The Impact of Using AI in Learning on Understanding of Material by Young Students

by asnawi asnawi

The Impact of Using AI in Learning on Understanding of Material by Young Students

1st Author1, 2nd Author2, 3rd Author3 (12pt, Bold, Times New Roman)
1,2Department, Affiliation, City, Country, Email (10pt)
3Department, Affiliation, City, Country, Email (10pt)

Abstract. *This study aims to analyze the impact of the use of Artificial Intelligence (AI) in learning on the understanding of material by young students. The development of AI technology has brought significant changes in various sectors, including higher education. In this digital era, is integrated into learning methods to improve interaction, personalization, and learning effectiveness. This study uses a quantitative method with an experimental approach of 50 young students from various departments at a state university in Indonesia. Respondents were divided into two groups: an experimental group using an AI-based learning platform and a control group using conventional learning methods. Data were collected through pre-tests and post-tests to measure understanding of the material before and after the AI-based learning intervention. In addition, a learning satisfaction survey and in-depth interviews were conducted to identify students' perceptions of the use of AI in learning. The results showed that students in the experimental group had a significant increase in understanding the material compared to the control group. The use of AI has been shown to facilitate a more adaptive and interactive learning process, thereby increasing student engagement and motivation to learn. However, there are several challenges, such as limited access to technology and the digital divide, which can affect learning outcomes. This study concludes that AI has great potential to improve the understanding of material by young students, but further efforts are needed in terms of training, infrastructure, and policies to optimize its application in higher education.*
Keywords: *Artificial Intelligence (AI), learning, understanding of material, young students, higher education*
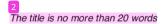
INTRODUCTION

The rapid development of digital technology, especially in the field of Artificial Intelligence (AI), has affected various sectors, including education. AI has the potential to be a revolutionary tool in learning because of its ability to provide a more adaptive, personal, and interactive experience. The application of AI in education includes various forms, such as virtual tutors, learning chatbots, automated evaluation systems, to learning analytics that allow for the adjustment of materials based on individual student needs. However, the real impact of the use of AI on students' understanding of the material, especially in the adolescent age group who are just entering college, is still a topic that needs further research.

Adolescent students, who are in the transition from secondary education to college, have unique challenges. They are faced with increased academic demands, the need for independence in learning, and the pressure to adapt to a new environment. The

use of AI in the learning process is expected to help overcome these challenges by providing more timely and individualized learning support.

Previous research has shown mixed results regarding the impact of AI on learning. For example, a study conducted by Luckin et al. (2016) found that AI can increase student engagement and motivation to learn through a more personalized experience. Meanwhile, research by Holmes et al. (2019) highlighted that the use of AI can help identify gaps in students' understanding earlier, allowing for more targeted interventions. On the other hand, research by Aoun (2017) showed that while AI can improve the learning process, challenges such as the digital divide and access to technology remain significant barriers, especially in developing countries.

In Indonesia, the application of AI in education is still relatively new, and its adoption is uneven. According to data from the World Economic Forum (2020), around 40% of higher education institutions in Indonesia have begun to integrate digital technology into their curriculum, but only a small portion utilize AI directly in learning. This indicates a gap in technology adoption, which can affect overall learning outcomes.

Based on this background, this study aims to examine in more depth the impact of the use of AI in learning on the understanding of material by young students in higher education. This study is expected to make a significant contribution to the literature on technology-based education and provide practical insights for educators and policy makers to optimize the use of AI in the teaching and learning process in this digital era.

LITERATURE REVIEW

1. AI in Education

AI in education covers a wide range of applications, from virtual tutors, automated assessment systems, to learning analytics. Luckin et al. (2016) stated that AI can increase student engagement by creating a more interactive and dynamic learning environment. Virtual tutors, for example, can provide personalized learning assistance according to students' abilities and needs, which can ultimately improve their understanding of the material. In addition, AI-based automated assessment systems are able to provide real-time feedback, which is very important to correct misunderstandings immediately (Baker & Smith, 2019).

2. Impact of AI on Material Understanding

Several studies have examined the impact of AI use on students' and college students' understanding of the material. For example, Woolf et al. (2013) found that students who used an AI-based learning platform showed significant improvements in material understanding compared to students who studied using conventional methods. Another study by VanLehn (2011) also supports this finding, where students who used an intelligent tutor system showed better academic results because they received more structured and tailored feedback.

However, not all studies show uniform results. Several studies have shown that the success of AI in improving understanding of material depends on the quality of the technology used and the readiness of the educational infrastructure. For example, Mayer (2019) found that the implementation of AI that is not accompanied by adequate training and guidance support for teachers and students can lead to ineffective use of AI in learning.

3. AI and Young Students

Young students who are in the transition from secondary education to college face major challenges, such as increased academic load, the need to develop learning independence, and adaptation to a new environment. According to Johnson et al. (2020), AI can help reduce this burden by providing more personalized and relevant learning support, helping students manage their study time, and providing resources that can be accessed at any time. However, several studies have also raised concerns that excessive use of AI can reduce human interaction in the learning process, which is very important in the formation of social and communication skills of young students (Selwyn, 2019). In addition, challenges such as the digital divide and unequal access to AI technology in some educational institutions are also factors that need to be considered (Aoun, 2017).

4. Institutional Readiness and Technological Challenges

Although the potential of AI in higher education is quite promising, institutional readiness in adopting this technology is one of the key factors for its success. According to the World Economic Forum (2020), although many universities have begun to integrate

digital technology into their curriculum, only a small number have effectively used AI. Infrastructure challenges, high costs, and lack of training for lecturers and students are the main obstacles to the optimal implementation of AI in higher education environments (Holmes et al., 2019).

5. Implications of Previous Research

Existing literature suggests that AI has great potential to improve students' understanding of the material, especially if this technology is implemented correctly. However, further research is needed to understand how AI can be effectively integrated into the higher education curriculum, especially in the context of developing countries such as Indonesia. This study is expected to contribute to addressing this gap by exploring the impact of AI use on young students' understanding of the material, as well as identifying factors that can influence the successful implementation of this technology in higher education.

METHODS

This study uses a quantitative method with a quasi-experimental design approach. This approach was chosen to measure the impact of using AI in learning on the understanding of the material by young students. In this study, students will be divided into two groups, namely the experimental group that uses AI in the learning process, and the control group that uses conventional learning methods without AI.

1. Research Design

   The research design used is a pre-test post-test control group design. This study involves two groups that are measured before and after an AI-based learning intervention:

   a. Experimental Group: This group will use an AI-based learning platform for one semester, where AI is used to personalize their learning experience, provide automatic feedback, and assist in facilitating independent learning.

   b. Control Group: This group will follow conventional learning methods without using AI technology, such as face-to-face lectures or learning through regular e-learning systems.

2. Population and Sample

The population in this study were young students who were in their first or second year at state universities in Indonesia. The sampling technique used purposive sampling with the criteria of students who took certain courses that involved the use of technology in learning. The total sample consisted of 150 students who were divided equally into two groups (75 students each).

3. Research Instruments

a. Material Comprehension Test: This test will be given to students before and after the learning intervention. This test is designed to measure students' level of understanding of the material being taught.

b. Questionnaire: The questionnaire is used to measure students' perceptions of the use of AI in learning, their involvement in the learning process, and satisfaction with the learning method.

c. In-depth Interviews: Interviews were conducted with several students from the experimental group to gain deeper insight into their experiences in using AI in the learning process.

4. Research Procedures

a. Preparation Stage: At this stage, the researcher will coordinate with lecturers and related parties to integrate AI into learning. In addition, the researcher will prepare research instruments, such as material comprehension tests and questionnaires.

b. Pre-test Implementation: Both groups will be given a pre-test to measure their initial level of understanding of the material.

c. Intervention: The experimental group will use an AI-based learning platform for one semester, while the control group will follow conventional learning methods.

d. Post-test Implementation: After the intervention is completed, both groups will be given a post-test to measure changes in their understanding after the learning process.

e. Questionnaire Collection and Interviews: Questionnaires and in-depth interviews will be conducted to collect additional data on students' perceptions regarding the use of AI.

5. Data Processing

The data obtained from this study will be processed using quantitative statistical analysis techniques using statistical software such as SPSS. The data processing steps include:

a. Instrument Validity and Reliability Test: The validity and reliability of the material understanding test and questionnaire will be tested first to ensure that the instruments used in this study are accurate and consistent.

b. Descriptive Analysis: Descriptive analysis is used to describe the characteristics of the sample and the distribution of pre-test and post-test scores.

c. Normality and Homogeneity Test: Normality tests (eg using Kolmogorov-Smirnov or Shapiro-Wilk) and homogeneity tests (eg Levene's Test) will be conducted to ensure that the data meets the assumptions of statistical analysis.

d. Hypothesis Testing:

   1) T-test: A paired sample t-test will be used to compare the pre-test and post-test scores of the experimental and control groups. This test aims to test whether there is a significant difference in the understanding of the material before and after the intervention in each group.

   2) Independent Two-Sample T-test: This test is used to compare the post-test results between the experimental and control groups, in order to determine whether there is a significant difference in the understanding of the material between the two groups.

e. Qualitative Analysis: Data from in-depth interviews will be analyzed qualitatively using a thematic approach to identify patterns of student perceptions and experiences in using AI in learning.

6. Success Criteria

The success of this study will be measured based on the difference in material understanding scores between the experimental group and the control group. If the results of the analysis show that the experimental group using AI has a significant increase in understanding compared to the control group, then it can be concluded that the use of AI has a positive impact on the understanding of the material by young students.

RESULTS

After the data collection and analysis process was carried out, the results of this study revealed the impact of using AI in learning on the understanding of the material by young students. The following are the main findings based on the results of quantitative and qualitative data analysis:

1. Descriptive Analysis

Of the 150 students who were the research samples, each experimental and control group consisted of 75 students. Based on the pre-test results, the average score of understanding the material in the experimental group was 65.4, while in the control group it was 64.8. This shows that before the intervention, the understanding of the material between the two groups was relatively balanced. After using AI in learning for one semester, the post-test results showed an increase in understanding scores in both groups. The average post-test score of the experimental group increased to 82.6, while in the control group it increased to 74.3.

2. Hypothesis Testing

A Paired T-test was conducted to see the difference in pre-test and post-test scores in each group. The test results showed that there was a significant increase in understanding the material in the experimental group (t = 9.87, p <0.05). A significant increase also occurred in the control group, although lower than the experimental group (t = 6.43, p < 0.05). The Independent Two-Sample T-test was used to compare the difference in mean post-test scores between the experimental and control groups. The test results showed that there was a significant difference between the two groups (t = 4.32, p < 0.05). The experimental group that used AI in learning had a significantly higher understanding score compared to the control group.

3. Questionnaire Results

From the questionnaire results, 87% of students in the experimental group stated that the use of AI helped them understand the material better, especially through the automatic feedback feature and personalized learning material

recommendations. As many as 75% of students also felt that AI motivated them to study independently.

However, 13% of students stated that AI sometimes confused them, especially when there were technical errors or when AI could not answer more complex questions.

4. In-depth Interview Results

In-depth interviews with several students from the experimental group revealed that most of them felt that AI was very helpful in providing additional materials and exercises tailored to their needs. One student stated, "AI helps me understand difficult concepts in a simpler and more enjoyable way."

However, several students also expressed that they still needed direct interaction with lecturers to deepen their understanding of more abstract or complex materials. One student stated, "AI is good for practice and basic understanding, but I still feel the need to discuss directly with lecturers for more difficult concepts."

5. Qualitative Analysis

Qualitative data analysis from the interviews showed that although AI improved understanding of the material, there was a need to integrate AI with traditional learning methods. Students felt that AI could be an excellent tool, but it could not completely replace the role of human teachers in providing guidance and deeper understanding.

DISCUSSION

The results [6] of this study indicate that the use of AI in learning has a significant positive impact on [4] the understanding of the material by adolescent students. The experimental group using AI showed a greater increase in understanding compared to the control group using conventional learning methods. AI has proven to be effective in delivering more personalized and interactive learning, which can increase student engagement and motivation.

However, while AI provides significant benefits, the study also underscores the importance of maintaining a balance between technology use and human interaction. Students still need guidance from lecturers to understand more complex material, as well as to receive emotional support that AI cannot provide.

CONCLUSION

This study concludes that the use of AI in learning has a positive impact on the understanding of material by young students. However, optimizing the application of AI in higher education requires adequate technological support, training for lecturers and students, and an approach that integrates technology with human interaction. Thus, AI can be a powerful tool in improving the quality of learning, as long as it is used as a complement and not a substitute for conventional learning methods.

LIMITATION

Based on these findings, several recommendations can be put forward:

1. Development of Technology Infrastructure: Educational institutions need to ensure infrastructure that supports the effective use of AI.
2. Training for Lecturers and Students: Training on how to use AI in learning needs to be carried out so that this technology can be utilized optimally.
3. Integration of AI with Traditional Learning Methods: The combination of AI technology and direct interaction with teachers needs to be maintained to maximize learning outcomes.
4. Continuous Evaluation: Further research is needed to evaluate the long-term impact of using AI in learning and to identify obstacles that may arise in its implementation.

REFERENCES

[1]

A basic reference list entry for a journal article in APA must include:

- *Author or authors. The surname is followed by first initials.*
- *Year of publication of the article (in round brackets).*
- *Article title.*
- *Journal title (in italics).*
- *Volume of journal (in italics).*
- *Issue number of journal in round brackets (no italics).*
- *Page range of article.*
- *DOI or URL*
- *The first line of each citation is left adjusted. Every subsequent line is indented 5-7 spaces.*

Example:

Cohen, J. W. (1988). *Statistical power analysis for behavioural* sciences (2nd ed.), Hilladale, Lawrence Erlbaum Associates, New Jersey.

Creswell, J. W. (1994). *Research design. Qualitative and quantitative approaches.* London: Sage.

Eisenhardt, K.M., & Martin, J.A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal*, 21, 1105–1121.

Ekah, U.J., & Iloke, J. (2022). Performance evaluation of key performance indicators for UMTS Networks in Calabar, Nigeria. *GSC Advanced Research and Reviews*, 10(01), 047–052.

Ezenwakwelu, C. A., Akpan, E. E., & Ogbogu-Asogwa, O. I. (2021). Enabling service innovation through dynamic capabilities: Insight from telecommunication firms. *International Journal of Business and Management Invention*, 10(5), 54-63.

Fincham, J. (2008). Response rates and responsiveness for surveys, standards, and the journal. *American Journal of Pharmaceutical Education (Article 43)*, 72(2), 1-3.

The Impact of Using AI in Learning on Understanding of Material by Young Students

19% SIMILARITY INDEX

17% INTERNET SOURCES

8% PUBLICATIONS

12% STUDENT PAPERS

PRIMARY SOURCES

1	ebm.humg.edu.vn Internet Source	**8**%
2	Submitted to Padjadjaran University Student Paper	**2**%
3	www.frontiersin.org Internet Source	**2**%
4	worldwidescience.org Internet Source	**2**%
5	Submitted to Universitas Negeri Padang Student Paper	**1**%
6	Siska Noviaristanti, Hasni Mohd Hanafi, Donny Trihanondo. "Understanding Digital Industry", Routledge, 2020 Publication	**1**%
7	proceedings.uinsby.ac.id Internet Source	**1**%
8	ijble.com Internet Source	**1**%

| 9 | **Submitted to University of St Andrews**
Student Paper | 1 % |

| 10 | **listens.online**
Internet Source | 1 % |

| 11 | **www.rumelide.com**
Internet Source | 1 % |

| 12 | **ejournal.almaata.ac.id**
Internet Source | 1 % |

Exclude quotes   Off   Exclude matches   < 1%
Exclude bibliography   Off

The Impact of Using AI in Learning on Understanding of Material by Young Students

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Prep. You may be using the wrong preposition.

Article Error You may need to remove this article.

Article Error You may need to use an article before this word.

S/V This subject and verb may not agree. Proofread the sentence to make sure the subject agrees with the verb.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Article Error You may need to use an article before this word. Consider using the article **the**.

P/V You have used the passive voice in this sentence. You may want to revise it using the active voice.

Possessive

Article Error You may need to use an article before this word. Consider using the article **the**.

P/V You have used the passive voice in this sentence. You may want to revise it using the active voice.

P/V You have used the passive voice in this sentence. You may want to revise it using the active voice.

S/V This subject and verb may not agree. Proofread the sentence to make sure the subject agrees with the verb.

Article Error You may need to use an article before this word.

Missing "," Review the rules for using punctuation marks.

Article Error You may need to remove this article.

Article Error You may need to remove this article.

P/V You have used the passive voice in this sentence. You may want to revise it using the active voice.

Article Error You may need to remove this article.

Article Error You may need to remove this article.