JPM
Jurnal Pendidikan Matematika
UNIVERSITAS ISLAM MALANG

ARTICLE INFORMATION

Exploring senior high school students' perceptions of artificial intelligence as a mathematics learning assistant

Ihqlil Sekti Nugroho, Dian Devita Yohanie, Darsono Darsono
Corresponding author: ihqlilnugroho@gmail.com

How to cite (APA Style):
Nugroho, I. S., Yohanie, D. D., & Darsono, D. (2026). Exploring senior high school students' perceptions of artificial intelligence as a mathematics learning assistant. *Jurnal Pendidikan Matematika (JPM)*, 12(2), 165–179. https://doi.org/10.33474/jpm.v12i2.25877

DOI	https://doi.org/10.33474/jpm.v12i2.25877
Contributions	**Ihqlil Sekti Nugroho**: CCP, MTD, INV, DAC, ANL, WOD, WRE. **Dian Devita Yohanie**: SPV, CCP, MTD, VLD, WRE. **Darsono**: SPV, CCP, MTD, VLD, WRE.
Funding	This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.
Conflict of Interest	The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.
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Declaration of AI Use	The authors declare that generative artificial intelligence (AI) tools were used solely to assist with language editing, grammar checking, clarity, and/or organization of the manuscript. AI tools were not used to generate research data, conduct statistical analyses, formulate research findings, or make scientific conclusions. The authors take full responsibility for the accuracy, originality, integrity, and final content of the manuscript and have reviewed and verified all AI-assisted content.

*** CRediT roles:** CCP: Conceptualization; MTD: Methodology; INV: Investigation; DAC: Data Curation; ANL: Formal Analysis; WOD: Writing - Original Draft; WRE: Writing - Review & Editing; SPV: Supervision; VLD: Validation.

JURNAL PENDIDIKAN MATEMATIKA (JPM)
Vol. 12, No. 2, 2026, pp 165–179 e-ISSN: 2656–4564
https://doi.org/10.33474/jpm.v12i2.25877
online at: https://riset.unisma.ac.id/index.php/jpm/article/view/25877/

Exploring senior high school students' perceptions of artificial intelligence as a mathematics learning assistant

Ihqlil Sekti Nugroho*, Dian Devita Yohanie, Darsono Darsono
Universitas Nusantara PGRI Kediri, Indonesia
Email: *ihqlilnugroho@gmail.com*

ABSTRACT

The development of Artificial Intelligence (AI) has presented various opportunities in education, including as a learning assistant in mathematics. This study aims to determine students' perceptions of the use of AI as a learning assistant, identify the forms of AI utilization in mathematics learning, and assess the risks and limitations of its use. This study employed a descriptive qualitative approach. Questionnaire responses from 31 students were used to provide an initial description of students' perceptions. In comparison, semi-structured interviews with five selected students were conducted to obtain in-depth qualitative data at Public Senior High School (SMA Negeri) 7 Kediri. Data were collected through questionnaires and semi-structured interviews, then analyzed using thematic analysis. The results showed that students had a positive perception of the use of AI in mathematics learning. AI is used primarily to help understand material, obtain additional explanations, and solve math problems. However, students still rely more on teachers and other learning resources to understand mathematical concepts in depth. This study also found that students are aware of the risks of using AI, such as potential dependency, reduced self-study efforts, and decreased independent thinking skills if used excessively. Furthermore, nearly all students believed that AI cannot replace the role of teachers in learning. These findings indicate that students perceive AI as a potentially useful learning assistant for mathematics learning when its use is guided by teachers and accompanied by critical evaluation of AI-generated information.

Keywords: Artificial Intelligence, Students' Perceptions, Mathematics Learning, Learning Assistant.

*** Corresponding Author Email:** ihqlilnugroho@gmail.com

Submission	Revised	Accepted	Published
July 1, 2026	August 3, 2026	August 6, 2026	August 24, 2026

How to cite (in APA style):
Nugroho, I. S., Yohanie, D. D., & Darsono, D. (2026). Exploring senior high school students' perceptions of artificial intelligence as a mathematics learning assistant. *Jurnal Pendidikan Matematika (JPM)*, *12*(2), 165–179. https://doi.org/10.33474/jpm.v12i2.25877

INTRODUCTION

The rapid development of digital technology has transformed educational practices by changing how students access information, construct knowledge, and engage in learning. Digital technologies have supported a shift from teacher-centered to student-centered learning, providing students with greater opportunities to learn independently through diverse digital learning resources (Haleem et al., 2022). Among recent technological developments, Artificial Intelligence (AI) has attracted considerable attention because of its ability to provide fast, interactive, and personalized learning support (Fortuna et al., 2025). In a study conducted by (Schmidt et al., 2025), AI was identified as one of the emerging technologies with the potential

to enhance learning while emphasizing that its educational use should remain guided by teachers and supported by critical evaluation

Artificial Intelligence refers to computer systems designed to perform tasks that normally require human intelligence, including reasoning, problem solving, and generating responses based on user input (Eriana & Zein, 2023). In the context of this study, AI specifically refers to generative AI chatbots, including ChatGPT, Gemini, and Microsoft Copilot, which generate human-like responses to support learning through explanations, summaries, question answering, and feedback. These technologies provide different forms of learning support, ranging from generating explanations and summaries to assisting students in solving mathematical problems through step-by-step solutions (Opesemowo & Ndlovu, 2024). Their accessibility has expanded the role of AI from a simple information source to a supplementary learning assistant that complements teachers, textbooks, and other learning resources (Nujum & Hadi, 2025).

The integration of AI is particularly relevant to mathematics education because mathematics requires logical reasoning, analytical thinking, and systematic problem solving (Manto et al., 2026). Many students continue to experience difficulties in understanding abstract mathematical concepts and solving problems that require sequential reasoning (Wulandari et al., 2022). AI-based learning technologies can provide concept explanations, step-by-step solutions, practice exercises, and immediate feedback that support independent learning (Owoc et al., 2021). Previous studies have reported that AI can improve conceptual understanding, increase learning motivation, and support students' critical thinking and problem-solving skills (Salido et al., 2025; Suryawijaya et al., 2025). Teachers have also begun integrating AI into instructional practices by developing more varied learning materials and providing timely feedback (Madanchian et al., 2025).

The growing use of AI also raises important educational concerns. Easy access to instant answers may encourage students to rely on AI instead of developing their own mathematical reasoning (Setiyanti & Pipa, 2025). Excessive dependence on AI may reduce students' independent thinking and problem-solving abilities (Hassen, 2025). AI systems may also generate inaccurate or conceptually incorrect mathematical solutions, particularly when solving complex problems, making critical verification essential before using AI-generated responses (Li et al., 2026; Sun et al., 2024). These findings suggest that the educational value of AI depends not only on the capabilities of the technology but also on how students understand, evaluate, and utilize it during learning.

Student perception therefore becomes an important factor because it influences how learners interpret, accept, and use AI in academic activities (Krisdianto & Roesdiana, 2024). Positive perceptions may encourage appropriate and productive use of AI, whereas inaccurate perceptions may increase the likelihood of overreliance or uncritical acceptance of AI-generated information (Brauner et al., 2025). Previous studies consistently report that students generally perceive AI positively because it provides quick access to information, facilitates conceptual understanding, and assists in completing academic tasks (Srianti et al., 2025; Sugiono, 2024). Other studies emphasize concerns regarding information accuracy, student dependency, and the potential decline of critical thinking when AI is used without sufficient guidance (Setyawan et al., 2025; Supriyono & Prihandono, 2024).

Existing studies have predominantly examined AI effectiveness, technology acceptance, learning media development, or AI implementation across various educational settings, with many focusing on higher education rather than secondary education (Kasneci et al., 2023; Zawacki-Richter et al., 2019). Studies involving school students have generally focused on isolated aspects of AI use, such as perceived usefulness, technology acceptance, learning outcomes, or concerns regarding AI use, rather than providing a comprehensive understanding of students' perceptions (Setyawan et al., 2025; Srianti et al., 2025; Supriyono & Prihandono,

2024). Consequently, limited empirical evidence is available regarding how senior high school students perceive AI as a learning assistant in mathematics by simultaneously considering their understanding of AI, attitudes toward its use, patterns of utilization, and perceptions of its risks and limitations.

To address this gap, the present study explores senior high school students' perceptions of AI as a learning assistant in mathematics by examining these four interrelated dimensions. Rather than evaluating the effectiveness of AI, this study seeks to explain how students understand, interpret, and utilize AI while recognizing its educational benefits, risks, and limitations. By integrating these four dimensions, the study provides a more comprehensive understanding of students' perceptions. It offers empirical evidence to support teachers, schools, and policymakers in promoting the responsible use of AI in mathematics learning.

METHOD

This study employed a descriptive qualitative approach to explore students' perceptions of Artificial Intelligence (AI) as a learning assistant in mathematics learning. The study sought to obtain an in-depth understanding of students' experiences, perspectives, and patterns of AI use through qualitative inquiry (Subakti et al., 2023) Although questionnaire data were summarized using response percentages to describe general perception tendencies, the primary interpretation of the findings was based on data obtained from semi-structured interviews. Therefore, the questionnaire served as supporting data, while the interviews constituted the main source for qualitative analysis. The study focused on students' understanding of AI, attitudes toward its use, patterns of utilization, and perceptions of its risks and limitations in mathematics learning.

The research was conducted at State Senior High School 7, Kediri City. Participants were selected using purposive sampling, considering the suitability of the respondents' characteristics to the research objectives. (Sugiyono, 2020) A total of 31 grade XI students participated in filling out the questionnaire, and five students were selected as interview informants based on variations in the questionnaire results to obtain more in-depth information.

Data collection was conducted through questionnaires and semi-structured interviews. The questionnaire comprised 28 statements adapted from indicators from several instruments used in previous research, including Artificial Intelligence Literacy, Perceived Usefulness, Attitude Toward Using AI, Behavioural Intention, and AI Confidence, developed by (Chai et al., 2020), an instrument for the perception of the use of AI in learning developed by (Shoufan, 2023), as well as Students' Perceptions of the Use of Artificial Intelligence Tools in Academic Tasks (PEHIA-TA) developed by (Crisol-Moya et al., 2026). The selection of items was carried out to align with the research objectives, namely exploring students' perceptions of AI as a learning assistant in mathematics learning.

Data analysis using interactive analysis models (Miles et al., 2014) This includes data condensation, data presentation, and drawing and verifying conclusions. Questionnaire responses were summarized descriptively using frequencies and percentages to give an idea of students' perceptions across the four research aspects. These descriptive results were not meant for statistical inference but to support the qualitative findings. Interview data were analyzed thematically using an interactive analysis model that includes data condensation, data display, and drawing and verifying conclusions (Miles et al., 2014). Methodological triangulation was applied by comparing questionnaire trends with interview findings to boost the credibility of the interpretation.

RESULT

The research results were obtained through the distribution of questionnaires to 31 students in grade XI-4 and interviews with 5 students selected using purposive sampling techniques as informants. Data were analyzed based on four aspects, namely (1) students' understanding of Artificial Intelligence (AI), (2) students' attitudes towards AI as a learning assistant, (3) the use of AI in mathematics learning, and (4) students' perceptions of the risks and limitations of AI. The questionnaire results were used to describe students' perceptions, while the interview results were used to strengthen and clarify the findings obtained.

The understanding aspect was assessed through indicators of familiarity with AI, understanding of the function of AI in mathematics learning, and knowledge of how and when to use AI as a learning assistant. A summary of the questionnaire results is presented in Table 1.

Table 1. Summary of Questionnaire Results on Understanding Aspects

Indicator	Key Findings
Familiarity with Artificial Intelligence (AI)	100%
Understanding that AI can support mathematics learning	100%
Understanding AI's role in explaining learning materials	80,7%
Understanding that AI assists in solving mathematical problems	87,1%
Reported knowing how to use AI	90,4%
Reported knowing when AI should be used	100%

Based on Table 1, the questionnaire findings indicate that all respondents were familiar with generative AI chatbots, particularly ChatGPT, Gemini, and Microsoft Copilot, which were the AI tools examined in this study. All students also reported that they understood the role of generative AI in supporting mathematics learning. Most respondents perceived that they knew how to use AI (90.4%) and when it should be used (100%), while more than four-fifths reported understanding its role in explaining mathematical concepts (80.7%) and assisting with problem solving (87.1%).

To strengthen the questionnaire results, interviews were conducted with five informants. A summary of the interview results is presented in Table 2.

Table 2. Summary of Interview Findings on the Understanding Aspect

Emergent Theme	Participants
AI is understood as an information-search tool	I-1, I-3, and I-4
AI is understood as a tool for solving mathematical problems	I-1, I-2, and I-5
AI is perceived as a learning assistant	I-1, I-2, I-4, and I-5

Several informants described AI as a technology that can provide quick and practical answers. One informant stated:

"A kind of application that can answer anything." (I-1)

Another informant explained:

"Oh I know, like a search engine, but simpler." (I-3)

The results of the interviews showed that students' understanding of AI was still limited to its practical function as a tool for finding information and solving math problems. These responses suggest that students' understanding of generative AI was largely shaped by their direct experiences of using it as an accessible source of explanations and solutions during mathematics learning.

This study also examined students' attitudes toward the use of AI as a mathematics learning aid. This aspect encompassed students' interest in using AI, their comfort level with it, and their belief in the benefits of AI in assisting the learning process. A summary of the questionnaire results regarding students' attitudes toward AI is presented in Table 3 below.

Table 3. Summary of Questionnaire Results on the Attitude Aspect

Indicator	Key Findings
Interest in using AI	100% of respondents
AI makes learning more engaging	80,7% agreed/strongly agreed
Comfort with using AI	71,0% agreed/strongly agreed
Feeling supported when using AI	100% of respondents
AI helps improve understanding of learning materials	100% of respondents
Trust in AI-generated explanations	80% agreed/strongly agreed
AI is perceived as a beneficial learning assistant	77,4% agreed/strongly agreed
AI supports mathematics learning	90,3% agreed/strongly agreed

Based on Table 3, the majority of students expressed a positive attitude toward the use of AI in mathematics learning. All respondents expressed interest in using AI and found it helpful when learning mathematics using it. The majority of students also trusted the explanations provided by AI and viewed AI as a useful learning assistant.

The interview results that strengthen these findings are presented in Table 4.

Table 4. Summary of Interview Findings on the Attitude Aspect

Emergent Theme	Participants
Ease of using AI	I-1 and I-5
AI's speed in retrieving information	I-1, I-2, I-4, and I-5
AI provides a more comfortable learning experience	All Participant
AI has the potential to promote learning dependency or laziness	I-4

Interview findings provided further insight into the reasons underlying these positive attitudes. Participants consistently associated AI with convenience, rapid access to information, and a more comfortable learning experience. One participant explained:

"It is very convenient, because it is easy, simple, and the answers are immediate." (I-5)

Several participants also emphasized that AI enabled them to obtain explanations quickly whenever they encountered difficulties during learning. These responses suggest that students' positive attitudes were largely influenced by the accessibility and responsiveness of generative AI rather than by a belief that AI could replace conventional learning resources.

Despite these positive perceptions, the interviews also revealed awareness of potential negative consequences. One participant commented:

"No, because for me it makes me lazy." (I-4)

This statement indicates that positive attitudes toward AI did not necessarily imply unconditional acceptance. Some students recognized that excessive reliance on AI might reduce their motivation to engage actively in the learning process.

The questionnaire and interview findings suggest that students generally perceived generative AI as a convenient and beneficial supplementary learning resource. At the same time, several students demonstrated critical awareness that its ease of use could encourage passive learning if used without appropriate self-regulation.

The utilization aspect aims to determine how AI is used in everyday mathematics learning activities. A summary of the questionnaire results is presented in Table 5.

Table 5. Summary of Questionnaire Results on the AI Utilization Aspect

Indicator	Key Findings
Using AI when experiencing difficulty understanding learning materials	100% agreed/strongly agreed
Using AI to obtain additional explanations	77.4% agreed/strongly agreed
Using AI to assist in solving mathematical problems	83.9% agreed/strongly agreed
Using AI to examine the solution steps for mathematical problems	61.3% agreed/strongly agreed
Using AI as a learning resource in addition to teachers and textbooks	54.9% agreed/strongly agreed
Using AI to find additional practice problems	9.7% agreed/strongly agreed
Using AI for independent learning at home	45.2% agreed/strongly agreed
Using AI when preparing for quizzes or examinations	0% agreed

Based on the questionnaire results indicate that students primarily used generative AI as a supplementary resource when they encountered learning difficulties rather than as a primary learning resource. AI was most frequently used to obtain explanations of unfamiliar material and to assist with solving mathematical problems. In contrast, relatively few students reported using AI to generate additional practice questions, support independent learning at home, or prepare for quizzes and examinations.

Interviews revealed that AI is used more to help solve math problems and assignments than to build conceptual understanding. Informant I-1 explained,

"To do difficult assignments, because sometimes the questions are not on the blackboard." (I-1)

I-2 also expressed almost the same opinion.

"Just to solve the problem, and that is only if the problem is really difficult." (I-2)

I-5 reveals that AI is used to help solve various types of math problems, both easy and difficult.

"To work on various questions, both difficult and easy." (I-5)

Interestingly, when asked about using AI to understand math material, most informants preferred other learning resources, particularly YouTube. I-2 stated that he frequently uses YouTube to understand math material.

"When it comes to understanding, I often open YouTube." (I-2)

A similar thing was also found in I-3 and I-4, who preferred learning videos over AI when they wanted to understand mathematical concepts in depth.

The interview results that strengthen these findings are presented in Table 6.

Table 6. Summary of Interview Findings on the AI Utilization Aspect

Emergent Theme	Participants
AI is used when students encounter difficult mathematical problems	I-1, I-2, I-4, and I-5
AI is used to assist with mathematics assignments	I-1, I-2, I-3, and I-5
AI is used by typing or uploading a photo of the problem	I-1 and I-5
AI is not considered the primary learning resource	I-2, I-3, I-4, and I-5
Other learning resources are more frequently used to understand the learning materials	I-2, I-3, and I-4

The questionnaire and interview results overall indicate that students tended to use generative AI selectively and purposefully. Rather than functioning as a primary source of learning, AI was perceived as a supplementary learning assistant that provided immediate support when students encountered specific mathematical difficulties. This pattern suggests that students integrated AI into their existing learning strategies instead of relying on it as their sole learning resource.

The risk aspect was used to determine students' views on the potential impacts of using AI in mathematics learning. A summary of the risk aspect questionnaire results is presented in Table 7.

Table. 7 Summary of Questionnaire Results on the Risk Aspect

Indicator	Key Findings
Feeling that learning becomes more difficult without AI	29.0% agreed, 38.7% neutral, and 32.3% disagreed
Immediately using AI when encountering difficult mathematical problems	67.7% disagreed
AI may reduce students' willingness to seek solutions independently	64.5% agreed/strongly agreed
AI may diminish students' independent thinking skills	51.6% agreed/strongly agreed
AI cannot replace the role of teachers	96.8% agreed/strongly agreed

The questionnaire results showed that most students did not feel reliant on AI when learning mathematics. The majority of respondents also acknowledged that excessive use of AI could reduce students' ability to find answers independently and potentially reduce independent thinking. Nearly all respondents also stated that AI cannot replace the role of teachers in mathematics learning.

These findings were strengthened through interviews as summarized in Table 8.

Table 8. Summary of Interview Findings on the Risk Aspect

Emergent Theme	Participantd
AI has the potential to foster dependency	All participants
AI may encourage students to become less motivated to learn	I-4 and I-5
The ease of using AI may contribute to dependency	I-2, I-3, and I-5
AI cannot replace the role of teachers	All participants

Most informants acknowledged that the ease of AI has the potential to make students more dependent on technology.

"Yes, in simple terms, if there is something easy, why look for something difficult." (I-3)

I-4 stated that the use of AI can make students lazier.

"Yes, I think AI makes people lazier." (I-4)

These responses indicate that students were aware that the immediate availability of AI-generated answers might reduce learning effort and discourage independent problem-solving when AI is used excessively.

Participants also consistently emphasized that AI should complement rather than replace teachers. As one participant explained:

"The way the teacher wants to do it is different, but the result is the same." (I-2)

Although AI was considered helpful for providing explanations and solving mathematical problems, participants recognized that teachers play broader educational roles, including guiding learning, monitoring students' progress, and providing direct interaction that generative AI cannot replicate.

Overall, the questionnaire and interview results suggest that students perceived generative AI as a valuable supplementary learning assistant while remaining aware of its potential risks. Students generally viewed responsible AI use as requiring critical judgment and continued teacher guidance to avoid excessive dependence and to support meaningful mathematics learning.

DISCUSSION

Students' Understanding of Generative AI as a Learning Assistant in Mathematics

The results indicate that most students reported being familiar with generative AI chatbots, such as ChatGPT, Gemini, and Microsoft Copilot, and recognized their functions in supporting mathematics learning. Students generally perceived generative AI as a tool for obtaining explanations, answering mathematical questions, and assisting with problem-solving. Interview findings also showed that students primarily understood generative AI from its practical functions as a source of information and learning assistance.

These findings are consistent with Long and Magerko (2020), who describe AI literacy as encompassing knowledge of AI applications and their educational use. The findings also

align with, who emphasize that AI literacy involves understanding the capabilities and limitations of AI technologies (Zhou & Peng, 2025). In the present study, students demonstrated familiarity with the educational functions of generative AI, although their descriptions mainly reflected its practical use rather than broader conceptual knowledge.

According to (Walgito, 2004), perception is formed through individuals' interpretation of information and experience. The findings therefore indicate that students' understanding of generative AI constitutes an important basis for their perceptions of its role as a learning assistant. These results support previous studies reporting that students generally recognize generative AI as a useful educational resource because of its accessibility and ability to provide immediate responses (Kasneci et al., 2023).

Students' Attitudes toward Generative AI as a Learning Assistant in Mathematics

The results indicate that students generally expressed positive attitudes toward the use of generative AI as a learning assistant in mathematics. Students perceived generative AI as easy to use, capable of providing rapid responses, and helpful in supporting their learning activities. Similar findings have been reported in previous studies, which show that students tend to view generative AI positively because it provides accessible explanations, immediate feedback, and flexible learning support (Aleid et al., 2024; Brauner et al., 2025; Chugh et al., 2025).

These findings are consistent with the Technology Acceptance Model (TAM), which explains that users' attitudes toward technology are primarily influenced by perceived usefulness and perceived ease of use (Davis, 1989). In this study, students' positive attitudes reflected both dimensions, as they regarded generative AI as a practical and beneficial tool for supporting mathematics learning. Similar patterns have also been identified by (Maryati et al., 2026), who found that students' positive perceptions of AI were associated with their confidence in using AI technologies and their recognition of AI's educational value.

Interview findings also revealed that a small number of students expressed concerns about becoming overly dependent on generative AI despite their generally positive attitudes. This finding supports recent recommendations that positive attitudes toward generative AI should be accompanied by responsible and critical use rather than unquestioning acceptance of AI-generated responses (Kasneci et al., 2023). Therefore, the positive attitudes identified in this study should be interpreted as reflecting students' acceptance of generative AI as a learning assistant rather than as evidence of complete trust in, or dependence on, the technology.

Students' Use of Generative AI in Mathematics Learning

The findings indicate that students primarily used generative AI to solve mathematical problems, complete assignments, obtain additional explanations, and search for supplementary information. Questionnaire and interview data consistently showed that generative AI was used mainly when students encountered difficulties in mathematics rather than as a primary learning resource. Students also reported that teachers and learning videos, particularly YouTube, remained their preferred resources for developing a deeper understanding of mathematical concepts.

This pattern is consistent with the concept of Artificial Intelligence in Education (AIEd), which positions AI as a tool designed to support learning by providing adaptive assistance, immediate feedback, and personalized learning resources rather than replacing teachers or students' learning processes (Holmes & Tuomi, 2022). Similarly, (Luckin et al., 2016) argue that AI should function as an intelligent learning support system that complements classroom instruction by providing timely guidance according to learners' needs. In the context of this study, students used generative AI primarily as a supplementary resource when they encountered specific learning difficulties, reflecting the supportive role proposed in AIEd literature.

The results also align with constructivist learning theory, which emphasizes that meaningful learning occurs when learners actively construct knowledge through interaction, reflection, and problem-solving rather than passively receiving information (Piaget, 1977). Although students appreciated the rapid responses provided by generative AI, interview data revealed that they continued to rely on teachers and instructional videos when they sought a deeper conceptual understanding of mathematics. This result suggests that students perceived generative AI as a complementary learning resource rather than the primary source for constructing mathematical understanding, a role that remains consistent with constructivist perspectives on learning.

Another notable finding is that students rarely reported using generative AI for examination preparation despite frequently using it to complete difficult assignments. Interview findings suggest that students tended to use AI when immediate learning support was needed rather than as a continuous study strategy. This pattern is consistent with (Sousa & Cardoso, 2025), which reports that students commonly employ generative AI to address specific academic tasks while continuing to depend on teachers and other educational resources for broader learning activities.

It is important to note that these findings describe how students use generative AI, rather than demonstrating that AI improves mathematical understanding, critical thinking, or problem-solving performance. Positive perceptions and frequent use cannot be interpreted as evidence of improved learning outcomes because this study did not evaluate students' academic performance. Investigating the effects of generative AI on mathematical achievement would require experimental or longitudinal research designs. Therefore, the contribution of this study lies in explaining students' patterns of generative AI use and their perceptions of its role as a learning assistant in mathematics, rather than measuring its effectiveness in improving learning outcomes.

Students' Perceptions of the Risks and Limitations of Generative AI

The findings indicate that students were aware of both the benefits and the limitations of generative AI in mathematics learning. Although students generally expressed positive attitudes toward generative AI, most respondents also acknowledged that excessive reliance on AI could reduce learners' willingness to seek solutions independently and potentially weaken independent thinking. Interview findings further revealed that students recognized the possibility of becoming overly dependent on AI because of the convenience and speed with which it provides answers.

These results are consistent with the concept of cognitive offloading, which explains that individuals tend to transfer part of their cognitive effort to external tools when those tools provide efficient solutions (Risko & Gilbert, 2016). While cognitive offloading can reduce cognitive load and support learning in certain situations, excessive dependence on external technologies may also reduce opportunities for learners to engage in reasoning and problem-solving actively. In mathematics education, where conceptual understanding and logical reasoning are essential, excessive reliance on AI may limit students' opportunities to develop these higher-order thinking skills.

The findings also support the constructivist perspective, which emphasizes that mathematical understanding is developed through active engagement, reflection, and problem-solving rather than through simply receiving answers (Piaget, 1977). Although generative AI can provide rapid explanations and procedural guidance, meaningful learning still depends on students' active participation in constructing knowledge. Therefore, generative AI should be viewed as a learning support tool rather than a substitute for students' own reasoning processes.

Another important finding is that nearly all students believed that generative AI cannot replace the role of teachers in mathematics learning. This perception is consistent with previous

studies emphasizing that AI lacks the pedagogical judgment, emotional support, and contextual understanding required for effective teaching (Holmes & Tuomi, 2022; Zheng, 2023). Teachers remain indispensable because they facilitate conceptual understanding, adapt explanations to students' learning needs, monitor students' progress, encourage mathematical reasoning, and provide social and emotional support throughout the learning process. These functions extend beyond the capabilities of current generative AI systems.

The interview findings also suggest that students recognized that AI-generated responses are not always fully consistent with teachers' explanations. This observation is supported by recent studies showing that generative AI may produce mathematically incorrect, incomplete, or procedurally inconsistent responses, a phenomenon commonly referred to as AI hallucination (Kasneci et al., 2023). However, the present study did not specifically investigate how students verify AI-generated responses or identify incorrect mathematical solutions. Future research should therefore examine students' verification strategies and their ability to critically evaluate AI-generated mathematical explanations before incorporating them into learning activities.

CONCLUSION AND SUGGESTIONS

This study aimed to explore senior high school students' perceptions of generative Artificial Intelligence (AI) as a learning assistant in mathematics by examining their understanding of generative AI, attitudes toward its use, patterns of utilization, and perceptions of its risks and limitations. The findings indicate that students generally reported positive perceptions of generative AI and regarded it as a useful supplementary resource for solving mathematical problems, obtaining additional explanations, and completing assignments. Nevertheless, students did not perceive generative AI as their primary source for developing conceptual understanding and continued to rely on teachers and learning videos for deeper mathematical learning. Students also recognized potential risks associated with generative AI, particularly dependency and reduced independent thinking, while acknowledging that AI cannot replace the pedagogical role of teachers. These findings describe students' perceptions and self-reported practices rather than demonstrating that generative AI improves mathematical understanding, critical thinking, problem-solving performance, or learning achievement, as these outcomes were not examined in the present study. The study contributes to the growing literature on generative AI in mathematics education by providing a comprehensive description of students' perceptions through four interrelated dimensions—understanding, attitudes, utilization, and perceived risks and limitations—which have rarely been examined simultaneously among senior high school students. From a theoretical perspective, the findings support perception theory and the Technology Acceptance Model by demonstrating that students' perceptions of generative AI are associated with their understanding of the technology and their evaluations of its usefulness and ease of use within mathematics learning.

Practically, the findings suggest that generative AI should be integrated into mathematics learning as a complementary learning resource under teacher guidance rather than as a substitute for teachers or students' independent thinking processes. Teachers are encouraged to design learning activities that promote the verification of AI-generated responses, critical evaluation of mathematical reasoning, and responsible AI use. Schools should provide opportunities to strengthen students' AI literacy, while policymakers are encouraged to develop clear pedagogical and ethical guidelines for the educational use of generative AI. This study was conducted in a single school with a relatively small number of participants, limiting the transferability of the findings to other educational contexts. Future research is therefore recommended to involve more diverse participants and employ mixed-methods, longitudinal, or experimental research designs to investigate the relationship between students' perceptions

of generative AI and learning outcomes, including conceptual understanding, mathematical reasoning, critical thinking, and problem-solving performance.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to Public Senior High School (SMA Negeri) 7 Kediri for granting permission and providing support for the implementation of this study. The authors also extend their appreciation to all students who generously participated as respondents and interview participants, making this research possible. The authors are deeply grateful to their academic supervisor and all lecturers of the Mathematics Education Study Program at Universitas Nusantara PGRI Kediri for their invaluable guidance, constructive feedback, and continuous support throughout the research process and the preparation of this manuscript. Finally, the authors would like to thank everyone who contributed, directly or indirectly, to the successful completion of this study.

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