competencies (Critical Thinking, Creativity, Communication, & Collaboration). Journal of Educational Research, 14 (1), 41–52. https://doi.org/10.21831/jpipfip.v14i1.35810

Pirmansyah, D. (2025). The Application of Digital Storytelling Projects to Improve Student Creativity in History Learning. Factum Journal of History and History Education, 14 (2), 271–284. https://doi.org/10.17509/factum.v14i2.84166

Rosfiani, O., Sukmana, B., Andri, E., Sukma, D., & Saidah, M. (2025). Challenges and Solutions for Islamic Education Teachers in Integrating Character Values in Learning in the Digital Age. Teaching Journal of Teaching Innovation and Education Science, 5 (2), 320–328. https://doi.org/10.51878/teaching.v5i2.6464

Safitri, N. (2022). The STEAM Approach to Improve 21st Century Skills in Elementary Schools. Kalam Cendekia Journal of Education, 10 (2), 227. https://doi.org/10.20961/jkc.v10i2.65493

Sahidah, M., & Sulistyani, A. (2022). The Application of 21stLearning During the Covid-19 Pandemic for Grade V Students at the Persatuan Umat Islam Haurgeulis Elementary School. Salam Journal of Social and Cultural Studies Syar I, 9 (1), 111–120. https://doi.org/10.15408/sjsbs.v9i1.24612

Silvester, S., Saputro, T. V. D., & Manggu, B. (2024). Digital Literacy Assistance for Elementary School Teachers in Implementing the Merdeka Curriculum. Lumbung Inovasi Journal of Community Service, 9 (4), 918–929. https://doi.org/10.36312/linov.v9i4.2276

Tanjung, S., & Supriatna, N. (2021). Creative Literacy: Building 21st Century Skills Through Local History Learning of the Langkat Sultanate. Harmony Journal of Social Studies and Civic Education, 6 (2), 101–109. https://doi.org/10.15294/harmony.v6i2.47999

Terusianita, E., Radiana, U., Dewi, N. O., & Wicaksono, L. (2024). Does Teachers' Educational Philosophy Influence Digital Literacy? The Mediating Effect of Resistance to Change. Vox Edukasi Journal of Educational Sciences, 15 (2), 254–266. https://doi.org/10.31932/ve.v15i2.3956

Timotheou, S., Miliou, O., Dimitriadis, Y., Villagrá- Sobrino, S., Giannoutsou, N., Cachia, R., Martínez-Monés, A., & Ioannou, A. (2022). Impacts of Digital Technologies on Education and Factors Influencing Schools'' Digital Capacity and Transformation: A Literature Review. Education and Information Technologies, 28 (6), 6695–6726. https://doi.org/10.1007/s10639-022-11431-8

Yamin, A. A. (2023). Designing a Competency-Based English for Young Learners Syllabus Using Information and Communication Technology. Jurnal Paud Agapedia, 7 (2), 249–255. https://doi.org/10.17509/jpa.v7i2.69657

Zaimina, Ach. B. (2024). Digital Literacy in Teaching Faith and Morals in the Society 5.0 Era: A Thematic Literature Analysis. Al-Adabiyah Journal of Islamic Education, 5 (2), 199–208. https://doi.org/10.35719/adabiyah.v5i2.1093.

https://doi.org/10.35568/abdimas.v9i1.7467
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