Mandau: Jurnal Pengabdian Kepada Masyarakat
Volume 1 Nomor 1 2026
Tersedia Online: https://abecen.com/index.php/index/

Strengthening Basic Teaching Skills through Artificial Intelligence among Preservice Teachers

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ABSTRACT

Preservice teachers' readiness to conduct teaching practice still needs to be strengthened, particularly in mastering basic teaching skills and using 21st-century learning technologies. This condition indicates the need for innovation in strengthening pedagogical competence that does not only focus on conventional micro teaching, but also integrates Artificial Intelligence (AI) as a supporting technology for lesson planning, simulation, and learning reflection. This community service program aimed to strengthen preservice teachers' basic teaching skills through the use of AI in online learning. The participants were 30 sixth-semester students from the English Education and Physics Education Study Programs at UIN Palangka Raya in the 2025/2026 academic year. The activity was conducted online through four sessions: strengthening the concept of basic teaching skills, AI-based lesson planning, micro teaching simulation, and reflection and evaluation. Data were collected through pretests, posttests, observation sheets, and student reflections. The results showed an increase in the average score from 60.93 in the pretest to 83.60 in the posttest, with an N-Gain score of 0.58, which falls into the moderate category. Improvements were also observed in opening and closing lessons, explaining material, questioning skills, providing reinforcement, using variation, guiding discussions, managing the classroom, and teaching small groups and individuals. These findings indicate that the AI-based basic teaching skills strengthening program was moderately effective in improving the pedagogical competence of preservice teachers, particularly in lesson planning, material development, question construction, and reflection on teaching practice. However, AI should still be positioned as a pedagogical support tool, not as a substitute for interpersonal sensitivity, classroom improvisation, and direct teacher-student interaction. This program is recommended to be integrated sustainably into micro teaching courses through structured training, guided practice, and reflective evaluation.

ARTICLE HISTORY
Received 23 April 2026
Accepted 6 June 2026
Published 13 June 2026

KEYWORDS
basic teaching skills; Artificial Intelligence; preservice teachers; micro teaching; pedagogical competence; online learning

Introduction

Preservice teachers' readiness to conduct teaching practice is one of the important indicators in teacher education. Micro teaching or Teaching Practice I serves as an initial stage for students to apply pedagogical competence before entering broader teaching practice in schools. At this stage, students are not only required to understand learning theories, but also to practice basic teaching skills in a planned, communicative, and reflective manner. However, various studies show that preservice teachers still face challenges in connecting pedagogical theory with real teaching practice, especially when learning requires technology integration and adaptation to the characteristics of 21st-century learners (Bond et al., 2021; Darling-Hammond et al., 2020).

Basic teaching skills include a set of pedagogical abilities, such as opening and closing lessons, explaining material, asking questions, providing reinforcement, using variations in learning, guiding discussions, managing the classroom, and teaching small groups and individuals. These skills serve as an important foundation for preservice teachers because they determine the quality of learning interaction, clarity of material delivery, student engagement, and the teacher's ability to create meaningful learning experiences. Nevertheless, preservice teachers often understand basic teaching skills at the conceptual level, but are not yet sufficiently trained to apply them in an integrated manner in micro teaching scenarios. This gap between theoretical understanding and practical performance is one reason why micro teaching needs to be strengthened through a more structured, practical, and reflective activity model.

These challenges become more complex in the context of online and technology-based learning. Preservice teachers not only need to master basic pedagogical skills, but must also be able to use technology as part of the planning, implementation, and evaluation of learning. Online learning experiences during and after the pandemic show that teachers' and preservice teachers' readiness to use technology cannot be regarded as an additional skill, but rather as part of modern pedagogical competence (Bond et al., 2021; Trust & Whalen, 2020). In this context, Artificial Intelligence (AI) has emerged as a technology that has begun to influence the way teachers design materials, prepare assessments, develop questions, provide feedback, and conduct learning reflection.

The development of AI in education opens new opportunities for strengthening preservice teachers' competence. AI can be used as a supporting tool to prepare lesson plans, develop teaching materials, generate varied examples, design higher-order thinking questions, construct assessment rubrics, and provide ideas for more adaptive learning strategies. UNESCO (2024) emphasizes that teachers need AI competencies that include a human-centered mindset, AI ethics, AI foundations and applications, AI pedagogy, and the use of AI for professional development. Zhang and Zhang (2024) also show that AI in teacher education has the potential to support learning management, the development of inclusive learning environments, digital literacy improvement, and learning personalization. Thus, AI can become a relevant pedagogical support tool when used critically, ethically, and purposefully in preservice teacher education.

In preservice teacher education, the use of AI cannot be understood as a replacement for the teacher's role, but rather as a support for pedagogical thinking. Karataş and Yüce (2024) show that preservice teachers who use AI, especially chatbot-based tools such as ChatGPT, gain new experiences in developing professional identity, designing learning, and reflecting on teaching practice. However, AI use also requires the ability to verify information accuracy, adapt AI outputs to classroom contexts, and consider ethical dimensions and professional responsibility. Therefore, preservice teachers need to be trained not only to use AI, but also to understand its limitations. AI can assist in planning and preparing learning resources, but it cannot replace interpersonal sensitivity, classroom improvisation, pedagogical empathy, and direct interaction between teachers and students.

In the local context, students of the English Education and Physics Education Study Programs at UIN Palangka Raya still need reinforcement in teaching readiness. English Education

students tend to face challenges in managing instructional communication, using questions, and varying classroom interactions. Meanwhile, Physics Education students face challenges in simplifying abstract scientific concepts into explanations that are easy for students to understand. At the same time, the use of AI as a pedagogical support tool has not yet been optimally integrated into micro teaching activities. This condition indicates the need for a community service program that does not merely repeat conventional micro teaching training, but also guides students to use AI in preparing lesson plans, developing materials, designing questions, and reflecting on teaching practice.

The research gap in this activity lies in the limited number of micro teaching strengthening programs that specifically integrate AI as a pedagogical strategy. So far, micro teaching training generally focuses on teaching practice, mastery of basic teaching skills, and feedback from lecturers or peers. Meanwhile, technology use in micro teaching is often still general, such as the use of online platforms or presentation media. This activity offers a different value because AI is positioned as a supporting tool in four stages of strengthening: reinforcing the concept of basic teaching skills, AI-based lesson planning, micro teaching simulation, and reflection and evaluation. Thus, this program does not only train students to "teach with technology," but also develops their ability to "think pedagogically with AI support."

Based on these problems, this community service activity aimed to strengthen preservice teachers' basic teaching skills through the use of Artificial Intelligence in online learning. The activity was designed to improve students' readiness to conduct micro teaching, strengthen pedagogical competence, and equip students with adaptive skills in using AI responsibly. The main contribution of this activity is to offer an AI-based basic teaching skills strengthening model that can be sustainably integrated into micro teaching courses. This model is expected not to remain merely an additional intervention, but to be developed as part of the regular learning design in preservice teacher education programs through guided practice, reflective evaluation, and reinforcement of ethical AI use.

Method

This community service activity used a descriptive quantitative approach combined with a qualitative approach. The quantitative approach was used to examine changes in students' basic teaching skill achievement through comparisons of pretest and posttest scores and N-Gain calculation. The qualitative approach was used to interpret the results of micro teaching simulation observations and students' reflections on the use of Artificial Intelligence (AI) as a learning support technology. The combination of these two approaches was selected because the community service activity did not only aim to measure score improvement, but also to understand changes in students' readiness, confidence, and pedagogical awareness after participating in the program. Indicator-based evaluation is needed so that program achievement can be explained more operationally, measurably, and accountably (Kidder et al., 2024).

Participants and Implementation Time

The participants of the activity were 30 sixth-semester students from the English Education and Physics Education Study Programs at UIN Palangka Raya in the 2025/2026 academic year. The participants were selected because they were preparing to take micro teaching or Teaching Practice I, so they needed strengthening in basic teaching skills and the use of learning technology. The activity was conducted from February to April 2026 online through the Zoom Meeting platform. Online implementation was selected because it allowed cross-study program activities to run flexibly while also providing space for students to practice teaching skills in a digital learning context.

Activity Design and Stages

The activity was implemented in four sessions that were designed gradually and interconnectedly. Each session lasted 60 minutes. The four-session design was arranged to ensure that students did not only receive conceptual material, but also engaged in planning, practice, observation, and reflection. The activity used demonstration, guided practice, discussion, and reflection methods. Demonstration was used to provide examples of effective teaching practice, guided practice was used so that students could apply skills directly, while discussion and reflection were used to deepen understanding and strengthen students' pedagogical awareness. In the context of developing teachers' AI competence, AI use needs to be directed in a human-centered, ethical, pedagogical, and professional development-oriented manner (UNESCO, 2024).

Table 1. Schedule and Design of Activity Implementation

Session	Activity Focus	Activity Description	Role of AI in the Activity	Expected Output
Session 1	Strengthening the concept of basic teaching skills	Introduction to the eight basic teaching skills, the urgency of micro teaching, and examples of effective teaching practice	AI was introduced as a pedagogical support tool, not as a teacher replacement	Students understand the indicators of basic teaching skills
Session 2	AI-based lesson planning	Preparation of learning objectives, teaching materials, prompting questions, and learning strategies	AI was used to help generate material ideas, activity variations, HOTS questions, and alternative assessments	Draft of AI-supported lesson plan
Session 3	Micro teaching simulation	Student teaching practice and observation of basic teaching skills	AI was used as a preparation support for simulation, not as a replacement for teaching performance	Students practice teaching skills
Session 4	Reflection and evaluation	Feedback, experience reflection, result evaluation, and improvement of lesson plans	AI was used to support reflection, revise plans, and improve learning ideas	Students obtain feedback and follow-up plans

Instruments and Data Collection Techniques

Data were collected using three main instruments: pretest-posttest tests, observation sheets, and student reflections. The instruments were developed based on indicators of basic teaching skills and indicators of AI use in learning. The indicators of basic teaching skills included opening and closing lessons, explaining material, asking questions, providing reinforcement, using variation, guiding discussions, managing the classroom, and teaching small groups and individuals. The indicators of AI use included the ability to use AI to support lesson planning, teaching material development, question construction, variation of learning strategies, and reflection on teaching practice. This indicator framework is consistent with the view that AI in teacher education needs

to be directed toward supporting pedagogy, professional development, and critical and ethical technology use (Karataş & Yüce, 2024; UNESCO, 2024).

First, pretest and posttest tests were used to measure changes in students' understanding before and after the activity. The tests were developed based on a blueprint of basic teaching skills and the use of AI as a pedagogical support tool. The test items consisted of objective questions and/or short case studies assessing students' ability to understand the concept of basic teaching skills, select appropriate teaching strategies, construct learning questions, and determine how to use AI responsibly in lesson planning. Test scores were converted to a 0-100 scale.

Second, observation sheets were used to assess students' skills during the micro teaching simulation. The observation sheet contained eight aspects of basic teaching skills: opening and closing lessons, explaining material, asking questions, providing reinforcement, using variation, guiding discussions, managing the classroom, and teaching small groups and individuals. Each aspect was assessed using a graded scale, for example from 1 to 4, with the following categories: 1 = poor, 2 = fair, 3 = good, and 4 = very good. Assessment was conducted based on behavioral indicators observed during the simulation. For example, the opening lesson aspect was assessed based on the ability to attract attention, state learning objectives, and connect the material with prior knowledge; the material explanation aspect was assessed based on conceptual clarity, systematic explanation, use of examples, and language appropriateness; while the questioning aspect was assessed based on question variation, cognitive level of questions, and the ability to follow up on students' responses.

Third, student reflections were used to identify changes in attitudes, understanding, confidence, and readiness to use AI as a learning support technology. Reflection was conducted after the simulation and evaluation sessions. Reflection questions focused on students' experiences in using AI, the benefits of AI in preparing lesson plans, difficulties encountered, changes in confidence, and awareness of AI limitations. This reflection was important because the use of AI in teacher education is not only related to technical skills, but also to the ability to assess the relevance of AI outputs, verify information accuracy, maintain ethical use, and adapt AI results to classroom contexts.

Instrument Validation

To strengthen the quality of evaluation, the pretest-posttest instruments and observation sheets needed to undergo content validation before use. Content validation was conducted through review by experts or lecturers who understood micro teaching, pedagogy, and learning technology. The aspects assessed included the alignment of items with basic teaching skill indicators, language clarity, relevance of the question context, appropriateness of the observation rubric, and suitability of AI use indicators. The validation results were used to revise test items, clarify observation indicators, and ensure that the instruments truly measured the aspects targeted by the activity.

Table 2. Evaluation Blueprint for AI-Based Basic Teaching Skills

Aspect Assessed	Operational Indicator	Data Source	Assessment Form
Opening and closing lessons	Attracting attention, stating objectives, providing apperception, and concluding learning	Test and observation	Test score and observation rubric
Explaining material	Delivering concepts in a coherent, clear, contextual manner and according to learner characteristics	Test and observation	Test score and observation rubric
Questioning skills	Constructing prompting questions, clarification	Test and observation	Test score and observation rubric

Aspect Assessed	Operational Indicator	Data Source	Assessment Form
	questions, and higher-order thinking questions		
Providing reinforcement	Giving verbal/nonverbal responses, appreciation, and feedback that supports learning	Observation	Observation rubric
Using variation	Using variations in strategies, media, examples, activities, and learning interactions	Test and observation	Test score and observation rubric
Guiding discussions	Directing conversations, providing opportunities to express opinions, and closing discussions with conclusions	Observation	Observation rubric
Managing the classroom	Managing time, interaction, instructions, and online classroom dynamics	Observation and reflection	Observation rubric and reflection analysis
Teaching small groups/individuals	Providing guidance, assistance, and feedback according to learners' needs	Observation	Observation rubric

Data Analysis Techniques

Quantitative data were analyzed by calculating the mean pretest and posttest scores, score improvement, and N-Gain value. The N-Gain value was used to determine the level of improvement after the activity compared with participants' initial condition. N-Gain interpretation was divided into three categories: low, moderate, and high. In this activity, an N-Gain value of 0.58 was interpreted as moderate, so the program outcome claim needs to be stated proportionally as moderately effective or showing moderate effectiveness. Thus, the program results were not narrated excessively as a very strong impact, but as a measurable improvement in basic teaching skills in the moderate category.

Qualitative data were analyzed descriptively through reading students' reflections and observation notes during the micro teaching simulation. The analysis was conducted by grouping student responses into several themes, such as increased confidence, ease of using AI in planning, difficulties in checking AI outputs, the need for practical training, and awareness that AI cannot replace direct pedagogical interaction. The qualitative analysis results were used to complement the quantitative data so that the explanation of activity results was not only based on scores, but also described students' learning experiences.

Indicators of Activity Success

The success of the community service activity was measured through three main indicators. First, pedagogical competence improvement was indicated by increased pretest-posttest scores, N-Gain value, and increased observation scores on the eight aspects of basic teaching skills. Second, changes in students' attitudes were indicated by increased confidence, readiness to conduct micro teaching, and ability to reflect on teaching practice. Third, technology use ability was indicated by students' ability to use AI to support lesson planning, material preparation, question development, learning strategy improvement, and practice reflection. Through these indicators, activity achievement can be seen from changes in cognitive aspects, pedagogical skills, professional attitudes, and AI literacy among preservice teachers.

Results

Activity Implementation

This community service activity was conducted online through the Zoom Meeting platform in four structured sessions. Each session was designed to gradually strengthen the basic teaching skills of preservice teachers, starting from concept reinforcement, Artificial Intelligence (AI)-based lesson planning, micro teaching simulation, and reflection and evaluation. The participants were 30 sixth-semester students from the English Education and Physics Education Study Programs at UIN Palangka Raya in the 2025/2026 academic year.

In the first session, students received concept reinforcement on basic teaching skills, covering eight aspects: opening and closing lessons, explaining material, asking questions, providing reinforcement, using variation, guiding discussions, managing the classroom, and teaching small groups and individuals. In the second session, students were guided to use AI in preparing lesson plans, including formulating learning objectives, developing teaching materials, preparing prompting questions, and developing learning strategies. In the third session, students conducted micro teaching simulations and received observations on their basic teaching skills. In the fourth session, students engaged in reflection and evaluation to identify strengths, weaknesses, and improvement plans for their teaching practice.

In general, the activity was implemented according to the planned design. Students participated in discussions, guided practice, teaching simulations, and reflection. The use of AI in this activity was mostly directed as a pedagogical support tool in lesson planning, material development, question construction, and teaching practice reflection, not as a substitute for students' teaching performance.

Pretest, Posttest, and N-Gain Results

The success of the activity was measured through comparisons of pretest and posttest scores, observation of micro teaching simulations, and student reflections. The evaluation results showed an increase in the average score from 60.93 in the pretest to 83.60 in the posttest. The score improvement of 22.67 points indicated a positive change in students' understanding and basic teaching skills after participating in the program. The N-Gain score of 0.58 was in the moderate category. Therefore, this activity can be stated as moderately effective in strengthening the basic teaching skills of preservice teachers.

Based on the data for each aspect of basic teaching skills, all aspects showed improvement after the activity. Improvements were observed in opening and closing lessons, explaining material, questioning skills, providing reinforcement, using variation, guiding discussions, managing the classroom, and teaching small groups and individuals. These improvements indicate that the activity did not only affect the total score, but also addressed the components of basic teaching skills in more detail.

The aspects that showed prominent development were explaining material and questioning skills. This can be understood because AI was more easily used by students to help structure explanations, create examples, formulate prompting questions, and develop higher-order thinking questions. Meanwhile, aspects such as classroom management, guiding discussions, and teaching small groups also improved, but still require further practice because they strongly depend on interpersonal sensitivity, experience in dealing with classroom dynamics, and improvisational ability during learning.

Changes in Students' Attitudes and Readiness

In addition to score improvement, this activity also showed changes in students' attitudes. Based on observations and reflections, students became more confident in preparing micro teaching simulations, more open to using AI as a learning support tool, and more aware that teaching preparation requires a systematic process. Students also began to understand that AI can help

enrich learning ideas, but still requires critical judgment so that the generated outputs are aligned with learning objectives, material characteristics, and students' needs.

These attitudinal changes were reflected in students' increased willingness to prepare lesson plans, try varied strategies, and revise materials based on feedback. English Education students received support in designing instructional communication and question variations, while Physics Education students received assistance in simplifying scientific concepts through examples, analogies, and more structured explanation sequences. However, students' reflections also showed that they still needed guidance in checking the accuracy of AI outputs, adapting materials to classroom contexts, and ensuring that AI use remains ethical and does not lead to excessive dependence on technology.

Program Outputs and Initial Outcomes

The main outputs of this activity included the implementation of four AI-based basic teaching skill strengthening sessions, the development of lesson plans supported by AI, the implementation of micro teaching simulations, the availability of pretest and posttest data, and the compilation of observation and student reflection results. These outputs indicate that the activity was implemented according to the planned design.

The initial outcomes of the activity were reflected in the increase in average scores, improvement in all aspects of basic teaching skills, increased student confidence, and increased readiness to use AI as a pedagogical support tool. However, these outcomes remain at the short-term level because the activity was conducted within a limited duration and implemented online. Therefore, the success of the program should be interpreted as an initial strengthening of AI-based pedagogical competence, not as final evidence of teaching readiness in real classroom contexts.

Discussion

Moderate Effectiveness of the AI-Based Basic Teaching Skills Strengthening Program

The results show that the AI-based basic teaching skills strengthening program was moderately effective in improving the pedagogical competence of preservice teachers. The increase in average score from 60.93 to 83.60 and the N-Gain score of 0.58 indicate that the intervention had a positive impact in the moderate category. Thus, the claim of effectiveness needs to be stated proportionally as moderate effectiveness, not as very strong effectiveness. This interpretation is important so that the results of the community service program are not overstated.

Pedagogically, this improvement can be explained by the gradual design of the program, which moved from concept reinforcement, AI-based planning, micro teaching simulation, and reflection. Such a gradual model helped students connect the theory of basic teaching skills with practice. This is in line with Darling-Hammond et al. (2020), who state that teacher competence development needs to connect theoretical understanding with practice, reflection, and meaningful learning experiences. In the context of online learning, Bond et al. (2021) also show that higher education requires digital learning designs that do not merely transfer face-to-face activities into online spaces, but also create learning experiences that support student engagement.

AI Contributions to Each Aspect of Basic Teaching Skills

The contribution of AI in this activity was most visible in lesson planning, material preparation, and question development. In the aspect of opening and closing lessons, AI helped students design apperception activities, prompting questions, lesson introductions, summaries, and reflective closing activities. In the aspect of explaining material, AI helped students arrange more systematic explanation flows, create examples, find analogies, and simplify difficult concepts, especially in

physics materials. In the aspect of questioning skills, AI helped students design varied questions, including clarification, exploratory, and higher-order thinking questions.

In the aspect of providing reinforcement, AI could help students design more varied and positive forms of verbal feedback. In the aspect of using variation, AI helped generate alternative learning activities, media, discussion scenarios, and simple evaluation formats. However, in the aspects of guiding discussions, managing the classroom, and teaching small groups and individuals, the role of AI was more limited. These three aspects do not only require good lesson planning, but also interpersonal sensitivity, the ability to read students' responses, improvisation, and direct decision-making during the learning process.

These findings are consistent with UNESCO (2024), which positions AI as part of teacher competence in the dimensions of pedagogy, ethics, AI application, and professional development, while still being grounded in a human-centered approach. Karataş and Yüce (2024) also show that preservice teachers perceive AI as supporting professional identity and teaching methodology, but its use requires critical reflection. Thus, AI in this program functioned as a support for pedagogical thinking, not as a replacement for basic teaching abilities.

AI as a Planning Support Tool, Not a Substitute for Pedagogical Interaction

One important reviewer concern was the need for a more critical discussion of AI limitations. The results of this activity show that AI helped students at the planning stage, but did not necessarily guarantee successful direct teaching performance. Students could use AI to prepare materials, questions, and learning strategies, but the quality of teaching practice still depended heavily on communication skills, empathy, sensitivity to learners, and the ability to manage classroom dynamics.

Miao and Holmes (2023) emphasize that the use of generative AI in education needs to be directed toward a human-centered, ethical, and pedagogically appropriate approach. AI can help accelerate the preparation of teaching materials and enrich alternative learning strategies, but teachers remain responsible for validating information, adapting AI outputs to classroom contexts, and ensuring that learning remains meaningful for students. Holmes et al. (2022) also emphasize the importance of an ethical framework for AI in education so that technology use does not ignore human agency, transparency, fairness, and pedagogical responsibility.

In the context of preservice teachers, this means that students need to be trained to use AI selectively. AI can support the design of learning scenarios, but it cannot replace eye contact, tone of voice, expression, spontaneity, and the ability to build pedagogical relationships. Therefore, AI-based strengthening of basic teaching skills must still be combined with direct micro teaching practice, lecturer observation, peer feedback, and repeated reflection.

Why Did Some Aspects Improve More than Others?

Differences in improvement across aspects can be explained by the characteristics of each skill. The aspects of explaining material and asking questions tended to improve more strongly because both are closely related to planning and content preparation. AI can help students arrange material sequences, create examples, develop analogies, and generate lists of questions. Therefore, students were able to improve more quickly in aspects related to written planning and cognitive structure.

In contrast, classroom management, guiding discussions, and teaching small groups require more direct practice experience. These aspects cannot be sufficiently strengthened through AI-generated plans because they require spontaneous responses to learning situations. For example, classroom management requires the ability to read the atmosphere, manage time, respond to disruptions, and adjust strategies when students are passive. Guiding discussions requires the ability to respond to participants' opinions, direct conversations, and build a dialogic atmosphere.

Thus, improvement in these aspects requires repeated practice in real classroom contexts or more intensive simulations.

Practical Value of the Program for Micro Teaching Development

This program has practical value because it offers a four-session model that can be integrated into micro teaching courses. The model can be positioned not only as an additional intervention, but also as part of regular learning design. The first session can be included as concept reinforcement for basic teaching skills. The second session can be integrated into the development of AI-based lesson plans. The third session can serve as micro teaching simulation practice, while the fourth session can become a reflection and evaluation forum.

Integration of this model into micro teaching courses can be carried out sustainably through assignments to prepare AI-supported lesson plans, teaching practice, rubric-based observation, peer feedback, and ethical reflection on AI use. Thus, the contribution of the program does not stop as a community service report, but can become a curriculum development model in preservice teacher education programs. This model can also be replicated in other study programs, with adjustments to the characteristics of the field of study and teaching skill needs.

Program Limitations

This activity has several limitations. First, the activity was conducted online, so direct interaction, nonverbal expression, and real classroom dynamics could not be optimally observed. Second, the duration of the activity was relatively short, so the strengthening of basic teaching skills could not be conducted deeply and repeatedly. Third, the evaluation data were still limited to pretest, posttest, observation, and student reflection, so they had not yet measured skill sustainability when students conduct teaching practice in schools. Fourth, the AI used in this activity was still more dominant at the lesson planning stage, so its impact on direct teaching performance still requires further testing.

These limitations indicate that future programs need to expand the activity into face-to-face micro teaching practice, repeated observation, testing in real classroom contexts, and mentoring in ethical AI use. In addition, the evaluation instruments need to be strengthened through content validation, more detailed observation rubrics, and documentation of students' performance over time.

Conclusion

This community service activity shows that AI-based strengthening of basic teaching skills was moderately effective in improving the pedagogical competence of preservice teachers. This was indicated by the increase in the average score from 60.93 in the pretest to 83.60 in the posttest, with an N-Gain score of 0.58, which falls into the moderate category. Thus, the results are more appropriately understood as moderate effectiveness or positive initial strengthening, not as evidence of very strong effectiveness.

The program provided benefits in the aspects of conceptual understanding, lesson planning, material preparation, question development, micro teaching simulation, and student reflection. AI helped students at the planning and learning idea development stages, especially in preparing materials, creating examples, designing questions, and evaluating lesson plans. However, AI cannot replace interpersonal sensitivity, classroom improvisation, direct communication, and the ability to build pedagogical relationships with students.

This activity has strengths in its integration of AI as a pedagogical support tool, systematic four-session design, and cross-study program implementation that enriched students' learning experiences. However, the activity still had limitations, especially because it was conducted online, had a short duration, and had not been tested directly in school field practice. Therefore, this program is recommended to be further developed through integration into micro teaching

courses, repeated guided practice, validation of evaluation instruments, reinforcement of ethical AI use, and mentoring for teaching practice in real classrooms.

The AI-based basic teaching skills strengthening program should not only be treated as a one-time community service activity, but should be sustainably integrated into micro teaching courses. Study programs can adapt the four-session model as part of the learning cycle, consisting of concept reinforcement, AI-based planning, micro teaching simulation, and evaluative reflection. Students need to be assigned to use AI critically in preparing lesson plans, while still being required to validate AI outputs, adapt them to learners' contexts, and take responsibility for their pedagogical decisions.

Future activities should be conducted in hybrid or face-to-face formats so that direct interaction, classroom management, nonverbal communication, and teaching improvisation can be observed more comprehensively. In addition, the program needs to be expanded through repeated observation, lecturer and peer feedback, and evaluation of skills during field practice in schools. In this way, AI-based strengthening of basic teaching skills can develop into a more comprehensive, ethical, and relevant preservice teacher training model aligned with the needs of 21st-century learning.

Acknowledgment

The authors would like to express their sincere gratitude to Universitas Islam Negeri Palangka Raya and Universitas Palangka Raya for the academic support provided during the implementation and preparation of this community service program. The authors also extend their appreciation to the students of the English Education and Physics Education Study Programs who participated in the online training, AI-based lesson planning activities, micro teaching simulations, and reflective evaluation sessions. Their participation, learning engagement, feedback, and reflective responses contributed substantially to the successful implementation of this program and the refinement of this article.

Research Ethics Statement

This community service program was conducted in accordance with the ethical principles of academic and educational activities, including respect for participants, voluntary participation, transparency, accountability, confidentiality, and research integrity. Since the program focused on strengthening basic teaching skills, AI-based lesson planning, online micro teaching simulation, pretest and posttest evaluation, observation, and student reflection, it did not involve clinical intervention, biomedical procedures, biological specimens, or the collection of sensitive personal health data. Participants were informed about the purpose, procedures, expected outputs, and evaluation activities before the program was implemented. Participation in the training, simulation, observation, reflection, and evaluation activities was voluntary. The data used in this article were limited to aggregated pretest and posttest scores, observation results, student reflection summaries, program records, and descriptive evaluation notes. All information was used responsibly while maintaining participant confidentiality and the academic context of the program.

Author Contributions

Zaitun Qamariah: conceptualization, coordination of the community service program, development of the AI-based basic teaching skills strengthening model, supervision of online implementation, analysis of program outputs and initial outcomes, and writing of the original draft.

Hadma Yuliani: preparation of basic teaching skills materials, development of AI-based lesson planning activities, facilitation of training sessions, support for micro teaching simulation, and contribution to manuscript review.

Desy Fitriani: preparation of evaluation instruments, organization of pretest and posttest data, observation of student teaching performance, analysis of student reflections, interpretation of program findings, and manuscript editing.
All authors have read, reviewed, and approved the final version of the manuscript.

Funding
This community service program received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of Interest
The authors declare that there is no conflict of interest regarding the implementation, authorship, or publication of this article.

Artificial Intelligence Use Statement
The authors declare that artificial intelligence was used only as a limited technical support tool for language editing, sentence refinement, grammar checking, translation assistance, and improving manuscript readability. In the implementation of the program, AI was also introduced and used as a pedagogical support tool for lesson planning, material development, question construction, learning strategy exploration, and reflective improvement. All processes involving program planning, participant coordination, training implementation, data collection, pretest and posttest evaluation, micro teaching observation, reflection analysis, academic interpretation, and conclusion development remain the full responsibility of the authors.

Data Availability Statement
The data supporting the findings of this article consist of community service program documents, activity reports, attendance records, pretest and posttest summaries, observation sheet results, student reflection summaries, AI-based lesson planning outputs, micro teaching simulation notes, and descriptive evaluation records related to the strengthening of basic teaching skills through Artificial Intelligence among preservice teachers. Due to participant confidentiality and ethical considerations in educational activities, complete raw data are not publicly available. Additional information regarding the program implementation and evaluation procedures may be obtained from the corresponding author upon reasonable request.

References

Bond, M., Bedenlier, S., Marín, V. I., & Händel, M. (2021). Emergency remote teaching in higher education: Mapping the first global online semester. *International Journal of Educational Technology in Higher Education, 18*, Article 50. https://doi.org/10.1186/s41239-021-00282-x

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied Developmental Science, 24*(2), 97–140. https://doi.org/10.1080/10888691.2018.1537791

Holmes, W., Porayska-Pomsta, K., Holstein, K., Sutherland, E., Baker, T., Shum, S. B., Santos, O. C., Rodrigo, M. T., Cukurova, M., Bittencourt, I. I., & Koedinger, K. R. (2022). Ethics of AI in education: Towards a community-wide framework. *International Journal of Artificial Intelligence in Education, 32*, 504–526. https://doi.org/10.1007/s40593-021-00239-1

Karataş, F., & Yüce, E. (2024). AI and the future of teaching: Preservice teachers' reflections on the use of artificial intelligence in open and distributed learning. *The International Review of*

Research in Open and Distributed Learning, 25(3), 304–325. https://doi.org/10.19173/irrodl.v25i3.7785

Kidder, D. P., Fierro, L. A., Luna, E., Salvaggio, H., McWhorter, A., Bowen, S.-A., Murphy-Hoefer, R., Thigpen, S., Alexander, D., Armstead, T. L., August, E., Bruce, D., Clarke, S. N., Davis, C., Downes, A., Gill, S., House, L. D., Kerzner, M., Kun, K., Mumford, K., Robin, L., Schlueter, D., Schooley, M., Valverde, E., Vo, L., Williams, D., Young, K., & CDC Evaluation Framework Work Group. (2024). CDC program evaluation framework, 2024. *MMWR Recommendations and Reports, 73*(6), 1–37. https://doi.org/10.15585/mmwr.rr7306a1

Miao, F., & Holmes, W. (2023). *Guidance for generative AI in education and research*. UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000386693

Trust, T., & Whalen, J. (2020). Should teachers be trained in emergency remote teaching? Lessons learned from the COVID-19 pandemic. *Journal of Technology and Teacher Education, 28*(2), 189–199. https://www.learntechlib.org/primary/p/215995/

UNESCO. (2024). *AI competency framework for teachers*. United Nations Educational, Scientific and Cultural Organization. https://doi.org/10.54675/ZJTE2084

Zhang, J., & Zhang, Z. (2024). AI in teacher education: Unlocking new dimensions in teaching support, inclusive learning, and digital literacy. *Journal of Computer Assisted Learning, 40*(4), 1871–1885. https://doi.org/10.1111/jcal.12988