



Effectiveness of The Use Artificial Intelligence on Biology Student Learning UIN Syahada Padangsidimpuan

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Abstract

Artificial Intelligence or AI is one of the technological achievements that is changing the landscape in various sectors of human life. Along with the development of technology, AI is taking an important role in various aspects of life, including higher education. In this digital era, AI has become an important partner and tool for students in solving their assignments. This study aims to see the effectiveness of using Artificial Intelligence (AI) in learning biology. The research method used is a quantitative descriptive method using a questionnaire, Likert Scale, which was made in google form and then sent to Whatsapp Group and students' private chat. By using random method 52 biology students from semester III, V and VII have participated in this study. The percentage of the results of this study shows that 13.46% of students very often, 67.31% often, 19.23% Sometimes 0% of students never use AI in their learning process, for students AI has become something commonplace in helping them do lecture assignments, find relevant material and information, work on practicum activity reports and field lectures and for the final level AI really helps them in doing their final lecture assignments such as proposals and theses.

Keywords: *Effective, Artificial Intelligence, Learning, Biology*

INTRODUCTION

Education is one of the main pillars in developing quality human resources. In the current era of globalization and digitalization, technology has become an integral component in various aspects of life, including education. Higher education as an institution responsible for producing generations of intellectuals is required to continue to adapt and utilize technological developments to improve the quality of learning. The development of information and communication technology (ICT) is what brings major changes in the world of education today. One of the innovations that has become a major highlight is artificial intelligence (AI). AI technology offers various solutions to improve the quality of learning,

such as learning personalization, learning data analysis, and technology-based simulation (Mayasari,2023).

Artificial Intelligence (AI) has become an integral part of our lives, especially in education. The integration of AI in the education sector has brought significant transformation. Starting from personalizing learning to suit individual learning styles, AI is able to analyze student data to create a more effective learning experience. In addition, the presence of AI-based virtual tutors provides wider access to quality education, especially for remote areas. Not only that, AI also plays a role in automating administrative tasks, such as grading assignments, so that teachers can focus more on direct interaction with students. Thus, AI is not only a tool, but also a collaborative partner in advancing the quality of education (Fitri, 2023). Online learning platforms such as Khan Academy and Coursera, which leverage AI algorithms, have revolutionized the way we learn. AI-based virtual tutors, such as Socratic, are able to provide in-depth explanations of various learning concepts in real-time. In addition, AI is also used to analyze big data on learner performance, allowing education to identify areas for strengthening and provide more personalized support. Nonetheless, the implementation of AI in education still faces challenges such as the digital divide and concerns over student data privacy. Therefore, it is important that educators continue to develop their digital competencies and work closely with technology developers to ensure that AI is used effectively and ethically to support learning. Unfortunately, the application of this technology has not been fully equitable in all educational institutions, especially in universities which are still in the early stages of utilizing modern technology (Dewi,2023).

Universitas Islam Negeri Syekh Ali Hasan Ahmad Addary is one of the universities that has an important role in producing competent generations of Muslim intellectuals, including in the field of biology. As an Islamic-based institution, this university faces the challenge of integrating cutting-edge technology such as AI into learning without neglecting Islamic values. However, based on initial observations, most students and lecturers at this university have not been wise to the utilization of AI in the learning process, especially for biology courses that require in-depth understanding of scientific concepts.

The main obstacles faced include a lack of understanding of the potential of AI, lack of supporting facilities, and limited training for lecturers and students. As a result, the learning methods used tend to be conventional and less effective in improving student understanding of abstract and complex material. For example, concepts about ecosystems,

genetics, or cell mechanisms are often difficult to understand through lecture-based learning (Rifky, 2024).

On the other hand, the implementation of AI can be a potential solution to overcome this obstacle. AI technologies, such as virtual laboratory simulations, adaptive learning systems, or AI-based chatbots, can help create a more interactive and customized learning experience (Kuncara, 2024). This is in line with efforts to improve the quality of education at Sheikh Ali Hasan Ahmad Addary Islamic University so that it can compete globally without forgetting the local context and Islamic values.

Therefore, it is necessary to conduct research on the effectiveness of using AI in learning biology at this university. This study aims to evaluate the extent to which the effectiveness of AI technology can improve student understanding, especially in learning biology, identify barriers to implementation, and offer relevant solutions as consideration for the university to develop appropriate and sustainable strategies for integrating AI technology.

RESEARCH METHODS

The method in this research is descriptive quantitative, which describes or describes a phenomenon or certain variables systematically, factually, and accurately and provides a clear and objective picture of a situation or condition (Sugiyono, 2017). The data collected in this study are generally in the form of numbers (quantitative) which are then analyzed statistically to understand how much influence or relationship between the use of Artificial Intelligence (AI) technology on the effectiveness of biology learning. This is an interesting and relevant research question, given the increasing role of technology in education. This study uses data collection techniques through questionnaires given to students to measure the frequency of AI use and their perceptions of learning effectiveness. The type of sampling used is simple random sampling. The sample used was 52 Biology students from semester III, V and VII. The data instrument uses a questionnaire distributed using the “whatsapp” application with the help of Google Form to students who have generally taken biology learning with the help of AI.

RESULTS AND DISCUSSION

The use of AI among students to help with coursework is an interesting phenomenon that has two sides: great opportunities, but also serious challenges. It is positive if AI is used wisely as it can: 1) Increase efficiency and productivity, AI helps students complete assignments faster. For example, apps like Grammarly for writing, or AIs like ChatGPT for

brainstorming ideas, really save time. This leaves students more time to explore concepts or work on other assignments. 2) Expanding Knowledge Access AI provides quick access to information and learning resources, which supports independent learning. Students can use AI to understand difficult material or learn new skills, such as programming or design. 3) Encouraging Creativity AI-based tools, such as Canva or DALL-E, help students produce creative work for tasks such as design or presentations, which may be difficult without technical experience. 4) Equal Access AI gives students with different backgrounds the opportunity to get support, such as students who have difficulty writing or have language barriers.

The use of AI among students at UIN Syahada Padangsidempuan is still relatively new and not very popular. This is due to several factors, such as a lack of understanding of the benefits and potential of AI, as well as limited access to technology that supports its use. In addition, there is still skepticism among some students regarding the reliability and ethics of using AI to support academic activities. Students use AI as a personal tutor to learn topics that are difficult to understand in class. For example, AI can explain concepts in a simpler way or provide additional examples. AI is also used to summarize journals, or to quickly understand a specific topic, summarizing long readings or scientific articles into more easily understood key points.

1. AI Frequency of Use

We can see this in the distribution of respondents' answers to the question of how often they use AI to help with assignments. Respondents were given four answer options:

- Very often: Selected by 16 people (30.8%).
- Frequently: Selected by 28 people (53.8%).
- Sometimes: Selected by 7 people (13.5%).
- Never: selected by 1 person (1.9%).

1. Seberapa sering anda menggunakan teknologi berbasis AI dalam pembelajaran biologi?

52 jawaban

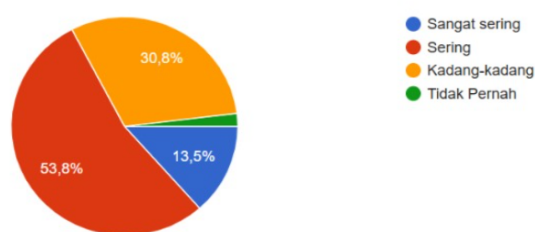


Figure 1. AI Frequency of Use Diagram

The results of a questionnaire survey of 53.8% of all respondents chose to use AI frequently, usually they use AI to find reference material, find material for assignments, make reports, make presentations, especially for VII semester students, AI is used to find references, material in working on proposals so that in general they state that AI is very helpful in solving their “problems” as students. AI can provide instant feedback on completed tasks, so students can quickly correct mistakes and improve their understanding. AI can quickly locate and present information from various sources relevant to the topic being studied. This saves students time on research and allows them to focus on analyzing and understanding the material, customizing learning materials according to each individual's learning style and pace. This makes the learning process more effective and engaging.

2. Implementation of AI commonly used in the learning process

2. Aplikasi berbasis AI apa saja yang Anda gunakan untuk mempelajari biologi?

52 jawaban

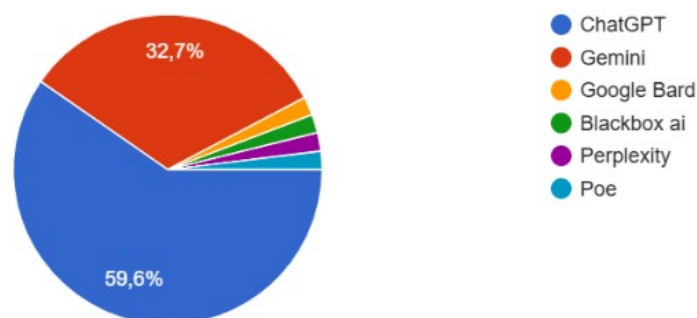


Figure 2. Diagram of the AI Application Used

Before making the questionnaire in this study, students were first asked to mention at least six (6) examples where artificial intelligence (AI) is often used in the teaching field, then these examples were included in the questionnaire answer options which were then distributed via Google Form. This pie chart shows users' preferences in using AI-based apps for learning biology. Each slice on the diagram represents the percentage of users who chose a particular app. ChatGPT (32.7%): ChatGPT app is the most popular one used by respondents to learn biology. This shows that ChatGPT is considered an effective and accessible tool to get information and explanations on biological concepts. Gemini (50.6%): Gemini occupies the second position with a significant percentage of usage. This indicates that Gemini is also a popular choice for many users in learning biology. Other apps (16.7%):

The “other” category includes apps like Google Bard, Blackbox.ai, Perplexity, and Poe. Although the percentage is smaller, it shows that there are a variety of AI apps used by users for biology learning purposes.

Based on the available data, it can be concluded that ChatGPT and Gemini are the two AI-based applications most widely used by biology students to learn biology. The popularity of these two apps is most likely due to their ability to provide relevant, comprehensive, and easy-to-understand answers to biology questions. These apps are also designed with a very user-friendly interface, so anyone can easily interact and utilize the features offered, both of which are capable of understanding and generating text that resembles human language very well.

3. Purpose of using AI in Biology learning



Figure 3. Purpose of using AI Diagram

Artificial intelligence (AI) in its utilization in the field of education refers to a system specifically designed to provide assistance and expedite the education and learning process. Artificial intelligence is used in the field of education to facilitate the customization of individual learning experiences for students. From a total of 52 respondents, the following data was obtained: Helping to complete tasks/problems: This was the most common use of AI with the percentage reaching 44.2%. This shows that many students utilize AI to help them with biology assignments or problems.

- Searching for reference materials: A fairly high percentage also shows that AI is used effectively to search for information or references related to biology subject matter.
- Creating reports or presentations: The use of AI also extends to the report or presentation making stage. AI can assist in collecting data, organizing information, and even generating text or data visualizations.
- Analyzing data: Some respondents also use AI to analyze data, which may be related to experiments or research in biology.

- Helping to explain audience questions: This use is more specific, indicating that there are students who use AI to assist them in providing better explanations during presentations or discussions.

Based on this diagram, it can be concluded that AI has become a very useful tool in biology learning activities. Students utilize AI for a variety of purposes, ranging from finding information to assisting in the completion of more complex tasks. The most common use of AI is to help complete assignments and find reference material.

4. Level of Confidence in AI



Figure 4. Diagram of Student Trust Level in AI

From the diagram above, we can see that about one-third of the respondents (32.7%) expressed great confidence in the information provided by AI in the field of biology, most of the respondents or more than half (55.8%) expressed confidence in the information provided by AI, Only a small percentage of respondents (5.8%) felt doubtful about the accuracy of AI information, but the smallest percentage of respondents (3.8%) expressed no confidence at all in AI information, they stated that sometimes the information was not appropriate (3.8%). Some respondents provided additional comments that even though they trust AI, they still double-check with other sources to ensure the accuracy of the information provided by AI. The majority of respondents had a fairly high level of trust in the information provided by AI in biology. However, there are still a small number of respondents who are skeptical or even not fully trusting. This shows that although AI technology is growing, users still need to be critical and verify the information obtained, especially in scientific fields such as biology.

Although AI has many capabilities, there are several factors that need to be considered so that the results obtained can be optimally trusted, namely: the accuracy and limitations of AI, AI can provide very precise answers in many situations, especially when the data used for training is extensive and accurate. However, AI also has limitations when it comes to understanding deeper context or nuances in conversations, especially if the data it is trained on lacks such variations, AI often generates answers based on pre-existing patterns. If you need a very creative or innovative solution, AI may not always give you the best answer.

5. AI and its Effect on Interest in Learning Biology



Figure 5. Diagram of AI Use in increasing Interest in Learning Biology

The bar chart above shows the survey results regarding the effect of using AI on interest in studying biology. Of the 52 respondents, the majority of 82.7% or around 43 people stated that the use of AI increased their interest in studying biology. Only about 17.3% or 9 people stated that the use of AI did not increase their interest.

Based on the available data, it can be concluded that the use of AI has a significant positive impact on the interest in learning biology in most respondents. This shows the great potential of AI in facilitating biology learning and making it more interesting for students.

6. AI and its Effect on Interest in Learning Biology



Figure 6. Diagram of Expectations in AI Usage

The ease and rapid access to information that they get when using AI is a breath of fresh air in fulfilling their duties and responsibilities as students. The 52 respondents in the diagram above show that 71.2% (37 people) agreed that the use of AI can increase the effectiveness of biology learning. This shows that the majority of respondents have a positive view of the potential of AI in the field of education, especially biology, so there is great hope that AI students can potentially increase the effectiveness of biology learning. With its ability for personalization, visualization, and data analysis, AI can help students learn more effectively and efficiently. Then 30.8% (16 people) disagreed, this proportion shows that there are still some respondents who doubt or have different views on the benefits of AI in the context of biology learning. Some of those who showed this hesitation reasoned that they were afraid to be too dependent on technology which had a negative impact on reducing students' critical thinking and problem solving skills.

The pros and cons of the trend of using AI in the academic world is certainly a challenge for lecturers or educators today and to address this, the concrete steps that must be taken are no longer blocking or limiting the use of AI technology, but rather accompanying and helping to direct its use because in essence the trust in the results provided by AI is highly dependent on the context of use and the extent to which the AI can be tested or verified. In general, although AI has many capabilities, there are several factors that need to be considered so that the results obtained can be optimally trusted.

The results of the data analysis above are in line with research conducted by Patty, (2023), who found that the use of artificial intelligence (AI) is a promising solution, allowing teachers to overcome technical obstacles and improve the quality of their

writing. Intensive training was conducted, focusing on writing techniques, grammar, and the use of AI. Patty added that in the context of scientific writing, AI brings significant benefits to the process of research, data analysis, and writing scientific articles in a more efficient and accurate way. AI can identify research trends, analyze data in-depth, and assist in making conclusions based on the available data. In addition, AI can also help in checking grammar, spelling, and writing formats that conform to scientific standards. With the help of AI, teachers can improve the quality and effectiveness of their scientific work, and minimize errors that may occur. This can help teachers produce high-quality research that contributes to the development of science and education.

Salsabilla, K. A. Z (2023) who said that in recent years, higher education has widely utilized the functions of this Artificial Intelligence technology. Students who use this artificial intelligence technology to support their lecture activities, such as in doing assignments, finding information, finding materials, and so on. From the results of his research it was also found that the use of artificial intelligence technology affects students. The influence is in the form of students being easier to access material for lectures, making it easier for students to learn foreign languages, students are more free to ask questions without being limited by time, and students' needs for the role of a teacher can be fulfilled.

7. Impact of AI Use

18. Apakah AI dapat menggantikan peran dosen dalam menjelaskan materi biologi?

52 jawaban

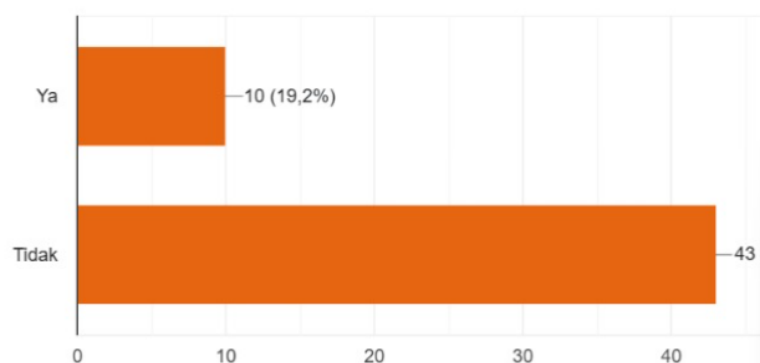


Figure 7. Diagram of AI can't replace the role of the lecturer

Some of them think that human interaction, such as providing more in-depth explanations, answering specific questions, and providing personalized feedback, is still very important in the learning process, the percentage of respondents who answered “Yes”

indicates that there is potential for the use of AI in learning biology, for example as an auxiliary or complementary tool in delivering material.

This is in line with the opinion that the utilization of artificial intelligence in the field of education has undeniably made a great impact on the livelihood of individuals. The utilization of artificial intelligence in the field of education undeniably exerts a profound influence on the livelihood of individuals. (Zahara et al, 2023)

The application of artificial intelligence in the field of education has been associated with several beneficial outcomes, including: (Rosid, 2022)

a. Streamlining the responsibilities of educators and learners in facilitating instructional and educational efforts.

b. Provision of unlimited data storage capacity. One way to enhance the role of educators is to minimize the repetition of their tasks.

c. Utilization of these resources is not limited by time constraints and can be used at any given moment.

d. Efficiency and quality of work are improved.

The application of artificial intelligence in the field of education has been associated with various adverse impacts. Such negative implications include: (Sulistiyowati, 2021); a. It has the potential to contribute to increased laziness among instructors and students; b. It has the capacity to relieve educators of certain responsibilities, particularly in the area of administrative tasks; c. Artificial Intelligence (AI) Users expressed a lack of understanding of the purpose and information that AI produces. It is stated that AI operates based on the instructions it is programmed with; d. Artificial Intelligence (AI) poses significant vulnerabilities in terms of security breaches; e. It is inevitable that it will eventually be disrupted.

8. Challenges and Hopes for the Future Use of AI

As an AI language model, I don't have personal concerns. However, based on the data I've learned, here are some of the main concerns often expressed by experts and the public about the use of AI in education in the future:

Over-reliance: The biggest concern is that students will become too dependent on AI to complete tasks, thus reducing their ability to think critically, creatively, and solve problems independently. **Loss of Human Touch:** Human interaction is crucial in the learning process. Excessive use of AI can reduce students' opportunities to interact with teachers and peers, hindering their social and emotional development. **Widening the Digital Divide:** Not all

students have equal access to technology. The use of AI in education has the potential to widen the gap between students who have access to technology and those who do not. Data Privacy: The collection of large amounts of student data to train AI models raises concerns about data privacy. This data can be misused or leaked, endangering student safety. Algorithmic Bias: AI algorithms used in education may contain biases, both intentional and unintentional. These biases can affect the assessments and recommendations made by AI, thus disadvantaging certain students. Replacement of Teachers: There is a concern that AI will replace teachers. Although AI can help teachers with many tasks, the role of teachers as facilitators, motivators, and mentors is very important and difficult to replace with machines.

In addition, there are other concerns such as: Standardization of Learning: Excessive use of AI can lead to overly rigid standardization of learning, limiting creativity and innovation in education. Cost: Implementing AI in education requires significant costs, both for hardware, software, and teacher training. This can be a burden on schools and governments. To address these concerns, a joint effort is needed from various parties, such as:

Developing a Comprehensive Curriculum: The curriculum must be designed in such a way that the use of AI can integrate active learning, collaboration, and critical thinking skills. Teacher Training: Teachers need to be adequately trained to be able to use AI effectively and responsibly. Equal Access: Governments need to ensure that all students have equal access to the technology and infrastructure needed to support AI-based learning. Clear Regulations: Clear regulations need to be established regarding the use of AI in education, including the protection of students' personal data. Ongoing Research: Continued research is needed to develop better AI models and address existing challenges. It is important to remember that AI is a tool, not an end in itself. The use of AI in education should always be oriented towards improving the quality of learning and student well-being.

CONCLUSION

AI shows great potential because it is stated to be supportive and effective in learning biology, biology students at UIN Syahada can improve their understanding of biological concepts, get more and relevant information, speed up the process of working on assignments, and prepare themselves to face challenges in an increasingly technology-based workforce. However, to ensure the accuracy of AI results, students should also be accustomed to verifying with more credible and reliable sources or references. For example, if AI provides information or answers, be sure to verify with books, journals, or other verified sources. Do

not rely on it completely as AI is a tool, not a substitute for human thinking. Users should still think critically and consider various points of view.

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