e-ISSN 0216-0847
https://journal.unnes.ac.id/journals/LIK

The Effectiveness of the Blended Learning Model on Artificial Intelligence Knowledge in Digital Competency Training for Non-Formal Education Teachers

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Article info:
Submitted: July 17, 2024. Revised: August 18, 2024. Accepted: August 27, 2024.
Publish: September 17, 2024.

Abstract

The development of technology, especially artificial intelligence (AI), has great potential to improve the quality of education, including non-formal education in Indonesia. AI-based digital competency training for non-formal education tutors is essential to keeping education relevant to the demands of the digital era, and the blended learning model is considered effective for achieving this goal. This study aims to explore the effectiveness of a blended learning model in improving knowledge of artificial intelligence (AI) in digital competency training for non-formal education tutors in Sukabumi District. This study used a quantitative approach with experimental methods and a pre-experiment design in the form of a one-shot case study, involving 23 trainees. The results showed that the blended learning model was effective in improving the AI knowledge of non-formal education tutors, with a Sig (2-tailed) value of 0.000. In addition to improving tutors' digital competencies, blended learning also offers flexibility and personalization in the learning process, which suits the needs and learning styles of adult participants. This research is expected to provide theoretical and practical contributions to the development of non-formal education in Indonesia as well as a reference in designing training programs that are more effective and relevant to the demands of the digital era. Blended learning, which combines online and face-to-face learning, is an effective model for improving AI knowledge and digital skills for non-formal education tutors while preparing them for future technological challenges.

Keywords: blended learning; artificial intelligence, competence

Recommended citation:
Purnomo, P., Hadiapurwa, A., Wahyudin, U., Pratama, Y.L., & Alawiyah, T. (2024). Effectiveness Of A Blended Learning Model on Artificial Intelligence Knowledge in Digital Competency Training for Non-Formal Education Teachers. (2024). *Lembaran Ilmu Kependidikan, 53(*2), 205-212.
https://doi.org/10.15294/lik.v53i2.11999

INTRODUCTION

Every year, the rapid development of technology has brought significant changes to various sectors, including education. Along with the challenges of globalization and digitalization, Indonesia is also undergoing a transformation in non-formal education, which plays an important role in providing access to learning for people not covered by formal education. One of the increasingly developing technologies is artificial intelligence (AI), which has great potential to

change the way we learn and teach. By understanding AI, tutors can develop more effective and innovative learning methods, improve the quality of teaching, and prepare learners to face challenges in this digital era, as well as improve students' understanding of programming concepts and enhance the overall learning experience (Keshtkar et al., 2024). AI offers many benefits for non-formal education tutors, including the ability to personalize education and adjust the learning experience to the individual needs of students, which is very beneficial with various learning styles and speeds (Picão et al., 2023; Shimasaki et al., 2023). Some research results also show that CLC students with an age range of 30 years and above, the form of technology adaptation is delivered through several stages, namely by first explaining the concept of technology and its functions, meaning that there are still many CLC students who do not understand the concept of technology because the majority of CLC students are given training and counselling in the form of theory only and have never attended debriefing on technology, then followed by explaining the negative and positive effects of technology that include concerns about displaying private matters to the public, essential data about certain families to keep secret, and wise use of social media relevant to their needs (Purnomo et al.,2020; Fahimah, N et al., 2023).

Therefore, artificial intelligence-based digital competency training for non-formal education tutors at SKB (Sanggar Kegiatan Belajar) Sukabumi Regency is very important. We need this training to ensure the relevance and high quality of non-formal education, and to equip tutors with adequate digital competence. One method that is considered effective to improve these competencies is by implementing a blended learning model, which harmoniously combines face-to-face learning with online learning so as to increase the effectiveness of learning by improving management and student outcomes (Putranti, 2023).

Blended learning is known to provide greater flexibility in the teaching and learning process, allowing students to adjust their time, place, and pace of learning according to individual needs. In the context of adult learning, this model is also in line with the principles of andragogy, which emphasize that learning must be relevant to students' work experiences and provide flexibility in the learning process (Santoso, et al., 2021; Sinelnikova et al., 2022).

By integrating online and face-to-face components, blended learning allows non-formal education tutors to learn at their own pace and needs while still learning at their own pace and needs while still getting direct guidance from the facilitator. Getting direct guidance from the facilitator Blended learning offers a dynamic educational experience, allowing learners to engage with content at their own pace through online modules while benefiting from face-to-face interaction (Baidya & Baidya, 2023). This allows participants to manage their own learning time, which is very beneficial for those with other commitments, such as work or family. Singh emphasizes that this flexibility is one of the main advantages of blended learning, which makes it very attractive to many adult trainees (Singh, 2021). A study by Kwak (Kwak et al., 2024) involving university students revealed that those who engaged in blended learning showed significant improvements in academic performance compared to traditional learning environments. In the context of digital competency training for non-formal education tutors, the application of the blended learning model can be an effective solution to improve knowledge about AI.

Although many studies have demonstrated the effectiveness of blended learning, most previous studies have focused more on formal education and less on the context of its implementation in adult training. Research on the use of blended learning models in non-formal education, especially in digital competency training for tutors, is still limited (Ibiloye, 2021). As a result, this study aims to investigate the effectiveness of blended learning models in improving AI knowledge in digital competency training for non-formal education tutors, as well as answering the need for further research in this context.

This study aims to measure the effectiveness of the blended learning model in improving knowledge about AI among non-formal education tutors. We expect this study to make significant theoretical and practical contributions to the development of non-formal education in Indonesia. Theoretically, this study will contribute to the existing literature on blended learning implementation in digital competency training, and practically, training organizers can use the study's results as a guide to design programs that are more effective and tailored to participant needs (Yang & Phongsatha, 2024).

e-ISSN 0216-0847
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In addition, this study also has the long-term goal of improving the quality of teaching in the non-formal education sector. We hope that tutors, with their increasing digital knowledge and skills, can provide their students with more meaningful teaching that aligns with the demands of the digital era. This is also expected to increase the competitiveness of non-formal education graduates in the job market, which increasingly prioritizes technological skills and an understanding of AI (Yuan & Du, 2021).

We also expect this study to provide comprehensive recommendations regarding the strategy of implementing blended learning in training activities. Empirical findings will inform these recommendations, demonstrating the optimal use of this model to enhance digital competence, particularly AI knowledge, among tutors in non-formal education. Thus, this study is expected to contribute significantly to improving the quality of non-formal education in Indonesia while facing the challenges of digitalization (Arrafi Bagus Pratama et al., 2024).

METHODS

This study employs a quantitative research approach and an experimental research method. Researchers use the experimental method to investigate the effects of specific treatments on others under controlled conditions (Handayani, D., 2023).. This study implemented the blended learning model in Sukabumi Regency from June 21, 2024, to July 3, 2024. This study employs a pre-experiment design in the form of a one-shot case study, a research approach that solely focuses on a single experimental class, without a comparison group or an initial test (pretest) (Handayani, D., 2023). The research team collected information to enhance the learning methods of the research subjects (Handayani, D., 2023). Figure 1 below displays the research design model.

Figure 1. Pre-Experiment Design Model in the Form of the One-Shot Study

Group	Pretest	Treatment	Postest
Eksperimen	-	X	T

Description:
X: *The treatment involves implementing the blended learning model.*
T: *Final test or evaluation*

By exposing one or more experimental groups and one or more experimental conditions, experimental research methods aim to investigate the possibility of a cause-and-effect relationship. The pre-experimental design method is not yet a true experiment because there are still external variables that influence the formation of the dependent variable. In this study, 23 students participated in AI training to improve their digital competence knowledge.

This study implemented a pre-experimental approach using multiple treatments, followed by a post-test to assess the students' skills. We conducted a one-shot case study design on a single class of students to assess the competencies they had acquired through the application of the blended learning model to artificial intelligence knowledge.

Table 1. Learning Actions

Phase	Activity
Planning	▪ Determine the problem topic. ▪ Prepare learning materials. ▪ Prepare offline and online learning scenarios. ▪ Prepare prospective training participants.

Phase	Activity
Implementation	**Online Activities** **Opening Section** 1. Prayer, starting the lesson **Main section** 2. The instructor delivers training material, and students listen. 3. The instructor gives examples of AI used in learning. 4. Q&A process between the instructor and training participants 5. Instructor assignments during online 6. Presentation of training participants' practical results 7. Independent assignments to train participants to be followed up on for the next offline activity **Final part** 1. Conducting discussions and evaluations between instructors and training participants 2. Training participants re-explain the learning outcomes **Offline Activities** **Opening Section** 1. Prayer, starting the lesson 2. Explanation of learning rules **Main section** 3. Instructor delivers training materials, students listen 4. Instructor gives examples of AI used in learning 5. Practice using AI in learning 6. The Q&A process involves the instructor and the training participants. 7. Presentation of training participants' practice results **Final section** 8. Filling in Posttest Questions 9. Training participants explain the learning outcomes again

RESULTS AND DISCUSSION

The blended learning model presents the research results on artificial intelligence knowledge for non-formal education tutors in the form of tables and narratives. We have tested the instruments used during the study to ensure their validity and reliability.

Validity and Reliability Value

If r count > r table = valid
If r count < r table = not valid
N = 23, then the r table value = 0.413
If the Croanbach alpha value > 0.6, then it is said to be ***reliable***

Tabel 2. Cronbach's Alpha

Reliability Statistics

Cronbach's Alpha	N of Items
.631	15

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Tabel 3. Validasi Instrumen

Item	Person Corelation	Table r value	Validity	Cronbach alpha value	Reliability
item1	0,583	0,413	Valid	0,631	Realible
item2	0,596	0,413	Valid	0,631	Realible
item3	0,659	0,413	Valid	0,631	Realible
item4	0,628	0,413	Valid	0,631	Realible
item5	0,586	0,413	Valid	0,631	Realible
item6	0,635	0,413	Valid	0,631	Realible
item7	0,607	0,413	Valid	0,631	Realible
item8	0,600	0,413	Valid	0,631	Realible
item9	0,631	0,413	Valid	0,631	Realible
item10	0,616	0,413	Valid	0,631	Realible
item11	0,562	0,413	Valid	0,631	Realible
item12	0,623	0,413	Valid	0,631	Realible
item13	0,629	0,413	Valid	0,631	Realible
item14	0,616	0,413	Valid	0,631	Realible
item15	0,629	0,413	Valid	0,631	Realible

Cronbach's Alpha calculation is used to test the reliability of the research questionnaire. The consistency values obtained are then compared using the Cronbach's Alpha consistency value table in the following table:

Table 4. Cronbach's Alpha Internal Consistency Values

No	Alpha Croncbach	*Internal Consistency*
1.	$\alpha \geq 0.9$	*Excellent*
2.	$0.9 > \geq 0.8$	*Good*
3.	$0.8 > \geq 0.7$	*Accepteble*
4.	$0.7 > \geq 0.6$	*Questinable*
5.	$0.6 > \geq 0.5$	*Poor*
6.	$0.5 > \alpha$	*Unacceptable*

The instrument's calculation of the Alpha Cronbach value yielded a value of 0.631. Referring to the Alpha Cronbach internal consistency value table, it is included in the **Questinable** category. Hypothesis testing is carried out by testing the equality of the average with the t-test technique, to determine whether the average learning outcomes in the digital competency training program, after the implementation of the blended learning model. The average learning outcomes using the one sample t-test can be formulated as follows.

Ho: there is no difference in Artificial Intelligence knowledge after the application of the blended learning model in digital competency training.
Ha: there is a difference in Artificial Intelligence knowledge after the application of the blended learning model in digital competency training.
If t count > t table, or sig. t value < 0.05 then Ho is rejected.
If t count < t table, or sig. t value > 0.05 then Ho is accepted.

Table 5. One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
total	22.228	22	.000	56.52174	51.2483	61.7952

Based on table 5, it shows that the Sig value (2 tailed) in the one sample test is 0.000, so the Ho hypothesis is rejected, and Ha is accepted, namely that there is a difference in Artificial Intelligence knowledge after the blended learning model is applied in digital competency training.

Blended learning is an innovative educational approach that combines traditional face-to-face teaching with online learning methods, leveraging technology to enhance the learning experience. It has become increasingly popular in various educational settings, especially in higher education institutions, because it offers flexibility, student motivation, cost-effectiveness, personalized learning experiences, and improved academic performance (Angwaomaodoko, 2023). This learning model assists in the distance learning process, ensuring that learning runs smoothly.

The results of the study indicate that there is an effectiveness of the blended learning model on artificial intelligence knowledge for non-formal education tutors (Sig value (2 tailed) = 0.000). Blended learning, combining online and face-to-face instruction, has shown significant effectiveness in improving student performance across a variety of disciplines. Studies have consistently shown the positive impact of blended learning on academic outcomes, including improved performance in areas such as academic knowledge, creativity, aesthetics, and overall engagement (Yang & Phongsatha, 2024).

The blended learning model offers many advantages over traditional learning methods, such as flexibility, personalized learning experiences, improved academic performance, and cost-effectiveness. In addition, blended learning increases learner motivation, fosters independence in learning, and promotes important 21st-century skills such as problem solving, information literacy, and critical thinking. By offering a dynamic and interactive learning experience, the blended learning model not only improves learner performance but also enhances teacher effectiveness, which ultimately benefits the entire education and training ecosystem (Angwaomaodoko, 2023).

Artificial Intelligence (AI) training for teachers is increasingly important as the educational landscape evolves. The integration of AI technologies into teacher training programs aims to equip educators with the competencies needed to improve teaching and learning processes. This training covers a range of aspects, including technical knowledge, pedagogical strategies, and ethical considerations, which are critical to the effective implementation of AI in education. Key Competencies for AI Training Technical Competencies: Understanding AI principles, algorithms, and software is essential for teachers to effectively utilize AI tools in their classrooms. Pedagogical Competencies: Teachers must adapt their teaching methods and materials to take advantage of AI capabilities, fostering personalized learning experiences. Ethical and Legal Awareness: Educators need to navigate the ethical implications of AI use, ensuring that they guide students in safe and responsible practices. Hands-on Training Approach: Engaging teachers in practical applications of AI tools during training increases their confidence and competence

Collaborative Learning: Promoting teamwork among educators in training can facilitate knowledge sharing and collective problem-solving regarding AI integration. Continuing Professional Development: Ongoing training opportunities are needed to keep educators updated on AI advances and ethical considerations. While the integration of AI in teacher training presents many benefits, it also raises concerns about the potential for technology to overwhelm important human elements of teaching, such as emotional support and the development of critical thinking. Balancing these aspects is critical for the future of education.

e-ISSN 0216-0847
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This study demonstrates the effectiveness of non-formal education tutors using the blended learning model to enhance their knowledge of artificial intelligence (AI) in digital competency training. The combination of online independent learning and face-to-face interaction allows tutors to develop practical and theoretical skills in a balanced manner. In addition, the blended learning model also helps tutors develop broader digital skills, which are crucial in today's digital era. As a result, non-formal education tutors are better prepared to face future technological challenges and can provide richer and more relevant learning experiences for their students.

CONCLUSION

Blended learning model has been proven effective in improving artificial intelligence (AI) knowledge in non-formal education tutors. By combining face-to-face and online learning, this model provides flexibility, personalization, and a dynamic learning experience, which not only improves academic performance but also student engagement and motivation. This study shows that blended learning contributes significantly to tutors' mastery of AI materials, with results showing a high level of effectiveness. In addition, this learning model prepares tutors to face future technological challenges by equipping them with broader digital skills. However, the application of AI in teacher training must consider the balance between the use of technology and the humanistic aspects of teaching, such as emotional support and the development of critical thinking. This is important to ensure that technology-based learning can run effectively without sacrificing the essential elements of education.

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