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ANALYSIS OF THE EFFECT OF USING ARTIFICIAL INTELLIGENCE (AI) AS A LEARNING RESOURCE FOR STUDENTS IN THE DIGITAL AGE

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ABSTRACT

Technological developments in today's digital era are advancing rapidly and have created significant impacts across various fields, including education—particularly in the way students access learning resources. Although AI offers convenience and efficiency, it also introduces challenges such as reduced creativity, diminished critical thinking, and increased dependence on technology. As one of the key innovations of the Industrial Revolution 4.0, AI has been widely adopted across multiple sectors, including education. This study focuses on three major AI tools: ChatGPT, Copilot, and Gemini. The purpose of this research is to identify which types of AI are most widely used and perceived as the easiest to understand as learning resources for students in the digital era, as well as to examine the influence of AI on students' material comprehension, learning effectiveness, and academic achievement. This study employed a quantitative research method. Data were collected through an online questionnaire distributed to 400 students in West Sumatra. The data were analyzed using Simple Linear Regression and ANOVA to compare and measure the influence of each variable. The findings indicate that AI usage has a significant effect on all three variables. The study concludes that ChatGPT is the most widely used AI tool among students. ChatGPT and Gemini are also considered the easiest AI tools to understand as learning resources. Furthermore, AI usage significantly affects students' material comprehension, learning effectiveness, and academic performance.

Keywords: Artificial Intelligence, ANOVA, Simple Linear Regression, Digital Era, Academic Achievement.

INTRODUCTION

The world of technology is rapidly advancing in line with the changing times, particularly in the digital era. These developments are leading society toward a fully digitalized age. The digital era continues to evolve and has enabled progress across various fields, including communication, e-commerce, agriculture, financial technology, and education. Technology refers to the application of behavioral sciences and other bodies of knowledge in a systematic and structured manner to solve human problems (Sitorus & Murti, 2024). Such technological growth has had a substantial impact on education, especially within higher education institutions (Abimanto & Mahendro, 2023).

Historically, learning resources have undergone continuous transformation. In the traditional era, students relied primarily on lecturers and textbooks. In the modern era, printed media, libraries, and audio-visual tools became important learning supports. With the emergence of the digital era, the internet became the dominant learning resource through the availability of e-books, electronic journals, and online learning platforms. Today, in the era of the Industrial Revolution 4.0 and Society 5.0, students not only access information via the internet but also make use of Artificial Intelligence (AI)-based technologies such as educational chatbots, virtual assistants, adaptive learning systems, and AI-driven research tools.

Artificial Intelligence (AI) refers to intelligence embedded in computer systems that enables them to mimic human thought and behavior (Pokhrel, 2024). AI systems are capable of performing tasks that typically require human intelligence, involving processes such as learning, reasoning, and self-correction. These processes resemble human analytical thinking prior to decision-making. AI has become widely adopted in the Industry 4.0 era. According to Lubis (2021), AI enables interconnectivity among devices, allowing automation without requiring human presence on-site. Utari et al. (2024) further explain that AI, as part of ICT development, is applied not only in telecommunications but also across service, manufacturing, and governmental sectors.

AI technologies have become familiar and commonly used among university students, bringing both positive and negative impacts. Rifky (2024) notes that AI offers positive benefits such

as simplifying task completion and serving as a learning resource that enhances access to instructional materials. However, Syuhada et al. (2024) highlight several negative effects, including reduced critical thinking, declining reading interest, unclear references provided by AI, limited information accuracy, and decreased creativity. Al-Khatib et al. (2024) identify reduced trust, lower psychological security, and the potential for misinterpretation as additional risks. Sunflower (2024) also outlines broader societal risks, such as unemployment due to automation, data privacy concerns, social inequality and recruitment bias, the development of autonomous lethal weapons, and financial instability linked to AI-driven trading. Importantly, AI technology is not only utilized at the global level but also offers opportunities for adoption at regional and local levels.

In this study, preliminary data were obtained from 30 respondents through a questionnaire aimed at identifying which AI platforms would be examined further. Six AI platforms were included in the selection process: ChatGPT, Copilot, Gemini, Jasper Chat, Character, and Replika. The researchers compared and analyzed three AI chatbots—selected for their ability to provide responses—based on their ease of use and comprehensibility.

METHOD

This research was conducted on students in West Sumatra Province. The research process began on February 21, 2025, and ended on April 23, 2025.The research employed a quantitative approach. Quantitative research involves collecting structured data through measurement instruments such as questionnaires or systematic observations. The collected data is then analyzed using statistical methods to generate numerical results and generalizations.. The research data was collected through an online questionnaire at https://forms.gle/WGhwmWxn6G8BpGHP9 to 400 respondents, all of whom were students in West Sumatra. This research employed a quantitative approach, collecting data through an online questionnaire distributed to 400 students in West Sumatra. The sampling technique used was convenience sampling. This method was selected for its efficiency in reaching many accessible and willing respondents within limited time and resources. Convenience sampling is appropriate for exploratory studies, which aim to identify general trends and perceptions regarding the use of Artificial Intelligence (AI) as a learning resource among students in the digital era. While this approach may limit the generalizability of the findings, it provides valuable initial insights into the patterns of AI adoption and its perceived impact on material comprehension, learning effectiveness, and academic achievement among the target population.

A hypothesis is a temporary answer or assumption to a research question. The hypotheses used in this study are as follows

1. Hypothesis 1

H_0= There is no effect of the type of AI used on improving students' understanding of material in the digital age.

H_1= There is an effect of the type of AI used on improving students' understanding of material in the digital age.

2. Hypothesis 2

H_0= There is no effect of the type of AI used on the effectiveness of student learning in the digital age.

H_1= There is an effect of the type of AI used on the effectiveness of student learning in the digital age.

3. Hypothesis 3

H_0= There is no effect of the type of AI used on student academic achievement in the digital era.

H_1= There is an effect of the type of AI used on student academic achievement in the digital era.

A research model is a framework that explains how an independent variable (X) affects a dependent variable (Y). The research model can be seen as follows:

1. The effect of Artificial Intelligence on improving material comprehension, student learning effectiveness, and student academic achievement in the digital age
   The research model on the effect uses the ANOVA method on variable X (ChatGPT, Gemini, and Copilot) and variable Y (improvement in material comprehension, student learning effectiveness, and student academic achievement) with n = 400 respondents. The research model can be seen in Figure 2.5.

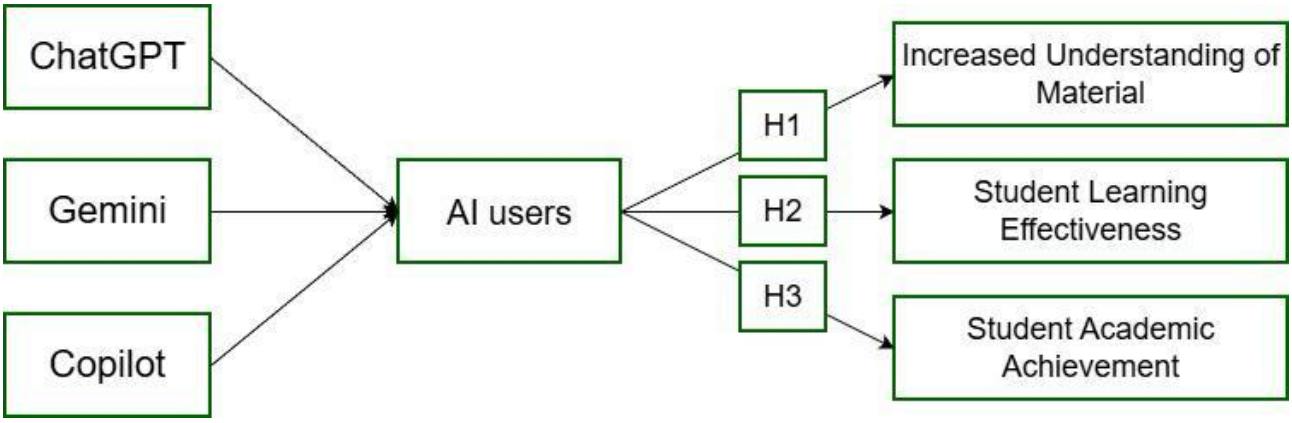

Figure 1 Research Model Of Influence

Based on Figure 1, three stages of data processing were conducted using SPSS version 26.0. In the first stage of data processing, which focused on the improvement of material comprehension, the independent variable (X) consisted of a specific type of artificial intelligence selected according to the respondents' answers. Meanwhile, the dependent variable (Y) was measured by the total number of respondents' answers to questions 11 and 12. The dataset used in this analysis comprised 400 respondents (n = 400).

The second stage of data processing, which focused on students' learning effectiveness, employed the independent variable (X) as a specific type of artificial intelligence selected based on the respondents' answers. The dependent variable (Y) was measured by the total number of respondents' answers to questions 13 and 14. The dataset used in this analysis consisted of 400 respondents (n = 400).

The third stage of data processing, which examined students' academic achievement, employed the independent variable (X) as a specific type of artificial intelligence selected based on the respondents' answers. The dependent variable (Y) was measured by the total number of respondents' answers to questions 15 and 16. The dataset used in this analysis consisted of 400 respondents (n = 400).

2. Comparison of the Most Frequently Used and Easily Comprehended Types of Artificial Intelligence as Learning Resources for Students in the Digital Era

The research model for comparison uses the Simple Linear Regression method on variable X (ChatGPT, Gemini, and Copilot) and variable Y (improved understanding of material, student learning effectiveness, and student academic achievement). The research model can be seen in Figure 2.6.

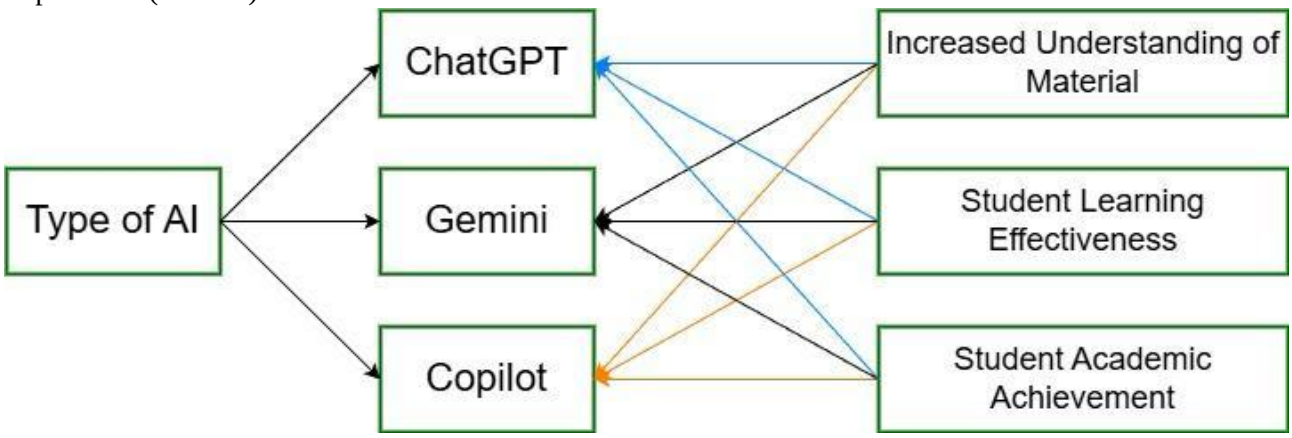

Figure 1.2 Comparative Research Model.

Based on Figure 1.2, which shows three data processing methods using SPSS 26.0 for the first data processing (ChatGPT users), the X variable used is the number of respondents' answers to questions 11 and 12, and the data used in the Y variable is the total number of respondents' answers to all statements with a data count (n) = number of ChatGPT respondents.

First data processing (Gemini users) The X variable used is the number of respondents' answers to questions 13 and 14, and the data used in the Y variable is the total number of respondents' answers to all statements with a data

count (n) equal to the number of Gemini respondents. First data processing (Copilot users) The X variable used is the number of respondents' answers to questions 15 and 16, and the data used in the Y variable is the total number of respondents' answers to all statements with the amount of data (n) = the number of Copilot respondents.

To ensure clarity and replicability, the following section details the operational definitions and specific indicators in this study. Material Comprehension, the extent to which students understand and assimilate lecture materials with the assistance of AI tools. Indicators : ChatGPT helps me understand lecture materials and ChatGPT provides explanations that are easy to understand." Learning Effectiveness, the degree to which AI tools enhance students' ability to learn efficiently and independently. Indicators : ChatGPT helps me learn more effectively and the use of ChatGPT motivates me to engage in independent learning. Academic Achievement, the impact of AI tools on students' academic performance and outcomes. Indicators : ChatGPT helps improve my academic performance and I use ChatGPT in the learning process during lectures. Additional Indicators, other aspects such as interactivity, learning autonomy, accessibility, enrichment, and ease of communication were also measured using statements like : I communicate with lecturers regarding course materials using ChatGPT, I explore and learn course materials independently with the help of ChatGPT, ChatGPT helps me shorten the time required to understand course materials, I can search for additional information related to course materials using ChatGPT, I can easily formulate questions from a problem to discuss with lecturers or other students using ChatGPT." All questionnaire items were measured using a Likert scale. This scale allowed for the quantification of respondents perceptions and experiences regarding the use of AI as a learning resource.

RESULTS AND DISCUSSION

Following the collection of the relevant data, the subsequent step entails the processing of said data in the inaugural stage, which involves the administration of the questionnaire instrument to a minimum of 30 respondents. This is undertaken to complete the validity and reliability test of the questionnaire, thereby providing a distribution of measurement values that approximates a normal distribution. Therefore, 30 of the 400 respondents were tasked with conducting a validity test on the statement instrument, the objective of which was to ascertain its validity. The instrument was deemed valid if the resultant value was greater than . The validity test results for the statement instrument were obtained from 30 respondents using SPSS 26.0 software, as demonstrated in the following table.

Table 1 Validity test results of 30 respondents on consumer interests

No.	Category	Statement	r_calculated	r_table	Status
1	ChatGPT Implementation	I use ChatGPT in the learning process during lectures	0.850	0.361	Valid
		The ChatGPT system provides up-to-date content	0.605	0.361	Valid
2	Interactivity	I communicate with lecturers regarding course materials using ChatGPT	0.628	0.361	Valid
		I discuss course materials with classmates with the assistance of ChatGPT	0.825	0.361	Valid
3	Learning Autonomy	I explore and learn course materials independently with the help of ChatGPT	0.902	0.361	Valid
4	Accessibility	ChatGPT helps me shorten the time required to understand course materials	0.855	0.361	Valid
5	Enrichment	I can search for additional information related to course materials using ChatGPT	0.802	0.361	Valid
		ChatGPT helps me complete assignments more effectively	0.856	0.361	Valid
6	Ease of Communication	I can easily formulate questions from a problem to discuss with lecturers or other students using ChatGPT	0.729	0.361	Valid
		I become more active in communicating and expressing opinions with the assistance of ChatGPT	0.796	0.361	Valid
7	Material Comprehension	ChatGPT helps me understand lecture materials	0.891	0.361	Valid
		ChatGPT provides explanations that are easy to understand	0.758	0.361	Valid
8	Learning Effectiveness	ChatGPT helps me learn more effectively	0.819	0.361	Valid
		The use of ChatGPT motivates me to engage in independent learning	0.810	0.361	Valid
9	Academic Achievement	ChatGPT helps improve my academic performance	0.729	0.361	Valid
	ChatGPT Implementation	I use ChatGPT in the learning process during lectures	0.850	0.361	Valid

A reliability test was conducted on data obtained from 30 respondents to assess the stability and consistency of respondents' answers to the questionnaire items. An instrument is considered reliable when the Cronbach's alpha coefficient exceeds 0.60. The results of the reliability testing are presented in Table 1.4.:

Reliabilitas Statistics

Cronbach's Alpha	N of Items
.958	16

Figure 2 SPSS 26.0 Processing Results Reliability

After measuring the statements processed with the SPSS 26.0 application, the results obtained can be seen in Table 2

Table 2 Reliability Test Results of 30 Respondents on Consumer Interests

Variable	N = 30 Number of Statement Items	*Cronbach's Alpha*	*Rule of Thumb*	Decision
Total	16 items	0.958	0,6	*Reliabilitas*

After the instrument was declared to be reliable, the questionnaire was distributed to 400 respondents, namely students in West Sumatra.

1. Comparison of the Most Widely Used Types of Artificial Intelligence as Learning Resources for Students in the Digital Age

Table 3
User Data Artificial Intelligence

Type	Number
ChatGPT	355 People
Gemini	38 People
Copilot	7 People

Based on Table 3, it can be concluded that ChatGPT is the most widely used Artificial Intelligence with 355 users. To identify AI that is easy to understand as a learning resource using the linear regression method, see Table 3.

Table 4
Output Regresi Linier

No	Variabel Independen (X)	t	Sig	Kesimpulan
1	ChatGPT	25,750	0,000	significant, which means that the independent variable (ChatGPT) significantly affects the dependent variable (understanding of the material).
2	Gemini	11,920	0,000	Based on the F value and sig value, the F value is considered significant, which means that the independent variable (Gemini) significantly affects the dependent variable (understanding of the material).
3	Copilot	1,688	0,152	Based on the F value and sig value, the F value is considered significant, which means that the independent variable (Copilot) significantly affects the dependent variable (understanding of the material).

Based on Table 3, the results obtained are ChatGPT with a t-value of 25.740 and a sig value of 0.000, Gemini with a t-value of 11.920 and a sig value of 0.000, and Copilot with a t-value of 1.688 and a sig value of 0.152.

Therefore, it can be concluded that the comparison of the types of Artificial Intelligence in this study is ChatGPT with a t-value of 25.750 > 1.96 and a sig of 0.00 < 0.05, which is considered significant, followed by Gemini with a t-value of 11.920 > 1.96 and a sig of 0.00 < 0.05, which is also considered significant. and Co Pilot with a t-value of 1.688 < 1.96 and a sig of 0.152 > 0.05, which is considered statistically insignificant, meaning that the independent variable does not have a significant effect on the dependent variable. Therefore, from the results of the data processing, the most understandable Artificial Intelligence is ChatGPT and Gemini.

In the process of identifying the influence of AI as a learning resource, the One-Way ANOVA method was used to analyze how AI affects material enhancement, student learning effectiveness, and student academic performance.

Table 4 *Output* ANOVA

No	Variable dependen (Y)	F Count	sig	Conclusion
1	improved understanding of the material	3,899	0,021	Based on the F value and sig value, it can be concluded that (the first hypothesis) is accepted, namely that there is an influence of the type of AI used on improving students' understanding of material in the digital era.
2	effectiveness of student learning	3,459	0,032	Based on the F count and sig value, it can be concluded that (the second hypothesis) is accepted, namely that there is an influence of the type of AI used on the effectiveness of student learning in the digital age.
3	student academic achievement	3,507	0,031	Based on the F count and sig value, it can be concluded that (the third hypothesis) is accepted, namely that there is an influence of the type of AI used on student academic achievement in the digital age.

Based on Table 4, Artificial Intelligence used as a learning resource significantly influenced the three variables, namely an increase in material comprehension with a calculated F value of 3.899 and a sig value of 0.021, student learning effectiveness with a calculated F value of 3.459 and a sig value of 0.032, and student academic achievement with a calculated F value of 3.507 and a sig value of 0.031.

Because all significant values (sig) are < 0.05 and all calculated F values are > F table, the hypothesis is accepted, meaning that there is a significant influence of Artificial Intelligence used on these three aspects.

Therefore, it can be concluded that overall, the results of data processing using ANOVA show that Artificial Intelligence used as a learning resource has a significant effect on improving material comprehension, student learning effectiveness, and student academic achievement.

This research agrees with and adds to the findings of many earlier studies:

1. Rifky (2024) and Syuhada et al. (2024) found that AI tools make completing tasks easier and help students get better access to learning materials. However, they also pointed out possible downsides like less thinking and creativity. This research supports the good effects of AI tools but also says there are risks, giving a balanced view.
2. Handoyo et al. (2023) and Nufus (2024) noticed that AI tools like ChatGPT encourage students to learn on their own and improve their grades. This research results, which show a big effect on learning and performance, back up these earlier findings and give strong statistical proof of how helpful AI can be in education.
3. Zega & Batubara (2024) and Abimanto & Mahendro (2023) talked about how AI changes digital skills and helps in learning languages. This research builds on this by comparing different AI tools and finding that ChatGPT and Gemini are the best and easiest for students in today's digital world.

By including these ideas and putting research findings in the context of past research, this study makes some important points:

a. Shows through real data and strong statistical methods like ANOVA and regression that AI tools have a positive effect on important education results, using a large group of students.
b. Compares different AI tools to find out which ones are most useful and easy for students, giving useful advice for teachers and school leaders.
c. Points out both the good and bad sides of using AI in school, pushing for a smart way to use technology so the benefits are used and risks are avoided.
d. This research not only supports the growing evidence about AI being helpful in education but also helps the field by comparing top AI tools and using well-known theories. This makes your findings more meaningful and useful for both scholars and people working in education.

CONCLUSION

Based on the data processing described above, the following conclusions can be drawn from this study:

1. Based on a comparison of the types of Artificial Intelligence, ChatGPT is the most widely used, and ChatGPT and Gemini are the types of

Artificial Intelligence that are most easily understood as learning resources for students in the digital age.

2. Based on the influence of the type of Artificial Intelligence used as a learning resource for students in the digital era, it can be concluded that Artificial Intelligence has a significant influence and role in improving material comprehension with a significant value of 2.1%, student learning effectiveness with a significant value of 3.2%, and student academic achievement with a significant value of 3.1%. This is evidenced by the calculated F value, the significant value (sig), and the acceptance of the proposed hypothesis.

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