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The Relationship between Student Perceptions of *DeepSeek* Use and Mathematics Learning Effectiveness

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Abstract

This research uses descriptive quantitative survey research. This study aims to determine the relationship between student perceptions of using *DeepSeek* on the effectiveness of mathematics learning. The sample in this study were 100 students majoring in mathematics at Surabaya State University. The sampling technique was carried out by means of probability sampling technique, namely simple random sampling. The data source of this research is the result of a survey conducted on the sample. In this survey, researchers used a questionnaire regarding students' perceptions of the use of DeepSeek on the effectiveness of mathematics learning with a Likert scale analyzed using Pearson's correlation analysis. The results showed that the correlation analysis between the independent variable (student perceptions in using *DeepSeek*) and the dependent variable (the effectiveness of mathematics learning) revealed a strong and positive relationship between the two variables. This means that there is a fairly strong and positive relationship between student perceptions of using *DeepSeek* and the effectiveness of mathematics learning.

Keywords: *DeepSeek*, Effectiveness, Mathematics Learning, Perception

Abstrak

Penelitian ini menggunakan penelitian deskriptif kuantitatif jenis survei. Penelitian ini bertujuan untuk mengetahui hubungan antara persepsi mahasiswa dalam penggunaan *DeepSeek* terhadap efektivitas pembelajaran matematika. Sampel dalam penelitian ini adalah 100 mahasiswa jurusan matematika di Universitas Negeri Surabaya. Teknik pengambilan sampel dilakukan dengan cara teknik probability sampling yaitu simple random sampling. Sumber data penelitian ini adalah hasil survei yang dilakukan pada sampel. Dalam survei ini peneliti menggunakan kuesioner mengenai persepsi mahasiswa dalam penggunaan *DeepSeek* terhadap efektifitas pembelajaran matematika dengan skala Likert yang dianalisis menggunakan analisis korelasi Pearson. Hasil penelitian menunjukkan bahwa analisis korelasi antara variabel bebas (persepsi mahasiswa dalam penggunaan *DeepSeek*) dan variabel terikat (efektivitas pembelajaran matematika) diperoleh adanya hubungan yang cukup kuat dan positif antara kedua variabel. Artinya terdapat hubungan yang cukup kuat dan positif antara persepsi mahasiswa dalam penggunaan *DeepSeek* dan efektivitas pembelajaran matematika.

Kata kunci: *DeepSeek*, Efektivitas, Pembelajaran Matematika, Persepsi

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Introduction

The rapidly growing era of digitalization is a major driver in accelerating global change. Rapid technological advances have created various innovations that not only affect individual lives, but also change the way work and interaction in various sectors and these advances provide a very wide range of sources and information from what humans already have (Yusniah et al., 2022). This development can be felt in various aspects of human life in the education, health, economic and other sectors. Overall,

technological developments have a significant impact on human life and open the door to new solutions in answering global challenges (Maulana et al., 2024).

One of the new technologies emerging today is called Artificial Intelligence. Artificial Intelligence (AI) is a science and technique for creating an intelligent machine. In 1955, John Carthy, one of the pioneers of AI, was the first to define the term artificial intelligence, as follows: "The Goal of AI is to develop machines that behave as though they were intelligent." (Ertel, 2025). This statement can interpret artificial intelligence as a step to create machines and programs that can work intelligently like humans. The development of artificial intelligence has affected many aspects of human life, one of which is the world of education (Putri et al., 2023). In the era of increasingly sophisticated technology, artificial intelligence also continues to progress marked by the emergence of various websites such as *ChatGPT*, Gemini, and so on. One of the latest AIs that is still unknown to the general public is *DeepSeek.*

DeepSeek has an advantage over other AIs such as *ChatGPT* and Gemini in that it focuses more on domain-specific optimization, transparency, and cost efficiency (Neha & Bhati, 2025). *DeepSeek* is designed to enhance precise reasoning and decision-making capabilities, making it more practical and reliable. *DeepSeek* has several variants, namely *DeepSeek* 7B, *DeepSeek* MoE-16B, *DeepSeek* V2, *DeepSeek* V3, *DeepSeek* R1-Zero, to the latest variant *DeepSeek* R1. *DeepSeek* R1 combines text, databases, and knowledge graphs, and uses Chain of Thought (CoT) techniques to perform step-by-step reasoning and Pro Search to provide context-appropriate responses (Neha & Bhati, 2025). *DeepSeek* improves accuracy in specific fields such as math, programming and decision-making while maintaining clarity and transparency in the process.

The development of AI plays a role in the learning process of mathematics. Learning mathematics using AI can bring a new dimension that is interesting and interactive (Auna & Hamzah, 2024). In addition, the use of AI in mathematics learning also has a significant positive impact, can form a generation that is more skilled, adaptive and also connected to the development of modern mathematics and technology (Sinaga, 2024). The wise use of AI in mathematics learning can improve the understanding of mathematical concepts for students and can also increase their confidence in working on complex mathematical problems. In addition to its role for students, AI can also help lecturers to identify student difficulties by analyzing student performance quickly (Kaluge, 2024). AI can also provide materials, resources and learning strategies. This can increase the effectiveness of mathematics learning which aims to ensure relevant and engaging learning experiences so it is important for lecturers to continue to adapt to technological advances to create innovative and adaptive learning experiences for students (Sinaga, 2024).

In a study conducted by (Tyaningsih & Wulandari, 2024) showed that most students (89.6%) felt that AI technology was easy to use, 75.9% had confidence in the accuracy of this technology, 94.9% felt an increase in efficiency in completing lecture assignments and based on interviews found concerns related to potential dependence on AI (29.3%) and ethical issues of its use (24.1%). Then research

conducted by (Nadjla, 2024) shows that artificial intelligence (AI)-based mathematics learning is very effective in improving students' accessibility and character. Data from pretest and posttest results showed a significant increase in posttest scores compared to pretest scores, with a pretest average score of 56.46 and a posttest average score of 91. In a study conducted by (Harnawati & Hidayati, 2024) showed that the majority of students who became research subjects had a positive perception regarding the use of artificial intelligence in learning mathematics, with most stating that this utilization was very important.

In contrast to previous research on the study of students' perspectives on the effectiveness of mathematics learning with the application of *ChatGPT* conducted by Auna & Hamzah (2024) and also research on artificial intelligence-based mathematics learning to improve accessibility and participant character conducted by (Nadjla, 2024). In some of these studies, no specific research has been found regarding student perceptions of the use of *DeepSeek* in the context of mathematics learning and how these perceptions relate to the effectiveness of mathematics learning. In this study, researchers tried to fill the research gap by focusing on the relationship between student perceptions of the use of *DeepSeek* and its impact on the effectiveness of mathematics learning.

Based on the above background, there is a need for further research on student perceptions of the use of *DeepSeek* and the effectiveness of mathematics learning. Technological advances in education have brought many changes to the education process, so it is important to introduce students to the changes that occur today, especially to the use of AI technology such as *DeepSeek*. This *DeepSeek* technology in the education process can also be used as a learning resource and can help in providing various information that we need. The proper use of *DeepSeek* is expected to improve concept understanding and support a more effective learning process, especially in mathematics learning. Therefore, this study aims to determine the relationship between student perceptions of using *DeepSeek* on the effectiveness of mathematics learning. If there is a positive relationship between student perception and the effectiveness of mathematics learning, then this supports the mathematics learning process.

Method

This research uses descriptive quantitative survey research. According to Siswono (2019).Descriptive research seeks to describe and interpret what exists, things that can be described in the form of a condition, opinion, or the result of a certain condition. Then, according to Siswono (2019) the purpose of the survey is to collect information about variables and not information about individuals but relates to generalizations resulting from a number of individual cases. According to Sugiyono (2013)surveys are used to get data from certain natural places such as distributing questionnaires, tests, interviews, and so on. Furthermore, quantitative research according to Sugiyono (2013) is used to examine a sample or certain population, data collection using research instruments, quantitative data analysis with the aim of testing existing hypotheses from a study.

In this study, researchers wanted to know the relationship between students' perceptions of the use of *DeepSeek* and the effectiveness of mathematics learning. This study uses a quantitative approach to analyze data that has been generated from surveys using a Likert scale. To analyze the data, this study uses correlation analysis to determine the relationship between student perceptions of the use of *DeepSeek* usage on the effectiveness of mathematics learning.

The population in this study consisted of students majoring in Mathematics at Surabaya State University. However, due to limitations in time, data sources, and accessibility, it was not possible to collect data from the entire population. Therefore, a sample of 100 students was selected using simple random sampling, which gives each member of the population an equal chance of being selected regardless of any strata. Data were collected through a Likert-scale questionnaire. According to Sugiyono (2013), a questionnaire is a data collection technique in which respondents are given a series of written questions or statements to answer. The indicators for AI usage in this study included user experience, student perceptions of AI, its impact on mathematics learning, and attitudes toward school policies on AI use (Kurniahtunnisa et al., 2024). Meanwhile, indicators for learning effectiveness were adopted from Ayuwardani (2023), which include learning quality, appropriateness of learning levels, provision of motivation or incentives, and adequate learning time allocation.

Data analysis was conducted using Pearson correlation to determine the relationship between the use of DeepSeek and the effectiveness of mathematics learning (Khoiri, 2021). Before performing the Pearson correlation test, assumption tests were conducted, including normality and linearity tests. The Kolmogorov–Smirnov (K–S) test was used to assess normality. According to Usmadi (2020), if Dmax≤DtableD_{max} \leq D_{table}Dmax≤Dtable, the data are normally distributed; otherwise, they are not. A linearity test was also carried out to confirm the linear relationship between the variables. According to Mashuri (2023), Pearson Product-Moment Correlation is used to test the relationship between two variables—an independent and a dependent variable—provided the data are normally distributed. In this study, the independent variable (X) was students' perceptions of using DeepSeek. As noted by Sugiyono (2013), the correlation coefficient indicates the strength of the relationship between the independent and dependent variables.

Table 1. Level of Relationship between Independent Variables and Dependent Variables

Coefficient Interval	**Relationship Level**
0,00-0,19	Very Weak
0,20-0,39	Weak
0,40-0,59	Medium
0,60-0,79	Strong
0,80-1,00	Strong Enough

Research Procedures

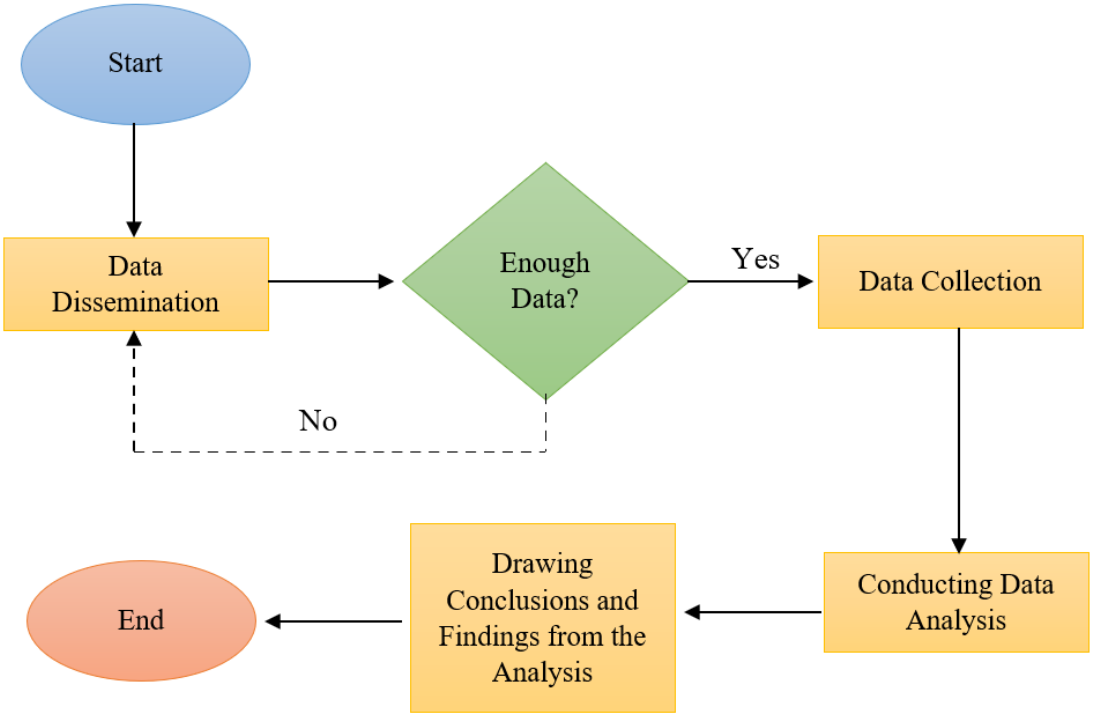

Figure 1. Research Flow Chart

The flowchart illustrates the sequential process of data analysis. The process begins with data dissemination, followed by an evaluation of whether the data is sufficient. If not, the process returns to the beginning. If so, it continues to the data collection, analysis, conclusion drawing, and final results stages. This flow emphasizes the importance of sufficient data before analysis is performed.

Results and Discussion

This study was conducted with the aim of knowing the relationship between student perceptions of using *DeepSeek* and the effectiveness of mathematics learning. The results of this study indicate a fairly strong relationship. Data analysis begins with prerequisite tests including data normality test, linearity test, and correlation test. The normality test is carried out with the aim of knowing whether the data being analyzed is normally distributed or not. This normality test was carried out using the Kolmogorov Smirnov (K-S) test through Excel. The Kolmogorov Smirnov test statistic is defined as follows:

$$D = \max_{1 \le i \le n} = (|Fz_i - F_{ni-1}(x_i), |Fz_i - F_{ni}(x_i)| \quad (1)$$

with F(z) is the theoretical cumulative distribution function or standard normal Z and $F_n(x)$ is the cumulative distribution function of observation data (Nasrum, 2018). The normality criteria according to (Usmadi, 2020) are if $D_{max} \le D_{table}$ then the data is normally distributed, while if $D_{max} \ge D_{table}$

then the data is not normally distributed. The following are the results of the normality test for the independent variable (X), student perceptions of using *DeepSeek*.

Table 2. Normality Test Results of independent variables (X), namely student perception data in using *DeepSeek*

Lots of Data	100
Mean	25,17
Standard Deviation	3,72
D-*table*	0,13
D-*max*	0,05

Based on the results of the normality calculation in Table 2, D_{max} is obtained at 0.05, so $D_{max} \leq D_{table}$. This shows that the data of students' perception in using *DeepSeek* is normally distributed. The following are the results of the normality test of the dependent variable (Y), the effectiveness of mathematics learning.

Table 3. Normality Test Results of the dependent variable (Y), the effectiveness of mathematics learning data.

Lots of Data	100
Mean	25,12
Standard Deviation	3,64
D-*table*	0,13
D-*max*	0,06

Based on the results of the normality calculation in Table 3, D_{max} is obtained at 0.06, so $D_{max} \leq D_{table}$ which indicates that the data on the effectiveness of mathematics learning is also normally distributed. The next step is the data linearity test which is carried out to determine whether there is a linear relationship between the student perception variables in the use of *DeepSeek* on the effectiveness of mathematics learning. In this study, the normality test was conducted through SPSS. The following are the results of the linearity test in this study:

Table 4. Linearity test results of student perceptions in the use of *DeepSeek* on the effectiveness of mathematics learning.

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
Effectiveness * Perception	Between Groups	(Combined)	1999.493	22	90.886	13.431	<,001
		Linearity	1653.768	1	1653.768	244.383	<,001
		Deviation from Linearity	345.725	21	16.463	2.433	.003
	Within Groups		521.067	77	6.767		
	Total		2520.560	99			

Based on Table 4 in the linearity test above, the Linearity significance value is <.001. Based on (Purnomo, 2017) two variables are said to have a linear relationship if the significance (Linearity) is less than 0.05. Because the Linearity significance value is obtained <.001 <0.05, it can be concluded that the relationship between student perceptions of the use of *DeepSeek* and the effectiveness of learning mathematics is linear.

Pearson correlation analysis is used for the magnitude of the relationship and contribution between two or more independent variables (X) simultaneously to the dependent variable (Y). This correlation test uses SPSS software. Pearson correlation is a number that shows the direction and strength of the relationship between the independent variable and the dependent variable. By using 95% confidence and a significance value of 0.05. The following are the results of the Pearson correlation analysis of student perceptions of the use of *DeepSeek* on the effectiveness of mathematics learning.

Table 5. Results of Pearson Correlation Analysis of student perceptions in the use of *DeepSeek* on the effectiveness of mathematics learning.

Correlations

		Persepsi	Efektivitas
Perception	Pearson Correlation	1	.810**
	Sig. (2-tailed)		<,001
	N	100	100
Effectiveness	Pearson Correlation	.810**	1
	Sig. (2-tailed)	<,001	
	N	100	100

***. Correlation is significant at the 0.01 level (2-tailed).*

With hypothesis:

H_0 : There is no significant relationship between students' perceptions in using *DeepSeek* and the effectiveness of math learning.

H_1: There is a significant relationship between student perceptions in the use of *DeepSeek* and the effectiveness of mathematics learning.

Based on Table 5, the results of the Pearson product moment correlation analysis between the independent variable X and the dependent variable Y obtained a correlation coefficient value of 0.81. The value obtained is greater than the R table of 0.195 at the 5% significance level with 100 respondents, indicating a significant relationship between the two variables. The level of relationship is in the “strong enough” category according to the interpretation of the correlation coefficient interval. According to (Sitorus, 2024), the Pearson correlation coefficient ranges from -1 to 1, a positive value indicates a unidirectional relationship, if the value is closer to 1 or -1, the stronger the relationship between the variables. Thus, H_0 is rejected and H_1 is accepted. This indicates that there is a positive and fairly strong relationship between the independent variables X and Y. The results of the Pearson correlation

calculation show that there is a positive and fairly strong relationship between student perceptions of using *DeepSeek* on the effectiveness of mathematics learning.

This finding is in line with Tyaningsih and Wulandari's research (2024) which states that Artificial Intelligence (AI) technology has great potential in helping students solve math problems. Most students feel the convenience, efficiency, and significant benefits of using AI, both in accelerating task completion and improving understanding of mathematical concepts. This finding is also in line with the results of research conducted by (Garasut et al., 2024)which states that the relationship between student perceptions of the use of *ChatGPT* in mathematical modeling courses has a significant and quite strong relationship. This is supported by satisfactory learning outcomes and both of these. Another study conducted by (Nadjla, 2024) mentioned that the results of the N-Gain analysis showed an average value of 0.792 where the value was included in the high category. This indicates that AI-based learning has a high level of effectiveness in improving students' accessibility and character. This statement confirms that the integration of artificial intelligence in mathematics learning can have a significant positive impact on the quality of education, the character of learners and the increased accessibility of mathematics education. It is also considered to provide valuable insights for educators and technology developers in designing more effective learning strategies.

In addition, this finding is also in line with the results of research conducted by (Opesemowo & Adewuyi, 2024) which states that the use of AI in mathematics education has significant potential to enrich the learning process, but its application must pay attention to ethical aspects and accessibility, as well as maintaining a balance between the role of technology and human abilities in order to obtain the best results. Other relevant research conducted by (Setiawan et al., 2024) also shows that the application of artificial intelligence in education has a crucial role and can significantly encourage increased understanding and foster student curiosity.

Therefore, discussing the relationship between students' perceptions of DeepSeek usage and the effectiveness of mathematics learning is important. This study provides insight that AI technology, particularly DeepSeek, can be an effective tool in mathematics learning, but its use must be done wisely. Educators need to ensure that AI technology is used to support the learning process, not replace it. Further research is recommended to involve respondents from various academic programs or universities to obtain more diverse results that can be generalized. This, the analysis of the relationship between perceptions of DeepSeek usage and the effectiveness of mathematics learning can be conducted more deeply based on the academic backgrounds of each respondent.

Conclusion

Based on the results and discussion of the research, it is found that there is a fairly strong and positive relationship between student perceptions of the use of *DeepSeek* on the effectiveness of mathematics learning. This can be proven by the Pearson correlation test data at the 0.05 significance level obtained a correlation coefficient value of 0.81. The value obtained is greater than the R table of

0.195 with the number of respondents 100 which indicates a positive and fairly strong relationship between the two variables.

In line with these findings, suggestions for future research suggest involving more respondents from various study programs or universities so that the results obtained are more varied and can be generalized to a wider population. With a more diverse scope of respondents, the relationship between the perceived use of *DeepSeek* and the effectiveness of mathematics learning can be analyzed in more depth based on differences in academic or institutional backgrounds.

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