

Training Utilization of Artificial Intelligence (AI) to Improve the Competence of Physics Teachers in Facilitating Learning in Langsa City

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Abstract

Purpose: This program aimed to address the limited use of artificial intelligence (AI) in physics education among high school teachers in Langsa City by enhancing their skills in developing AI-assisted learning and evaluation tools.

Method: Training was conducted through the MGMP Physics community, involving workshops focused on designing and implementing AI-based educational media and assessments.

Practical Application: Teachers gained practical skills to integrate AI into their teaching, enabling more effective and personalized learning experiences for students.

Conclusion: The training program was successfully implemented, and its objectives were effectively achieved. Physics teachers in Langsa City showed improved competence in understanding and applying AI in education. The outputs include a service result report, improved teacher skills in developing AI-assisted tools, and an article prepared for publication. Overall, the activity contributed significantly to advancing technological literacy and teaching innovation within the local educational sector.



Introduction

Education and learning are key elements in the development of human potential and society. In the era of globalization and industrial revolution 4.0, the need for innovation in education is increasingly urgent. Artificial intelligence (AI) technology has emerged as a revolutionary force capable of significantly changing the educational landscape. In this context, the utilization of AI in education is not just an option, but a necessity to improve the effectiveness and relevance of learning. The integration of AI in education can help create a learning environment that not only focuses on knowledge, but also on developing 21st century skills. In perspective, AI can act as an assistant that supports teachers in identifying the needs and potential of each student (Seldon, 2019).

AI can provide significant personalization assistance, enabling education to suit the individual needs of each student. Through sophisticated data analysis, AI can customize curriculum and learning methods to improve learning outcomes (Luckin, 2018). The use of technology, including AI, can also accelerate feedback on student performance. This can provide opportunities for faster and more effective improvement in the learning process (Hattie, 2017). The utilization of AI in education is not just a trend, but an urgent need. The views of education experts confirm that AI integration can improve learning effectiveness, provide personalization, and create a more inclusive learning environment. Therefore, the exploration and implementation of AI in education is not only an effort to keep up with technological developments, but also a strategic step to prepare the next generation to face increasingly complex global challenges.

Ideally, today's educational institutions should maximize the use of technological advances that can simplify tasks for teachers and students (Tjahyanti, et al., 2022). However, many teachers today are still not fully familiar with and utilizing artificial intelligence (AI) in an educational context, particularly in Langsa city. This suggests a challenge to integrate this advanced technology into their learning practices.

One solution that can be done immediately (urgent) is to provide training and mentoring to physics teachers in Langsa city regarding the utilization of AI technology in the learning process so as to improve teacher competence in supporting the independent curriculum. The main problems of the current partners can be summarized as follows: (1) There are still many high school physics teachers in Langsa City who are not familiar with Artificial Intelligence (AI) technology. (2) The low skill of teachers in using AI-based technology. (3) The low ability of teachers in making good learning tools and in accordance with the demands of the current independent curriculum

Artificial Intelligence is the process of modelling the way humans think and designing a machine to behave like humans or other terms called cognitive tasks, namely how machines can learn automatically from data and information that has been programmed. Artificial intelligence can also be interpreted as Artificial intelligence or AI is one part of computer science that makes machines (computers) can do work like and as well as humans do. Artificial Intelligence (AI) is a simulation of intelligence possessed by humans that is modelled in machines and programmed to think like humans (Boucher, 2020). Broadly speaking, AI can also be applied in various ways by emphasizing machine intelligence that can respond like humans (Saleh, 2019).

Objectives of Community Service This community service aims as follows: (1) To improve the knowledge of Langsa City High School Physics teachers in the utilization of AI to support the learning process. (2) To improve the skills of Langsa City High School Physics teachers in applying AI to the learning process. **Benefits of Community Service** By holding this community service, it is hoped that: (1) Physics teachers of Langsa City High School can understand the benefits and types of AI-based applications to support learning. (2) Physics teachers of Langsa City High School can use AI-based applications in the learning process.

Method

In the era of the industrial revolution 4.0, technological developments have had a significant impact in various sectors, including education. One technology that is growing rapidly and has great potential in education is Artificial Intelligence (AI). AI technology offers various innovative solutions to improve the effectiveness and efficiency of the learning process, such as learning personalization, educational data analysis, and more effective classroom management. However, the application of AI technology in education requires specialized skills and knowledge that must be mastered by teachers. One of the main obstacles in the application of AI technology in schools is teachers' skills and knowledge. Many teachers are still not familiar with AI technology and how to use it in the learning process. This problem can be caused by several factors, including lack of training and education, limited access to technology, resistance to change, lack of support and policies. The methods to be used are presentations by resource persons, discussions, and simulations. This activity will be attended by several physics' teachers in Langsa City who are included in the MGMP. In its implementation, participants are given material on the introduction and use of AI by resource persons, discussions related to the material, and simulations of the use of AI in the process of preparing learning tools and evaluations.

The stages and steps of implementing this proposed Community Service program are as follows:

1. *Preparation and Planning*
 - Identifying teachers' needs through an initial survey.
 - Preparing training materials on AI concepts and their applications in physics education.
 - Technical coordination with schools and participants.
2. *Introduction to AI Concepts in Learning*
 - Discussion on the basic concepts of AI and its applications in education.
 - Case studies on AI implementation in physics teaching.
 - Interactive discussion on the benefits and challenges of AI in learning.
3. *Training in AI-Based Media and Evaluation Development*
 - Workshop on developing AI-based teaching materials and assessments.
 - Mentoring on AI implementation to enhance learning effectiveness.
4. *Simulation and Classroom Implementation*
 - Teachers conduct teaching simulations using AI.
 - Analysis and feedback for improvement.
5. *Evaluation and Follow-Up*
 - Assessing training effectiveness through surveys and discussions.
 - Preparing recommendations for AI implementation in schools.
 - Ongoing monitoring and mentoring.

The participation of partners / Physics teachers in Langsa City in the implementation of this Independent Program Community Service program in 2024, including:

1. Following the mentoring activities seriously.
2. Providing implementation reports in the field after the activity takes place.
3. Establish active communication with fellow participants and educational staff in the Department of Physics Education, FKIP USK, in order to help each other find solutions to implementation constraints in the workplace.

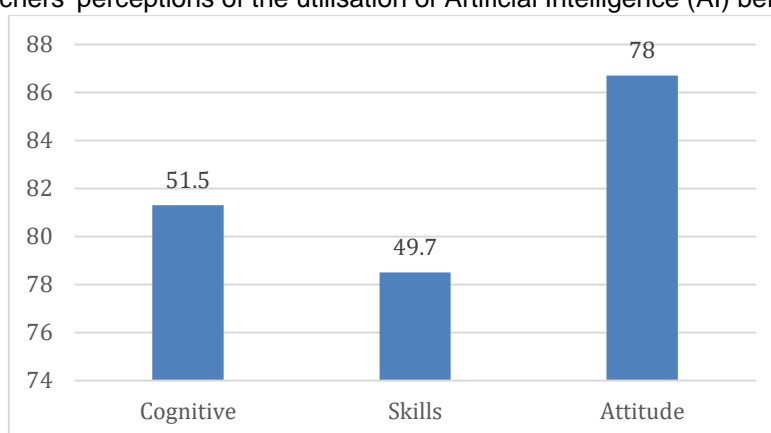
The implementation of this Independent Program Community Service activity is to carry out Training on the Utilization of Artificial Intelligence to Improve the Competence of Physics Teachers in Facilitating Learning in Langsa City. This activity was carried out on 25-26 January 2024 at SMA Muhammadiyah Kota Langsa. Participants in this activity were 20 people who worked as high school and vocational physics teachers in Langsa City. During the

activity, participants were given insights related to the preparation and development of learning tools and AI-assisted evaluation as an effort to improve learning in supporting the independent curriculum. It is expected that after the completion of this training activity, teachers will be able to create or develop AI-assisted learning tools that will be ready to be implemented. In addition, with this training, it is hoped that the repertoire in the field of education will be wider because many teachers will improve their professionalism to improve the quality of learning.

Result

Before the training activities were conducted, participants' perceptions of the utilization of Artificial Intelligence (AI) in the learning process were measured. From the aspects of teachers' knowledge, skills, and attitudes towards the utilization of AI, the results are shown in Figure 1.

Figure 1. Teachers' perceptions of the utilisation of Artificial Intelligence (AI) before the training



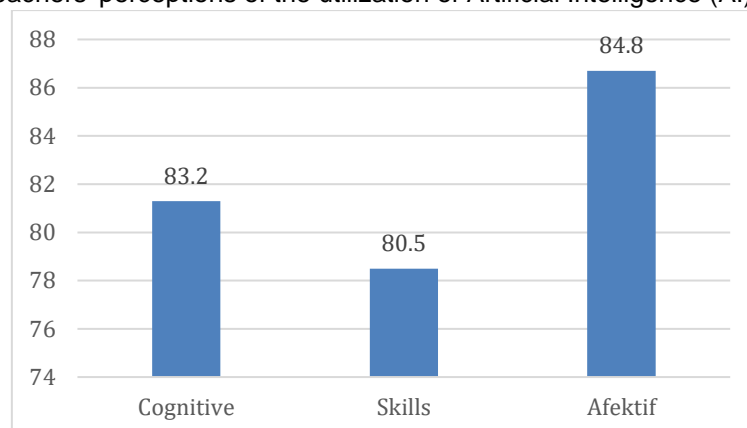
Based on the analysis of the participants' assessment of the utilisation of AI, it was found that:

- The overall knowledge of participants before attending the training with an average score of 51.5 was categorised as poor.
- Participants' skills before attending the training as a whole with an average score of 49.7 were categorised as poor.
- Participants' attitudes before attending the training as a whole with an average value of 78 including the good category.

Based on the above results, it shows that teachers' perceptions of the use of AI in learning are good from the attitude aspect but still relatively poor in the knowledge and skills aspects. From the initial data, the training for physics teachers in Langsa city was continued for 2 days.

In this training activity on the use of AI in the preparation of learning tools and evaluation, a deductive approach was used, namely the service team first explained the material (theory) about the technique of making learning tools and AI-assisted evaluation, then continued with training activities which included hands-on activities carried out by the participants. At the end of the training activities, participants were re-measured for their perceptions of the utilisation of AI in the development of learning and evaluation tools. This was done to compare the results of participants' perceptions before and after attending the training. The results can be seen in Figure 2.

Figure 2. Teachers' perceptions of the utilization of Artificial Intelligence (AI) after training



From Figure 2, the results of the analysis of participants' assessment of the utilization of AI showed that:

- The overall knowledge of the participants after attending the training with an average score of 83.2 was categorized as good.
- The skills of the participants after the training as a whole with an average value of 80.5, are in the good category.
- The attitude of the participants after the training as a whole with an average score of 84.8 including the excellent category.

These results are consistent with previous research, which showed that AI-based training can enhance teachers' understanding and skills in educational technology (Rahman et al., 2023). Another study by Saputra & Wijaya (2023) also found that the integration of AI in teacher training improves the effectiveness of digital teaching and learning. Additionally, AI training helps teachers automate administrative tasks, allowing them to focus more on creative and interactive aspects of teaching (Nurhadi, 2024).

Thus, AI training not only enhances teachers' technical knowledge and skills but also transforms their role into more adaptive facilitators in response to technological developments in education. Overall, this training has successfully improved the competence of physics teachers in utilizing AI for the development of teaching and assessment tools, which is expected to enhance the quality of physics education in Langsa City.

Discussion

The analysis results show that AI training has improved teachers' competence in developing learning tools and assessments. Teachers' knowledge and skills increased to a good category, while their attitude toward AI usage reached a very good category. These findings confirm that the training effectively enhances teachers' understanding and acceptance of AI technology in education.

Previous studies support these results. Rahman et al. (2023) stated that "AI-based training has been proven to improve teachers' technological literacy, particularly in the application of digital learning." Furthermore, Saputra & Wijaya (2023) revealed that "the integration of AI in education helps teachers develop more interactive teaching strategies and personalize student learning." A study by Nurhadi (2024) also showed that "AI training not only enriches teachers' technical skills but also changes their perspective on technology as a tool to enhance teaching effectiveness."

However, several challenges still need to be addressed. A study by Prasetya et al. (2024) found that "limitations in infrastructure and access to AI tools are the main obstacles in implementing this technology in schools." This aligns with research findings by Sari et al. (2023), which highlight that "although teachers have a positive attitude toward AI, its successful implementation heavily depends on institutional support and resource availability."

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In terms of disseminating training outcomes, publications through mass media, YouTube, and the department's website represent a positive step in spreading the benefits of this training. However, not all results have been widely published. As suggested by Wijayanti et al. (2024), “enhancing the visibility of research and training outcomes through academic platforms and scientific publications is crucial to expanding impact and encouraging more teachers to adopt AI in learning.”

Figure 3. Presentation of Material by Resource Persons



Figure 4. Simulation (practice) by Trainees



After the AI training for physics teachers is completed, the community service activities will focus on sustainable implementation and skill development in AI utilization. To ensure the continuity of AI training, several strategic steps are planned:

1. Advanced Workshops – Enhancing teachers' skills in using AI for interactive teaching materials and automated assessments.
2. Mentoring and Monitoring – Assisting teachers in applying AI in the classroom through evaluation and reflective learning.
3. AI Module Development – Creating guides and video tutorials to support teachers' independent learning.
4. Seminars and Publications – Disseminating AI implementation results through webinars and scientific publications.

With these steps, AI is expected to be sustainably integrated into physics education to enhance learning quality.

Conclusion

The conclusion of this training activity is that participants have new insights into the development of good and correct Artificial Intelligence (AI)-assisted learning and evaluation tools. The targets that have been set previously have been achieved well. The competence (knowledge, skills, attitudes) of the participants has increased after attending the training. In

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addition, through the results of the analysis of the participant response questionnaire, it was concluded that the participants gave a good response where the partners felt helped by this training activity.

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Suggestions that can be given by the service team are to hold a follow-up program to see the results of the performance carried out by partners after receiving direction from partners. This will be very helpful for further development. In addition, it is highly recommended that the same activities be continued for other districts and cities in Aceh province.

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