



# Enhancing elementary teacher competence through Love-based Curriculum, deep learning, and AI via Action Research

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## ABSTRACT

This community service program aims to enhance the competencies of elementary school teachers (SD/MI) in Pekanbaru City in integrating a Love-based Curriculum, deep learning approaches, and the utilization of Artificial Intelligence (AI) in classroom instruction. The program was implemented through several stages, including needs analysis, training (knowledge transfer), mentoring, classroom implementation, and evaluation and reflection. The training focused on strengthening teachers' understanding and practical skills in designing learning tools that integrate values-based education, deep learning strategies, and AI applications such as ChatGPT and Canva AI. The results indicate a significant improvement in teachers' competencies, as reflected in the increased quality of instructional materials, the ability to integrate values and technology into teaching practices, and the contextual use of AI in lesson planning. Furthermore, classroom implementation demonstrates a positive impact on the learning process, including increased student engagement, more interactive classroom communication, and a more reflective and supportive learning environment. Therefore, this community service program not only improves teachers' competencies but also contributes to enhancing the overall quality of classroom learning through the holistic integration of values, pedagogy, and technology.

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## 1. INTRODUCTION

21st-century education introduces novel challenges and demands regarding the implementation of teaching and learning processes in elementary schools. A primary concern involves the teacher's ability to transcend mechanical instruction in favor of creating meaningful learning experiences that address students' affective, social, and spiritual dimensions (Herdiana et al., 2025). Mathematics, despite being a core subject, is frequently perceived by elementary students as an abstract, daunting, and complex discipline. This perception is often exacerbated by conventional pedagogical approaches that prioritize rote formulaic memorization and problem-solving in isolation from the students' real-world contexts.

Under these circumstances, mathematics education risks losing its humanistic essence, devolving into a purely technical exercise devoid of human values. Consequently, there is an urgent

need for a curricular approach capable of revitalizing the teacher-student relationship through a learning environment characterized by compassion, empathy, and respect for individual uniqueness. The Love-based Curriculum emerges as a pedagogical framework that positions love in its broadest sense, encompassing care, social sensitivity, responsibility, and profound respect for the learner, as the fundamental cornerstone of the educational relationship (Labibah et al., 2026; Rissi et al., 2025).

Simultaneously, meaningful learning must cultivate the higher-order thinking skills essential for the information age. In this regard, the deep learning approach is vital, as it extends beyond content mastery to encompass critical reflection and the practical application of knowledge in real-world contexts (Zainuri et al., 2025). This approach emphasizes both emotional and intellectual engagement while fostering collaboration and creativity, which are two core competencies of the Merdeka Curriculum.

However, integrating love-based pedagogy and deep learning into instructional design remains a significant challenge. Many educators, particularly in Pekanbaru City, struggle to develop teaching materials that move beyond administrative compliance to effectively incorporate affective and reflective values. Consequently, instruction often remains focused on cognitive aspects through repetitive exercises that fail to resonate with students' personal lives or emotions (Rusnaini et al., 2021).

Based on preliminary surveys conducted among elementary school teachers in Pekanbaru City, it was found that the majority of educators still encounter difficulties in integrating humanistic, reflective, and technology-based approaches within mathematics instruction. Initial data indicate that teachers' understanding of the Love-based Curriculum remains low, the implementation of deep learning strategies is not yet optimal, and the utilization of Artificial Intelligence (AI) in the classroom is highly limited. Furthermore, teachers tend to rely on conventional instructional materials that do not accommodate 21st-century learning requirements. This situation highlights a significant gap between curricular demands and actual field practices.

Meanwhile, technological advancements, particularly in Artificial Intelligence, offer new opportunities for teachers to design more adaptive and efficient instructional tools. Technologies such as ChatGPT, Canva AI, and MagicSchool AI enable educators to rapidly generate lesson plans, student worksheets, practice questions, and even personalized assessments (Sujana et al., 2025). However, according to preliminary surveys and literature reviews, AI utilization among elementary teachers remains relatively low. The primary obstacles identified include a lack of practical training, low digital literacy, and the absence of school policies that support AI integration in the learning process (Sormin et al., 2025).

In terms of infrastructure readiness, most schools in Pekanbaru City already have access to basic technological devices such as laptops and internet connectivity, although quality and stability vary. While some schools have utilized digital platforms, their use remains suboptimal for supporting AI-based learning. Furthermore, there is a lack of specific school guidelines or policies directing the use of AI technology in education. This situation suggests that while the basic infrastructure is available, strengthening teacher competence is necessary to ensure these resources are maximized to support pedagogical innovation.

Previous community service initiatives indicate that practice-based teacher training and mentoring are effective in enhancing professional competence for innovative instruction. Findings by Gusty et al. (2025) demonstrate that technology-based training significantly improves teachers' digital literacy. Additionally, Sofiyana et al. (2025) reported that continuous mentoring has a positive impact on the ability of teachers to develop contextual and reflective instructional materials. Other work by Rusnaini et al. (2021) also shows that value-based learning approaches increase student engagement. These findings suggest that integrating pedagogical approaches with technology through training and mentoring serves as a relevant and effective strategy for improving the quality of elementary education.

Furthermore, the integration of the Love-based Curriculum, deep learning approaches, and the utilization of Artificial Intelligence (AI) not only enhances teacher competence but also directly impacts the quality of student learning experiences. Instruction designed through a love-based lens has the potential to create an emotionally safe learning environment, bolster student self-confidence, and reduce academic anxiety, particularly within mathematics education. The implementation of deep learning strategies encourages students to engage in critical thinking, reflection, and contextual problem-solving, leading to a more profound conceptual understanding. Meanwhile, the use of AI enables the presentation of more varied, adaptive, and engaging materials, thereby increasing student motivation and involvement.

The synergy between the Love-based Curriculum, deep learning, and AI technology represents an innovative approach capable of producing instructional materials that are pedagogically sound and technologically relevant. To achieve this, teachers require intensive training that addresses both conceptual aspects and technical skills, supported by continuous mentoring to facilitate collaborative reflection and revision of teaching tools (Rissi et al., 2025). Consequently, this community service initiative is designed as a direct response to the actual needs of elementary school teachers in Pekanbaru City.

Furthermore, the integration of the Love-based Curriculum, deep learning approaches, and Artificial Intelligence (AI) utilization not only enhances teacher competence but also has direct implications for the quality of classroom learning experiences. Instruction designed with a love-based approach has the potential to cultivate an emotionally secure learning environment, bolster student self-confidence, and reduce academic anxiety, particularly in mathematics. The application of deep learning strategies encourages students to engage in critical thinking, reflection, and contextual problem-solving, resulting in a more profound conceptual understanding. Meanwhile, the use of AI facilitates the presentation of more varied, adaptive, and engaging materials, thereby increasing student motivation and engagement. Consequently, strengthening teacher competence through this community service program is a strategic step that impacts both professional development and the holistic quality of student learning outcomes.

Generally, this community service initiative aims to enhance the capacity of elementary school teachers in Pekanbaru City to develop meaningful, reflective, and adaptive mathematics instructional materials by integrating the principles of the Love-based Curriculum, deep learning, and AI technology. Specifically, this program seeks to: (1) Analyze the needs and challenges faced by teachers; (2) Provide participatory-based training; and (3) Improve teachers' proficiency in utilizing AI.

## **2. METHODS**

This community service initiative was conducted in collaboration with the Mathematics Teacher Working Group (*Kelompok Kerja Guru/KKG*) for Elementary Schools and Madrasah Ibtidaiyah in Pekanbaru City. The partners were selected through purposive sampling, considering the alignment of their needs with the program's focus, specifically in strengthening value-based pedagogical competence, deep learning approaches, and the utilization of Artificial Intelligence (AI) in mathematics instruction.

A total of 60 teachers from various elementary schools and madrasah ibtidaiyah in Pekanbaru participated in this activity. The program was centered in a training hall for intensive workshops and training sessions, followed by implementation at their respective schools. Partner characteristics indicate that most teachers are in the early stages of integrating value-based and technological approaches, necessitating interventions that are not only conceptual but also practical and sustainable in nature.

Throughout its implementation, the partners acted not as passive participants but as active subjects involved in every stage, including problem identification, program planning, training execution,

classroom implementation, and reflection and evaluation. This active engagement was crucial to ensure the program aligned with real-world needs and provided a sustainable impact.

The approach employed in this initiative was Participatory Action Research (PAR), a collaborative method that integrates iterative cycles of action and reflection. This approach was selected for its relevance to community service activities oriented toward partner empowerment. Through PAR, teachers were not merely subjects of training but were integral to the change process, ensuring that the outcomes were more contextual and applicable.

### **Design and Stages of Community Service Program**

This community service program is designed as a systematic and sustainable cycle of activities consisting of six primary stages: needs analysis, program planning, training (knowledge transfer), mentoring, classroom implementation, and evaluation and reflection. Each stage is structured with clear objectives, specific activities, and measurable outputs, facilitating a gradual improvement in teacher competence. Table 1 describe the implementation stages of the program.

**Table 1.** Program implementation stages

<b>Stage</b>	<b>Activities</b>	<b>Objectives</b>	<b>Participants</b>	<b>Timeline</b>
Needs Analysis	Surveys, interviews, and observations	Identifying teacher challenges and requirements	Team & Partners	October 2025
Planning	Module and instrument development	Preparing training materials and curriculum	Team	October 2025
Training	Workshops and practical sessions	Facilitating knowledge transfer	Team & Teachers	November 2025
Mentoring	Intensive guidance and coaching	Strengthening professional competencies	Team & Teachers	Nov–Dec 2025
Implementation	Classroom teaching practice	Real-world application of concepts	Teachers	December 2025
Needs Analysis	Surveys, interviews, and observations	Identifying teacher challenges and requirements	Team & Partners	October 2025

During the needs analysis stage, the research team identified the teachers' initial conditions through a combination of surveys, interviews, and observations. The primary focus was to assess the extent of their understanding of the Love-based Curriculum, their ability to implement deep learning approaches, and the degree to which they utilize AI technology in the classroom. The findings from this analysis served as the foundation for designing targeted program interventions.

The program planning stage involved developing training modules that integrate both conceptual and practical aspects. These modules were designed not only to provide theoretical understanding but also to offer technical guidance for developing innovative instructional materials. Additionally, evaluation instruments were formulated to measure the overall effectiveness of the program. The training stage (knowledge transfer) serves as the core of this community service initiative. During this phase, the service team facilitates the transfer of knowledge through participatory approaches, such as interactive lectures,

technological demonstrations, and hands-on practice. Teachers do not merely receive information; they are actively engaged in developing instructional materials under the direct guidance of the team.

The mentoring stage is conducted intensively following the training to ensure that the newly acquired knowledge is implemented optimally. In this phase, teachers receive direct feedback on their instructional designs, fostering a process of continuous improvement. Classroom implementation represents a crucial stage that demonstrates the program's success in a real-world context. Teachers apply the instructional materials they have developed within the actual learning process, effectively bridging the gap between training and practical execution. The evaluation and reflection stage is carried out to assess the overall effectiveness of the program. This evaluation focuses not only on outcomes but also on the process, providing a comprehensive overview of the program's success and offering recommendations for future development.

### **Concepts and Technologies Applied**

This program integrates four interrelated core components, the Love-based Curriculum, deep learning approaches, the utilization of Artificial Intelligence (AI), and reflective assessment. The Love-based Curriculum is implemented through instructional designs that emphasize positive interpersonal relationships between teachers and students, while cultivating an emotionally secure learning environment. Teachers are trained to integrate values of empathy, care, and respect into every learning activity. The deep learning approach is executed via problem-based learning, reflective discussions, and activities that encourage students to think critically and achieve a profound understanding of concepts. Consequently, teachers are encouraged to design instruction focused not only on outcomes but also on the students' thinking processes.

AI utilization is conducted practically through various digital applications. ChatGPT assists teachers in developing lesson plans, student worksheets, and assessment items, while Canva AI is utilized to create engaging visual learning media. Teachers are taught not only how to operate these technologies but also how to evaluate and refine the generated outputs to suit their specific educational contexts. Finally, reflective assessment is applied through the use of reflection journals, open-ended questions, and process-based evaluations. This approach aims to measure not only academic achievement but also student engagement and cognitive involvement throughout the learning journey.

### **Data Collection Instruments and Techniques**

Data for this initiative were collected through various techniques, including observation, interviews, documentation, as well as pre-tests and post-tests. The use of multiple methods aims to obtain comprehensive and in-depth data. The pre-test and post-test instruments were developed based on competency indicators relevant to the program, specifically the understanding of the Love-based Curriculum, the ability to implement deep learning, the utilization of AI, and the development of reflective assessments. These instruments consist of a combination of multiple-choice and essay questions designed to measure both cognitive and applicative aspects.

### **Data Analysis Techniques**

Data obtained from this initiative were analyzed using both descriptive quantitative and qualitative approaches. Quantitative analysis was employed to evaluate improvements in teacher competency based on pre-test and post-test results, while qualitative analysis served to interpret findings from observations, interviews, and teacher reflections. This dual-method approach allowed for a more comprehensive understanding of the impact resulting from the implemented community service program.

### **Success Indicators**

The success of this initiative is measured by the teachers' ability to develop lesson plans (RPP), student worksheets (LKPD), and assessments that integrate love-based values, deep learning, and the utilization of artificial intelligence. Further indicators of success include the quality of instructional materials that meet standardized rubric requirements and receive positive peer feedback, as well as significant increases in teacher knowledge scores from pre-test to post-test. Additionally, success is demonstrated by the emergence of documented reflections on changes in pedagogical practices within teacher logs.

### **Ethics of Service**

The entire program followed professional ethics for community service, starting with a clear explanation for all participants. Through informed consent, teachers were given full information about the goals, steps, benefits, and risks of the activities. To protect privacy, all teacher information was kept confidential by using identity codes and safe data storage. The approach focused on equality and collaboration, treating teachers as equal partners in the effort to improve their professional skills throughout the project.

### **Related Stakeholders**

The success of this community service program was made possible by the collaboration of various stakeholders. The Pekanbaru City Education Office provided the necessary permits, participant recommendations, as well as institutional and policy support. The Mathematics Teacher Working Group (KKG) served as the primary partner by recruiting participants, facilitating communication, and sharing best practices. Elementary school teachers in Pekanbaru acted as both the main participants and agents of change through their active involvement in every stage of the program. The academic team from the university was responsible for the design, execution, evaluation, and sharing of the program results. Finally, partner schools provided facilities, served as implementation sites, and acted as models for applying innovative, value-based, and technology-driven instructional materials.

## **3. RESULTS AND DISCUSSION**

The training and mentoring program for elementary school teachers in Pekanbaru focused on developing mathematics instructional materials using the Love-based Curriculum and AI-driven deep learning. The initiative took place over two months and involved 60 teachers. The program structure included three days of face-to-face training, five weeks of intensive mentoring, and the direct implementation of teaching materials in the classroom. Participant engagement was remarkably high, with a 96 percent attendance rate and a 92 percent task completion rate, reflecting the teachers' strong enthusiasm and genuine need for innovation in mathematics instruction.

### **Results**

The results of this community service project were analyzed comprehensively based on the designed implementation stages, including needs analysis, training (knowledge transfer), mentoring, classroom implementation, and evaluation and reflection. The primary focus of presenting these results is not merely on statistical measurements, but rather on how the knowledge transfer process occurred, how teachers internalized the material, and how they implemented it into their teaching practices.

### Needs analysis: Identifying teacher competency gaps

The needs analysis stage revealed a significant gap between the demands of 21st-century education and the actual teaching practices used by teachers. In general, teachers still focus on procedural-based learning and have not yet fully integrated affective dimensions or technology into their classrooms. These findings are presented in Table 2.

**Table 2.** Initial teacher needs analysis

Measured Aspect	Average (%)	Category
Understanding of Love-based Curriculum	41	Low
Ability to Implement Deep Learning	38	Low
Ability to Utilize AI for Learning	22	Very Low
Ability to Design Reflection-Based Worksheets	35	Low
Ability to Develop Alternative Assessments	30	Low

Range 0-25 = Very Low; 26-50 = Low; 51-75 = Medium; 76-100 = High

Based on the data obtained, it appears that most teachers are currently in the low to moderate categories regarding the integration of value-based learning, the application of deep learning, and the use of artificial intelligence in education. However, these findings should be understood as more than just statistical figures; they indicate more fundamental issues. Analytically, this condition shows that teachers still view teaching as a process of delivering material rather than building meaningful learning experiences. This is evident from the dominant use of lectures and practice problems that focus only on final results, without involving reflection or the emotional engagement of students.

Furthermore, from a cognitive perspective, teachers are not yet fully able to guide students toward deep learning. Lessons still focus on following procedures rather than understanding concepts as a whole. As a result, students tend to be able to solve problems without understanding the meaning behind what they are learning. In terms of technology, although some teachers are familiar with digital tools, their use is still limited to basic functions like presenting material. Technology has not yet been used as a tool to support personalized learning or develop student creativity.

Therefore, this needs analysis stage does more than just identify initial conditions; it confirms that the challenges faced are multidimensional, covering pedagogical, cognitive, and technological aspects. These findings serve as the basis for designing program interventions that are not only technical but also transformational in nature.

### Training stage: Knowledge transfer process and understanding reconstruction

The training stage is the core of this community service project, serving as the primary channel for knowledge transfer from the team to the participants. However, the training in this program is more than just a presentation of material; it is a process of reconstructing how teachers understand learning. The training is conducted as an interactive workshop that combines conceptual explanations, demonstrations, and hands-on practice. In the early phase, teachers are introduced to the Love-based Curriculum as an approach that places emotional connections and human values at the heart of education. This explanation is followed by reflective discussions that encourage teachers to evaluate their current teaching practices.

Next, teachers are introduced to the deep learning approach, which emphasizes the importance of education focused on a profound understanding of concepts. At this stage, teachers begin to realize

that their previous methods often remained at a surface learning level, highlighting the need for a change in instructional strategies. The most significant part of the training is the practical session on using artificial intelligence. Teachers are not only introduced to applications like ChatGPT and Canva AI but are also directly guided in using them to develop instructional materials. This process allows teachers to see clearly how technology can be used to support learning. Analytically, this training stage shows an initial shift in the teachers' mindset. They have begun to move from being mere presenters of information to becoming learning designers. This shift is a vital indicator that the knowledge transfer process is happening not just at a cognitive level, but also at a conceptual one.

### **Mentoring stage: Strengthening and internalizing competencies**

The mentoring phase is a continuation of the training and serves to ensure that the knowledge gained can be optimally implemented. At this stage, teachers no longer simply learn but begin to develop instructional tools independently with guidance from the service team. The mentoring activities are shown in Figure 1.



**Figure 1.** Intensive mentoring process for developing AI-based teaching tools

Based on Figure 1, the service team provides personalized technical guidance to teachers in verifying Artificial Intelligence outputs to ensure they remain aligned with the values of the Love-based Curriculum. This mentoring process is key to transforming teaching practices because teachers receive direct feedback on the drafts they develop. Teachers do not only improve the technical aspects of their instructional tools but also become more skilled at integrating Love-based Curriculum values, deep learning strategies, and the use of artificial intelligence into mathematics lesson planning. This pattern of improvement shows that the collaborative mentoring model has a positive impact on the quality of instructional planning and teacher professionalism. The results of this mentoring stage are presented in Table 3.

Based on Table 3, there is a significant improvement across all aspects of the instructional tools developed by teachers following the mentoring process. The average score increased from the "Very Low" category (32.75) to "High" (84), demonstrating that mentoring impacts not only theoretical understanding but also the practical ability of teachers to design learning materials. The most notable increase occurred in the utilization of AI, where the score rose from 22 to 89. This suggests that while teachers previously struggled to use technology optimally, they are now able to not only use AI tools but also integrate them effectively into their teaching. These findings indicate that the successful use of technology relies heavily on intensive and contextual guidance.

**Table 3.** Quality of teacher teaching materials resulting from mentoring

Aspects	Assessment Indicators	Initial Score (Average)	Final Score (Average)	Category	Description of Changes
Integration of Love-based Curriculum	Presence of empathy, positive interaction, and humanistic learning atmosphere	41	86	Very High	Teachers began integrating affective values into learning scenarios
Implementation of Deep Learning	Critical thinking activities, problem-solving, and reflection	38	82	High	Learning is no longer procedural but encourages conceptual understanding
Utilization of AI	Use of AI in lesson plans (RPP), worksheets (LKPD), and learning media	22	89	Very High	Teachers are able to use AI creatively and relevantly
Reflective Assessment	Presence of reflection instruments and learning process evaluations	30	79	High	Teachers began using reflection-based assessments
<b>Average</b>		<b>32.75</b>	<b>84</b>		

Range  $\leq 44$  = Very Low; 41-55 = Low; 56-70 = Moderately High; 71-85 = High; 86-100 = Very High

Additionally, the improvement in deep learning implementation shows a shift from procedural teaching toward methods that encourage conceptual understanding and critical thinking. Teachers have begun to design activities that actively involve students, making the learning process more meaningful. In terms of the Love-based Curriculum, the higher scores show that teachers are starting to recognize the importance of emotional connections in education. This is reflected in their efforts to create a more humanistic and interactive classroom atmosphere. Overall, the improved quality of these instructional materials demonstrates that the mentoring process plays a vital role in transforming the knowledge gained during training into actual practice when developing lesson plans and tools.

### Implementation stage in class

The implementation stage is the most critical part of this community service project, as it reveals whether the knowledge transferred is actually applied in teaching practice. Teachers began to use the instructional tools they developed during their classroom activities. This process was monitored through direct observation and documentation. The observations showed a significant change in the learning process. Students appeared more active, more confident in sharing their opinions, and more involved in group discussions. This indicates that the designed lessons successfully increased both cognitive and emotional engagement among students.

In terms of classroom interaction, there was a clear shift in the communication patterns between teachers and students. Lessons were no longer dominated by the teacher but became more dialogic, providing space for students to participate actively. The classroom atmosphere also became more supportive and inclusive, making students feel more comfortable while learning. The use of artificial intelligence in the classroom also made a significant contribution. The resulting learning media were more diverse and engaging, which helped boost student motivation. Additionally, AI assisted teachers in providing a variety of problems and materials that matched the students' needs. Analytically, this implementation shows the program impacted not only teacher competence but also the overall quality of classroom learning. This also shown in Figure 2.



**Figure 2.** Implementation of deep learning-based mathematics learning in MI classes

Based on Figure 2, these records prove that integrating deep learning strategies can create a positive learning environment, which in turn reduces students' academic anxiety when facing mathematics. Other findings show that the use of artificial intelligence contributes positively to the quality of instructional design, particularly in helping teachers create more diverse and visual materials. However, the effectiveness of using AI is highly dependent on the teacher's critical approach in verifying and adapting the technology's output rather than simply copying it directly. The most decisive factor in the successful transformation of teaching practices in this program was the intensive and collaborative mentoring provided after the training. Ongoing support allowed teachers to reflect on their practices, receive constructive feedback, and make gradual improvements, making the changes more profound and sustainable. The data for the teachers' pre-test and post-test score improvements can be seen in Table 4.

**Table 4.** Improvement of teachers' pre-test and post-test scores

Competency	Pre-test	Category	Post-test	Category	Improvement
Love-based Curriculum	41	Very Low	86	Very High	+45
Deep Learning	38	Very Low	82	High	+44
Utilization of AI	22	Very Low	89	High	+67
Reflective Assessment	30	Very Low	79	High	+49

Range  $\leq 44$  = Very Low; 41-55 = Low; 56-70 = Moderately High; 71-85 = High; 86-100 = Very High

These findings show a significant improvement in all measured competency aspects. The understanding of the Love-based Curriculum increased from an initial score of 41 to 86, a rise of 45 points. In terms of deep learning, teacher scores grew from 38 to 82, showing an improvement of 44 points. Competency in utilizing artificial intelligence (AI) saw the largest increase, jumping from an initial score of 22 to 89. This 67 point difference illustrates a significant transformation in the teachers' digital literacy. Meanwhile, the ability to conduct reflective assessments improved from a score of 30 to 79, an increase of 49 points.

This pattern of improvement demonstrates that the training and mentoring program did more than just strengthen technical skills; it also encouraged a shift in the teachers' pedagogical mindset. The progress in the Love-based Curriculum and deep learning aspects indicates a move away from procedural teaching toward a more humanistic, reflective approach focused on meaningful learning experiences. Therefore, the integration of values, deep learning strategies, and AI technology has proven effective in comprehensively improving teachers' professional competence.

Based on the entire series of activities, the findings show that teacher competence improved simultaneously across conceptual, pedagogical, emotional, and digital dimensions through a practice-based training model combined with ongoing mentoring. Value-based mathematics instruction, centered on the Love-based Curriculum, successfully created a more supportive and emotionally safe classroom environment. As a result, students showed more courage in asking questions and a decrease in academic anxiety. Furthermore, the implementation of deep learning strategies encouraged higher-order thinking, a deeper understanding of concepts, and the development of reflective skills among students.

## Discussion

The discussion in this article views community service not merely as a training activity, but as a gradual transformation of teacher competence through the mechanisms of knowledge transfer, internalization, and practical implementation. The main findings show that the improvement in teacher competence cannot be explained by quantitative scores alone. Instead, it must be understood as a structural change in how teachers think, teach, and utilize technology in education.

Conceptually, the results of this project reveal that the initial low category of teachers was not caused solely by limited technical skills. Rather, it stemmed from a fundamental gap between the demands of 21st-century learning and actual field practices. This aligns with recent studies indicating that integrating artificial intelligence into education requires multidimensional competencies that cover pedagogical, technological, and ethical aspects simultaneously (Aulia et al., 2026). In this context, the low ability of teachers to use AI should not be seen only as a lack of training, but as an indicator that a pedagogical framework for integrating technology meaningfully has not yet been established.

Furthermore, global literature confirms that the successful implementation of AI in education depends heavily on teachers' readiness to understand ethical, pedagogical, and technological dimensions in a balanced way. UNESCO (2023–2024) explicitly emphasizes that the use of AI in education must be accompanied by strengthening teacher competencies, including ethical literacy, transparency, and responsibility in using technology (Utomo et al., 2025). This finding reinforces the results of this community service project, which showed that before the intervention, teachers did not have a complete understanding of the role of AI as a pedagogical tool.

During the training stage, the results showed an initial shift in the cognitive structure of teachers, specifically in understanding learning as a process focused on creating meaningful experiences rather than just delivering material. This transformation is consistent with findings in various studies showing that practice-based training significantly influences changes in perception and teacher readiness to integrate educational technology. The use of AI such as ChatGPT and Canva AI during training has proven effective in increasing efficiency when developing instructional tools and opening opportunities for more adaptive and personalized learning (Syawaludin, 2025).

However, the results of this project also indicate that training alone is not enough to produce sustainable changes in practice. This finding is consistent with various community service studies confirming that training without mentoring tends to only result in increased knowledge without significantly impacting actual teaching practices (Lingga et al., 2026). In this context, the mentoring phase became the key factor bridging the gap between knowledge and practice.

The mentoring in this program served as a space for reflection and iteration, where teachers did not just apply the knowledge they gained but also performed repeated evaluations and improvements. This process aligns with the practice-based professional development approach, which emphasizes that teacher competence grows through continuous cycles of practice and reflection. The significant

improvement in the quality of instructional tools shows that teachers did not only understand the concepts but were also able to internalize them into contextual practices.

These findings are reinforced by recent community service results showing that practice-based mentoring can significantly improve the quality of instructional design, particularly in the integration of AI and deep learning approaches (Purba et al., 2026). Furthermore, the use of AI in developing instructional tools has proven to enhance teacher creativity and efficiency, especially in producing diverse learning materials and assessments (Triyono et al., 2026).

During the classroom implementation stage, the results showed that the changes were not only technical but also structural. Teachers began implementing lessons that were more interactive, reflective, and student-centered. This indicates that the knowledge transfer did not stop at a cognitive level but reached the level of practice. This finding is consistent with global studies stating that AI in education serves as a tool to strengthen teacher capacity rather than replace it, playing a role in creating more personalized and adaptive learning (Chan & Tsi, 2023).

Furthermore, studies on generative AI in education show that this technology has great potential in supporting learning oriented toward exploration, creativity, and differentiated instruction (Denny et al., 2024). Nevertheless, the effectiveness of AI use depends heavily on the teacher's ability to integrate it pedagogically. Without this ability, AI risks becoming merely a technical tool that fails to provide a significant impact on the quality of learning.

Additionally, the ethical aspects of AI usage are a critical focus of this discussion. Various studies indicate that the use of AI in education is inseparable from issues such as algorithmic bias, data privacy, and academic integrity (Porayska-Pomsta et al., 2024). In this context, the project results show that teachers are beginning to develop an awareness of the importance of using AI responsibly, although further reinforcement is still required in its implementation. Viewed more broadly, the results of this activity demonstrate that the success of a community service program is determined not only by the use of technology but by the integration of values, learning strategies, and technology. The Love-based Curriculum plays a role in developing the affective dimension, deep learning addresses the cognitive dimension, and AI supports the technological dimension. The integration of these three components results in learning that is more holistic and meaningful.

These findings align with various literature reviews emphasizing the importance of a holistic approach in education, where technology does not stand alone but must be integrated with pedagogical values and strategies. Studies on AI literacy also show that a teacher's ability to use AI encompasses more than technical aspects; it includes the capacity to understand, evaluate, and critically reflect on the use of technology (Abrari & Fajariningtyas, 2025). Therefore, the results of this project reinforce the idea that educational transformation cannot be achieved through a partial approach. An effective community service program must be able to simultaneously integrate pedagogical, technological, and value-based aspects, while providing space for teachers to learn, practice, and reflect on their teaching in a sustainable manner.

#### **4. CONCLUSION AND RECOMMENDATIONS**

Based on the results and discussion, this community service project has proven relevant and effective in achieving the goal of improving the competence of elementary school teachers in Pekanbaru through the integration of the Love-based Curriculum, deep learning approaches, and the utilization of artificial intelligence (AI). The implementation process, conducted in stages from needs analysis and training to classroom implementation, shows that improvements in teacher competence occurred not

only in cognitive aspects but also in pedagogical mindset and teaching practices. This is evidenced by the increased quality of instructional tools, the ability to integrate values and technology, and a shift toward more active, reflective, and student-centered classroom interactions. Furthermore, while AI utilization successfully boosted teacher creativity and efficiency, its success relied heavily on continuous mentoring. Consequently, this program did not only produce improved teacher competence as a direct output but also enhanced the quality of classroom instruction as a real-world implementation.

Based on the execution of this project, several recommendations are suggested for future program development. First, subsequent activities should integrate direct evaluations of student learning outcomes, as this project focused primarily on teacher competence and did not quantitatively measure the impact on student achievement. Second, there is a need to develop a long-term mentoring model based on professional learning communities to ensure that competency improvement continues through ongoing teacher collaboration. Third, further development and testing regarding the diverse uses of AI are necessary, particularly in differentiated instruction and adaptive assessment, since this project primarily focused on instructional tool development. Fourth, it is recommended to expand the scope of partners and implementation contexts, including different educational levels and regions, to test the consistency and sustainability of the Love-based Curriculum, deep learning, and AI integration model under various learning conditions.

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