

Enhancing Teachers' Competence in AI-Integrated Learning through Participatory Training: A Community Service Program in the Society 5.0 Era

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Article Info	Abstract
Article history: Received: September 19, 2025 Accepted: January 13, 2026 Published: February 28, 2026 Keywords: Artificial intelligence Adaptive learning Community service Participatory training Teacher competence This article is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License © 2026 Bubungan Tinggi: Jurnal Pengabdian Masyarakat	Digital transformation in education requires teachers to possess adequate competencies in utilizing Artificial Intelligence (AI) to support adaptive and data-driven learning. However, preliminary observations at SMA Negeri 1 Ngoro Mojokerto indicated that AI utilization in classroom practices remained limited. This community service program was therefore implemented as a participatory training initiative to strengthen teachers' competence in integrating AI into teaching and learning activities. The program employed a Participatory Action Research (PAR) framework as a method for implementing community service, consisting of planning, implementation, reflection, and evaluation stages. Program outcomes were evaluated through comparisons of teachers' competency scores before and after the training, complemented by observations and reflective discussions. The results demonstrated an increase of more than 45% in teachers' average competency scores across knowledge, skills, and attitudes toward AI integration. In addition, 85% of teachers successfully developed AI-integrated lesson plans (RPP), and 70% implemented them in classroom learning. Qualitative findings further revealed the emergence of an internal teacher learning community and a shift toward more adaptive and innovative teaching practices. These findings suggest that contextual, practical, and participatory training is an effective strategy for building teachers' capacity to respond to educational challenges in the Society 5.0 era. To cite this article: Siswati, B. H., Wicaksono, I., & Salim, M. S. A. B. M. (2026). Enhancing teachers' competence in ai-integrated learning through participatory training: A community service program in the society 5.0 era. <i>Bubungan Tinggi: Jurnal Pengabdian Masyarakat</i>, 8(1), 1-11.

INTRODUCTION

The rapid advancement of digital technology in the 21st century has fundamentally transformed the landscape of education. Digital transformation demands that educators not only master subject matter but also possess competencies in utilizing information and communication technology (ICT) to create learning experiences that are more effective, personalized, and relevant to contemporary needs ([Samsiyah et al., 2025](#)). One of the cutting-edge technologies increasingly being adopted in global education is AI, which enables learning to become more adaptive, data-driven, and tailored to individual student

characteristics ([Agustina et al., 2025](#); [Darmawan et al., 2024](#); [Misbah et al., 2026](#); [Suyidno et al., 2025](#); [Zainuddin et al., 2025](#)).

Despite the vast potential of AI in education, its adoption in secondary schools in Indonesia, especially in non-urban areas, faces numerous challenges. Preliminary observations at SMA Negeri 1 Ngoro, Mojokerto, revealed that the use of AI in teaching and learning has not been optimized. Most teachers still rely on conventional approaches such as lectures and one-way methods, which often overlook students' diverse abilities, interests, and learning styles. This gap indicates a mismatch between the availability of technology and the readiness of human resources to utilize it effectively ([Achruh et al., 2024](#)).

Several factors contribute to the low adoption of AI in classroom settings, including limited teacher digital literacy, lack of access to relevant training, and insufficient understanding of how AI can be practically implemented in daily teaching practice ([Burgess et al., 2000](#)). Many teachers are unfamiliar with AI-powered platforms that can analyze student learning needs, develop adaptive teaching materials, or provide automated feedback ([Puspandari et al., 2025](#)). As a result, the transformative potential of AI to improve learning quality remains largely untapped in these educational contexts.

This issue becomes increasingly critical in light of national curriculum demands that emphasize 21st-century competencies such as critical thinking, creativity, collaboration, and communication ([May et al., 2022](#)). Without the ability to integrate technology, particularly AI, into teaching and learning, schools will struggle to meet the indicators of quality education that are responsive to the times ([Aravind et al., 2025](#); [Indarti et al., 2024](#)).

Structured and contextual training is therefore a strategic approach to improving teachers' abilities to utilize AI. Such training should not only provide conceptual knowledge about AI but also practical skills for integrating it into real teaching practices ([Arochman et al., 2024](#)). Capacity building must be conducted through collaborative and experiential strategies to ensure that results go beyond understanding and lead to lasting changes in teaching practice.

During the training, teachers were introduced to accessible and relevant AI tools and applications, including platforms for learning analytics, AI-powered question generators, and educational chatbots for interactive learning. The training was delivered through participatory workshops, simulations, and hands-on mentoring to enable teachers to integrate AI within the context of their respective subjects ([Zakariyah et al., 2025](#)). In addition to technical aspects, the training also included discussions on the ethics of AI use and its impact on student learning processes ([Ence & Herman, 2017](#)).

The program was implemented with sensitivity to the school's social and cultural context, including the varying levels of digital infrastructure and literacy. Accordingly, the training was tailored to be relevant, applicable, and not burdensome to teachers. Reflections from each stage of the training served as the basis for developing follow-up mentoring strategies, ensuring that AI adoption would not stop at the training phase but evolve into a new professional habit ([Baskara et al., 2024](#); [Kelley & Wenzel, 2025](#); [Shektar et al., 2025](#)).

The success of the program was measured by improvements in teachers' knowledge, attitudes, and skills in utilizing AI for adaptive learning. Additional indicators included increased participation in developing technology-based lesson plans and shifts in classroom practices toward more interactive and analytical approaches. The school leadership expects this program to drive a broader and more sustainable digital transformation in education.

Overall, this community engagement initiative is part of a larger effort to strengthen teacher capacity as frontliners in addressing digital education challenges. By enhancing competencies in AI utilization, teachers become not only adaptive educators but also agents of change capable of delivering meaningful learning in line with the spirit of education in

the Industrial Revolution 4.0 and Society 5.0. Therefore, this program has strong urgency and relevance to be replicated in other schools across Indonesia facing similar challenges.

Therefore, the objective of this community service program was to enhance teachers' competence in integrating AI into the teaching and learning process, encompassing knowledge, practical skills, and professional attitudes. In addition, this program aimed to strengthen the partner school's institutional capacity by fostering a sustainable teacher learning community and supporting the integration of AI-based practices into the school's continuous professional development (CPD) system.

METHODS

This community service program employed a Participatory Action Research (PAR) framework as a program implementation approach rather than as a formal research design. PAR was used to guide participatory planning, collective action, reflective practice, and evaluation within the context of teacher capacity building. The application of PAR in this program emphasized practical problem-solving and the empowerment of teachers as community partners, without conducting inferential statistical analysis or hypothesis testing. The method consisted of four integrated stages: planning, implementation, reflection, and evaluation, which were adaptively designed based on field conditions and participants' needs.

2.1. Planning Stage

The planning stage begins with observation and a needs assessment of the teachers' conditions and current teaching practices at SMA Negeri 1 Ngoro Mojokerto. Direct observations were conducted through school visits and informal discussions with teachers and school management. The results revealed a gap in teachers' digital competencies, particularly in utilizing advanced technologies such as Artificial Intelligence (AI). Based on these findings, the community service team developed a training program and learning modules tailored to local needs. The modules cover the introduction of AI concepts in education, practical applications of AI tools, and the ethical considerations and challenges of using this technology in teaching.

In addition to material preparation, the team coordinated with the principal and teachers to schedule the training. This stage also included program socialization and establishing initial commitment from the school as a program partner. Pre-test and post-test instruments were also prepared to measure the impact of the training program.

2.2. Implementation Stage

The action stage focuses on intensive training sessions and participatory workshops conducted on-site at the school. The activities were carried out in several sessions, covering:

- a) Introduction to AI in Education – providing a basic understanding of AI concepts, roles, and potential in supporting learning.
- b) Exploration of AI-Based Tools – introducing various educational platforms utilizing AI, such as student ability analysis applications, automatic question generators, and learning chatbots.
- c) Designing AI-Based Learning – guiding participants through simulations and hands-on practice in designing lesson plans (RPP – *Rencana Pelaksanaan Pembelajaran*) or teaching modules integrated with AI technology.
- d) AI Ethics and Challenges – discussing limitations, potential biases, and teachers' responsibilities when using AI in education.

The training employed an active, collaborative, and learning-by-doing approach. Each teacher was guided to directly try the platforms and applications introduced. The program also included individual consultations and small group mentoring to ensure participants had a personalized learning experience.

2.3. Reflection Stage

Following the training, teachers were asked to implement the training outcomes in their actual classroom practices. During this stage, teachers were guided to design AI-supported learning activities, such as using applications to analyze students' learning needs or developing adaptive technology-assisted materials. Reflection was facilitated through Focus Group Discussions (FGD), teacher learning journals, and brief interviews to document experiences, challenges, and successes during implementation.

Reflection plays a crucial role in the PAR approach, as it provides space for participants to evaluate their practices, share strategies, and collectively build an understanding of the changes taking place. Findings from this stage indicated that most teachers felt supported by a more analytical, data-driven approach to teaching, although they still required time to fully adapt.

2.4. Evaluation Stage

Evaluation was conducted using both qualitative and quantitative approaches. Quantitatively, pre-tests and post-tests measured the improvement in teachers' knowledge and skills related to AI. Qualitatively, evaluations were carried out through observations, in-depth interviews, and analysis of training and implementation outputs (such as AI-based lesson plans or teacher reflection reports).

Additionally, the evaluation stage included the development of a sustainability plan collaboratively designed by the community service team and the school. This plan encompassed integrating training materials into the school's CPD programs, leveraging teacher learning communities, and developing internal policies to support the sustainable use of AI technologies.

Quantitative evaluation focused on descriptive comparisons of pre-test and post-test scores to capture changes in teachers' competencies without inferential statistical testing. Teacher competence was assessed using a rubric-based instrument covering three aspects: conceptual understanding of AI in education, practical skills in using AI tools, and professional attitudes toward AI integration.

Qualitative evaluation was conducted through classroom observations, reflective journals, and semi-structured interviews to document teachers' experiences in designing and implementing AI-integrated lesson plans (RPP). These evaluation results were used primarily for program reflection and improvement rather than for research generalization.

RESULTS AND DISCUSSION

The community service program conducted at SMA Negeri 1 Ngoro Mojokerto produced several significant outcomes, including improved teachers' competencies, particularly in the use of AI for adaptive learning. The program, which consisted of a series of training sessions, workshops, reflection activities, and evaluations, demonstrated a positive impact on teachers' knowledge, skills, and attitudes toward integrating AI into teaching and learning.

3.1. Improvement of Teacher Competence

To measure the impact of the training, pre-tests and post-tests were conducted to assess three main aspects: (1) understanding of AI concepts in education, (2) skills in using AI

tools for teaching, and (3) attitudes toward the integration of AI in teaching practices. The results revealed a clear improvement in all three assessed aspects, namely teachers' understanding of AI concepts, skills in using AI tools, and attitudes toward AI integration, based on descriptive comparisons of pre-test and post-test scores, as presented in Table 1.

Table 1 Average teacher competence scores before and after training

Competence Aspect	Pre-test Score	Post-test Score	Increase (%)
Understanding of AI Concepts	58.3	85.7	46.9%
Skills in Using AI Tools	51.2	82.4	60.9%
Attitudes Toward AI Integration in Teaching	65.0	90.3	38.9%

Note: Maximum score = 100; Number of teacher participants = 20.

These descriptive results indicate that the training activities contributed positively to teachers' competency development as part of the program evaluation, rather than serving as evidence for statistical generalization.

3.2. AI Implementation in Lesson Plans and Teaching Practice

Following the training, teachers were tasked with developing AI-based lesson plans and implementing them in their classroom teaching. Monitoring and reflective evaluation conducted during and after the training program revealed that most teachers were able to translate the training outcomes into practical classroom applications.

- 17 out of 20 teachers (85%) successfully developed lesson plans integrating at least one AI tool into their learning scenarios.
- 14 teachers (70%) implemented AI-based teaching in the classroom with mentoring support.
- AI was most commonly applied to student diagnostic assessments, automatic question generation, and the provision of interactive learning materials.

The types of AI utilization in lesson plans and teaching practices are listed in Table 2.

Table 2 Types of ai utilization in lesson plans and teaching practice

Type of AI Use	Number of Teachers Applying	Percentage (%)
Student Ability Diagnostics (e.g., Quizizz, Edmodo AI)	16	80%
Automatic Question Generation (e.g., ChatGPT, QuestionWell)	12	60%
Adaptive Learning Materials (e.g., Canva AI, Magic School AI)	10	50%
Automated Feedback on Assignments	8	40%
Interactive Learning Chatbots	5	25%

These implementation outcomes reflect the practical feasibility of AI integration when teachers receive hands-on mentoring and contextual support within a community service framework.

3.3. Participant Feedback

Qualitative evaluation through interviews and FGDs indicated that most teachers found the training relevant to their professional needs. Teachers also reported that the use of AI helped them to:

- Better understand students' learning progress patterns.

- b) Save time in preparing teaching materials.
- c) Increase student engagement in the learning process.

However, several challenges were also identified, including:

- a) Limited infrastructure in some classrooms (particularly internet access).
- b) Need for more time to explore AI tools independently.
- c) There are concerns about reliability and ethics in using AI for assessment purposes.

A summary of teacher feedback on AI training is shown in Table 3.

Table 3 Summary of teacher feedback on ai training

Aspect Evaluated	Very Satisfied	Satisfied	Fair	Not Satisfied
Relevance of Materials to Teaching Tasks	11	8	1	0
Quality of Facilitators and Mentoring	13	7	0	0
Alignment of AI Tools with Curriculum	9	10	1	0
Ease of Using AI Tools	6	12	2	0
Intention to Apply AI in Teaching	15	5	0	0

Participant feedback was used primarily to improve program delivery and mentoring strategies, as well as to identify contextual challenges faced by teachers during AI implementation.

3.4. Short-Term Impact

The short-term outcomes of this community service program indicate both individual and institutional-level impacts. At the individual level, teachers developed more positive perceptions and confidence in using AI for learning. At the institutional level, the school began considering AI integration as part of its learning quality improvement agenda.

- a) Teachers developed a positive perception of AI use in education.
- b) The school began considering AI adoption as part of its learning quality improvement program.
- c) An internal teacher learning community was established as a platform for sharing best practices in AI integration.

The community service program implemented at SMA Negeri 1 Ngoro Mojokerto demonstrated that training on the integration of AI into learning had a positive impact on improving teacher competencies. These improvements were evident in conceptual knowledge, skills in using AI tools, and attitudes toward integrating technology in teaching. This finding aligns with the results of community service reported by ([Ravi et al., 2023](#)), who noted that intensive digital literacy training can enhance teachers' readiness to adopt innovative technologies in the classroom. Similar findings were also reported by ([Widiasih et al., 2023](#)), who demonstrated that AI-focused training effectively improves teachers' technological competence in Physics learning.

The application of the PAR approach in this program proved effective in encouraging active teacher participation, fostering reflective awareness, and accelerating the internalization of new knowledge. This finding is further supported by the work of [Ambiyar et al. \(2021\)](#), who showed that PAR creates a professional learning environment that enables teachers to develop innovative, practice-based strategies. Unlike one-way training models, PAR provides space for teachers to actively participate in the process of change rather than merely acting as recipients of knowledge. This is consistent with ([Jagom et al., 2023](#)), who emphasized that teacher participation in AI-related activities strengthens their confidence and practical skills.

The achievement of AI-based lesson plan implementation by the majority of teachers (85%) reflects a relatively high level of adaptability after the training. This indicates that training programs designed with hands-on, context-based approaches significantly influence the successful adoption of new technology. A study by ([Sumilat et al., 2025](#)) in Sleman Regency similarly found that AI integration is more effective when teachers are involved in subject-specific simulations and practical exercises. Thus, experiential learning emerges as a key factor in technology-related teacher training. This aligns with findings by ([Kumala et al., 2023](#)), who reported that practice-oriented AI mentoring for elementary teachers improved implementation readiness in the Merdeka Curriculum.

Nevertheless, challenges remain in AI implementation, such as infrastructure limitations and the need for additional time for adaptation. These challenges are consistent with the findings of [Agustina et al. \(2025\)](#) in schools in Indonesia, which revealed that limited internet connectivity and device availability often become major obstacles to digital technology adoption. Therefore, the success of such programs requires strong support from school management in the form of infrastructure strengthening and internal policies that encourage the sustainability of technology use ([Burton & Burton, 2024](#); [Ding et al., 2024](#)). In line with this, ([Hermanto et al., 2023](#)) also reported that inadequate school digital infrastructure remains one of the key barriers to AI-based learning implementation.

From a psychosocial perspective, this program also revealed that teachers' confidence increased after learning and independently using AI tools. This is consistent with the community service findings of [Gligorea et al. \(2023\)](#), who emphasized that technology-based training not only develops cognitive competence but also enhances teachers' self-efficacy in their role as facilitators of learning. When teachers feel confident and valued throughout the training process, their motivation to try new approaches tends to increase. Similar insights were found by ([Utami et al., 2023](#)), who noted that AI training increased teachers' motivation and confidence in using technology for classroom innovation.

Interestingly, the program also triggered the organic formation of an internal teacher learning community after the training. This represents an early indicator of sustainable practice, which, according to ([Rincon-Flores et al., 2024](#)), is an important measure of success for capacity-building programs. The community functions as a space for collective reflection, technical discussion, and sharing of best practices related to AI integration in teaching and learning activities. The importance of sustained communities of practice is also highlighted in ([Triyaningsih et al., 2023](#)), who found that collaborative AI-based media development fostered long-term teacher engagement.

Overall, the results indicate that AI integration training not only improves teachers' technical abilities but also contributes to a paradigm shift in learning. Teachers began to perceive learning as a dynamic process that must be tailored to students' individual needs and abilities. This reflects the core principle of adaptive learning, which is a key goal of Industry 4.0 and Society 5.0 in the education sector. Similar transformations were identified by [Nurqadriani et al. \(2023\)](#), who observed that AI socialization changed teachers' perspectives toward more innovative and technology-integrated pedagogy.

In general, the success of this program was closely linked to its contextual approach, the practical relevance of its materials, and the facilitators' responsiveness to participants' needs. These factors were also identified in the community service project conducted by [Tammets and Ley \(2023\)](#), which highlighted that the effectiveness of technology training is largely determined by the facilitators' sensitivity to participants' backgrounds and the preparedness of the learning environment. This is further strengthened by several community service studies ([Widiasih et al., 2023](#); [Jagom et al., 2023](#); [Utami et al., 2023](#)), which emphasize that contextual AI training results in better teacher engagement and better adoption outcomes.

Thus, the results of this program reinforce the view that improving teacher competence in the digital era cannot rely solely on technology provision. It must be accompanied by targeted, practice-oriented training and sustained mentoring. Moreover, school policy support, teacher collaboration, and strengthened professional networks are essential prerequisites to ensure the long-term sustainability of training outcomes.

CONCLUSION

The community service program implemented at SMA Negeri 1 Ngoro Mojokerto successfully enhanced teachers' competence in integrating AI technology into the learning process. Through the PAR approach, the training provided not only conceptual understanding but also practical skills and a positive attitude toward AI utilization. The results indicated a significant improvement in three key aspects of teacher competence—knowledge, skills, and attitudes. In addition, AI-based learning implementation has begun to be applied by the majority of participating teachers, with the emergence of teacher learning communities serving as an indicator of program sustainability. Thus, this training makes a tangible contribution to digital transformation efforts in education, particularly in addressing the challenges of the Industrial Revolution 4.0 and Society 5.0.

To ensure the long-term impact and replicability of this program, it is recommended that schools and other education stakeholders provide continued support by developing internal policies that promote technology integration, ensuring adequate infrastructure, and organizing regular follow-up training. Furthermore, it is important to expand interschool networks and establish forums for sharing best practices among teachers in the use of AI. This will ensure that technology adoption does not remain at the individual level but develops into a collective movement to improve the overall quality of education.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

AUTHOR CONTRIBUTIONS STATEMENT

Conceptualization, BHS and IW; methodology, BHS; formal analysis, BHS and MSABMS; investigation, BHS and IW; resources, BHS and IW; data curation, BHS; writing—original draft preparation, BHS; writing—review and editing, I.; supervision, BHS; project administration, BHS; funding acquisition, BHS.

AI DISCLOSURE STATEMENT

The author used ChatGPT (OpenAI) during the preparation of this work for language refinement and minor editing of the manuscript. After using the tool, the author carefully reviewed, revised, and edited the content to ensure accuracy and coherence. The author takes full responsibility for the final content of the publication. The research, analysis, and interpretation presented in this article were conducted by the author without reliance on artificial intelligence (AI) for generating the scientific findings.

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