An Investigation into Artificial Intelligence Knowledge to Support Science Learning among Junior High School Students

Jauha Khoirun Nisa, Fidia Fibriana✉

Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, Indonesia

Article Info	Abstract
	Artificial Intelligence (AI) has rapidly become an essential component of digital learning environments, making AI literacy increasingly important for junior high school students. This study investigates students' knowledge of AI, the frequency of AI use, and the role of AI in supporting science learning. A descriptive quantitative design was employed, involving 136 seventh-grade students who completed a validated questionnaire via Google Forms. The data were analyzed using descriptive statistics to identify patterns in AI familiarity and utilization. Results indicate that although 92.6% of students have heard of AI and 63.2% have used it in general learning activities, the frequency of AI use in science learning remains low, with 78.7% reporting infrequent use. Students primarily rely on AI for textual explanations and homework completion, yet many express concerns about the accuracy of AI-generated information. The study highlights a substantial gap between students' awareness of AI and their ability to engage with it meaningfully in science learning contexts. These findings underscore the need for targeted AI literacy programs and structured pedagogical strategies that guide ethical, critical, and inquiry-based uses of AI in science education. Integrating AI meaningfully in the curriculum may strengthen students' scientific reasoning and digital competencies.

✉ correspondence:
Gedung D5 Lantai 1 Kampus, Jl. Sekaran Raya, Sekaran,
Gunungpati, Semarang City, Central Java 50229, Indonesia
E-mail: fibriana.f@mail.unnes.ac.id

INTRODUCTION

The digital revolution has changed various aspects of life, including the education sector, which faces new challenges and opportunities through technological innovation. Over the past few years, digital technology has increasingly been applied in the world of education, including Virtual Reality (VR), Augmented Reality (AR), and Artificial Intelligence (AI) (Chassignol et al., 2018). AI has emerged since 2022 and nowadays is widely applied in the field of education. It helps students find abilities, learn styles, and solve their study problems. AI can assist students in answering questions quickly and efficiently and completing assignments and projects by providing valuable suggestions, tips, and input (Laughter et al., 2024). AI technology can also provide feedback quickly to students, assisting students in understanding the good and bad aspects of the learning process. These benefits allow students to improve learning outcomes (Nasution et al., 2024).

Young Generation Z (Gen-Z) dominates junior high school students. Gen-Z is a generation that was born when information technology developed very quickly. In this generation, there has been a development in the use of the internet, computers, and robots that can make human work easier. Then, it is also introduced with AI that can help humans obtain information quickly (Wenas, 2024). Gen-Z characters can be said to be multitasking or used to technology as one of the factors for teachers to determine learning models and media that are suitable for Gen-Z (Source et al., 2020). According to research by Ayuningtyas et al. (2024), students use AI frequently to solve their assignments and problems. Meanwhile, the research conducted by Susanto et al. (2024) showed that 42 out of 44 junior high school students from various schools in Pontianak have used AI for school tasks. AI technology can serve as a Tutor System, learning tools and media, and a guide for creating Education policies (Source et al., 2024). AI also makes education more accessible, especially for students who live in remote areas, and makes classrooms more interactive and engaging (Resnawita & Karmanita, 2024).

Besides students, teachers are required to understand and follow the use of technology because Gen-Z has been familiar with technology since their childhood. Therefore, teachers must continue to improve their abilities by practicing digital-based learning media applications (Live et al., 2019). They are expected to use the education technology, including learning media, to make learning more interesting and structured, motivate students, realize the student-centered approach, improve their abilities, and achieve the learning outcomes (Fitriani & Yudiana, 2022). To meet these expectations, professional development programs for teachers must prioritize digital literacy and pedagogical integration of technology. This includes technical training and opportunities to reflect on best practices in designing meaningful, interactive learning experiences. By embracing a growth mindset and engaging with emerging educational technologies, teachers can foster inclusive, engaging, and future-ready classrooms that resonate with Gen-Z learners' digital habits and preferences.

Currently, AI is a trend that supports the development of educational curricula. Building upon this, curriculum design must evolve to integrate AI not merely as a tool, but as an embedded element that transforms how knowledge is delivered, assessed, and personalized. With AI, the curriculum can be more flexible and follow students' learning needs, providing a more effective and relevant learning experience (Holmes & Luckin, 2016). Teachers should be empowered to co-create curricula that utilize AI-driven platforms for adaptive learning pathways, intelligent tutoring systems, and data-informed feedback loops. This integration allows for differentiated instruction, enabling students to progress at their own pace and style. Hwang et al. (2020) state that implementing AI in the education curriculum includes content innovation, learning systems, and educational facilities. Moreover, embedding AI into curriculum design encourages the development of digital competencies and ethical awareness, such as skills essential for navigating the future workforce. As facilitators of this transformation, teachers must be supported in aligning AI tools with learning objectives, national standards, and pedagogical values. They enhance student engagement and achievement and model digital fluency and lifelong learning. AI can be applied in education because teachers have adequate skills to operate the technology (Yanti & Mawarwati, 2023). They can use it to arrange lesson plans, learn media, and

prepare assessment instruments. This can provide solutions for teachers in preparing lesson planning efficiently (Serdianus & Saputra, 2023).

Integrating AI into science curriculum design offers significant opportunities to make complex scientific concepts more tangible, personalized, and exploratory. Through AI-powered tools and interactive, data-rich environments, students can engage more effectively with abstract phenomena such as gene expression, climate systems, or chemical reactions. The use of AI enables access to adaptive and interactive learning resources that support deeper conceptual understanding while making science learning more engaging and contextually relevant.

Moreover, AI supports real-time diagnostics and formative assessment by providing immediate feedback on students' learning processes, allowing teachers to identify conceptual gaps and adjust instruction accordingly. Adaptive platforms can analyze student interactions during simulations and recommend targeted resources or scaffolded explanations, thereby fostering deeper scientific reasoning. From a curriculum development perspective, this requires a reorientation of learning outcomes toward not only content mastery but also scientific reasoning, computational thinking, and ethical awareness in technology use. In this context, teachers play a central role in designing inquiry-driven and interdisciplinary learning experiences in which AI serves as a supportive tool that enhances curiosity and scientific engagement rather than replacing human pedagogical judgment.

However, until now, there has not been much discussion about the application of AI at the elementary education level. Given that basic education has special characteristics and a critical role, a special strategy is needed to apply AI (Chen et al., 2020). In particular, differences in students' cognitive development, learning autonomy, and digital readiness require careful adaptation of AI-supported learning approaches at this level. Therefore, the recent study explores the use of AI in science learning and aims to determine the level of use of AI in the educational environment, especially in junior high school science learning.

METHODS

The method used in this study was a descriptive quantitative approach to obtain accurate and representative data. Data were collected through questionnaires distributed using Google Forms, allowing for broad participation and an efficient collection process. The research sample consisted of grade VII students at a high school in Kudus, Central Java, Indonesia. The school was purposefully selected to provide a comprehensive overview of students' views on using AI in learning. The data analysis technique used is descriptive statistical analysis to identify patterns and trends in the data. In addition, it also provides in-depth insight into how the perception and experience of grade VII students relate to the use of AI in learning effectiveness.

RESULTS AND DISCUSSION

Students' Understanding of Artificial Intelligence (AI)

Artificial Intelligence (AI) is now constantly evolving to provide information quickly. Currently, AI is increasingly developing from its type and the features offered, from providing information through chatbots, doing automatic editing, and collecting the necessary data. This technology will have a good impact by helping students' work if used positively. This research was conducted with junior high school students in grade VII, and 136 students filled out the questionnaire related to their knowledge about AI. The results show that 92.6% of students had heard of AI, indicating that junior high school grade VII students have begun to learn about AI. This result aligns with research conducted by Susanto et al. (2024), who found that junior high and high school students (age 10-18) show 100% knowledge about AI. In addition, as many as 14 out of 16 grade VII students of SMP Insan Rabbany have filled out a questionnaire stating that they know about AI (Setiawan et al., 2024). Most students know about AI from the internet and social media platforms rather than from friends, parents, family, and teachers (Figure 1).
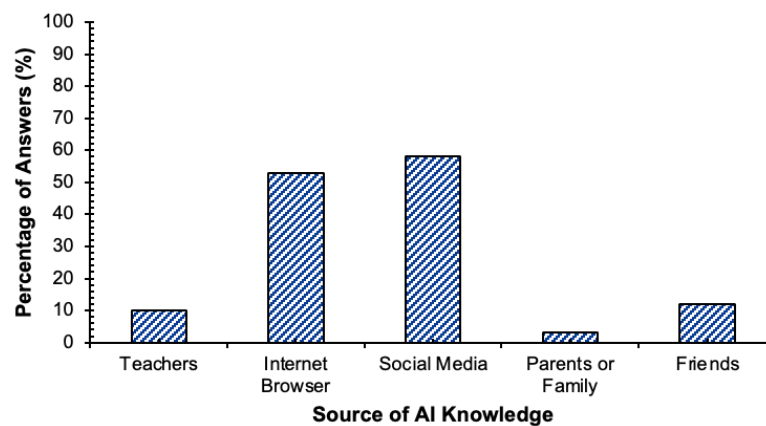
Figure 1. The resource of knowledge about AI

The popularity of social media as a platform for sharing information and discussion has significantly contributed to introducing AI to students. The internet browser also plays a role in spreading knowledge about AI. The ease of access and the abundance of information make the internet a source of learning for everyone. The result also highlights that teachers who are responsible as the facilitators at school do not dominate in giving knowledge on AI. In contrast, the role of teachers is important in introducing technological concepts to students. The result also shows that there is still a low discussion related to information technology in the family environment. This reflects that digital technology is the center of information dissemination in various fields. This data can be used to consider how to socialize about AI. The research on grade VIII students found that out of 203 students, 195 (96.1%) students stated that they use technology in their daily lives via mobile phones (Astawa & Permana, 2020). This result is also supported by data from the 2024 Indonesian Education statistics report, which shows that most students aged 5-24 use the internet and social media to search for information (Central Statistics Agency, 2024).

The data on the level of students' understanding about the use of AI is shown in Table 1. It shows that most grade VII students know about AI, but 57.4% of students still do not understand how to use AI correctly, and only 5.9% have a deep understanding of how to use AI. It reflects that there is still a gap in students' knowledge of this growing technology. The low percentage of students who do not understand can be due to the fact that basic awareness of AI requires more technical knowledge and experience. Meanwhile, the percentage of very knowledgeable students is also relatively low, which can be due to the fact that basic awareness of AI is quite widespread. These results are also supported by research conducted on high school students, where of the 13 students, only 3 understood how to apply AI technology (Nurfidari et al., 2024).

Table 1. The students' level of understanding of the use of AI

Level of understanding	Frequency	Percentage (%)
Not at all	4	2.9
Poorly understand	78	57.4
Good understand	46	33.8
Completely understand	8	5.9
Total	136	100

The students' awareness of using AI daily was also measured (Table 2), and 39.7% of students were aware of using AI in applications that students use daily. Furthermore, the second highest result was obtained from 33.8% of students who were unaware of AI's use in their daily lives. This phenomenon can occur due to students not understanding AI deeply and how it works. Students may be used to using AI-based features, but unknowingly, these features result from AI technology. According to Siddiq et al. (2025), realizing technological literacy is the first step to increasing the competitiveness of the younger generation. It is expected to continue developing by involving technology in learning.

Table 2. The students' level of AI use awareness

Level of awareness	Frequency	Percentage (%)
Completely unaware	18	13.2
Slightly aware	46	33.8
Moderately aware	54	39.8
Extremely aware	18	13.2
Total	136	100

Table 3 shows the students' interest to learn about AI. The results obtained in the study showed that the majority of 58.1% of students are interested, and 8.8% are very interested in learning more about AI. These results show a significant interest from students to learn about AI topics. This high interest is likely driven by the awareness and potential of AI in various aspects of the future, especially in education. A study conducted by Barus et al. (2023) showed that junior high and high school students of Sekolah Lentera Harapan Medan are highly interested in AI because students actively ask questions when resource persons allow them to ask questions about the technology. In addition, 30.1% were less curious, and 2.9% were not interested in learning more about AI. This result can be due to a lack of a basic understanding of AI and concerns about an overview of this technology.

Table 3. The students' level of interest in learning AI

Level of interest in learning	Frequency	Percentage (%)
Not interested	4	2.9
Less interested	41	30.1
Interested	79	58.2
Very interested	12	8.8
Total	136	100

The use of AI applications in science learning was investigated as well. Most students use AI for

Frequency of AI Use in Science Learning

This part discusses how AI helps science learning, as shown in Table 4. More than 70% students felt that AI can help them understand science material. They said that AI provides significant assistance and a potential tool in the science learning process. Utilizing AI technology can detect students' abilities objectively. Based on research conducted at SMPN 16 Pekabaru, the integration of technology in education is very important to support the optimal development of students' talents and interests (Ismanto et al., 2024). These results are supported by research conducted at SMPN 4 and SMK Pesisir, which suggests that the existence of AI helps students in the learning process in the current digital era (Subakti, 2024). Meanwhile, as many as about 20% students felt that AI does not significantly help them in science learning. This is likely due to the AI applications being less relevant, unsuitable for students' learning styles, and requiring time to adapt to AI features. According to Susanto et al. (2024), based on a survey conducted by most students, they feel helped by the existence of AI, both in fulfilling school assignments easily and practically. However, this needs supervision from teachers so that the assignments or information given to students can be proven accurate.

Table 4. The students' perception of AI in helping science learning

Students' perception of AI	Frequency	Percentage (%)
Not helpful	3	2.2
Less helpful	27	19.9
Helpful	86	63.2
Very helpful	20	14.7
Total	136	100

science learning activities, and the type of AI application is shown in Table 5.

Table 5. AI applications used by students for science learning

Apps	Description	Number of students
Google Assistant	Google Assistant is a virtual assistant-based service that can communicate with humans. The advantage of this AI lies in the voice feature, which, by simply saying "Ok, Google" and mentioning the information needed, will provide the information (Meganingrum et al., 2023).	62

Apps	Description	Number of students
Chat GPT	Chat GPT is an artificial intelligence technology trained using NLP (Natural Language Processing). This technology can understand and respond to incoming text in a way that resembles a human conversation (Hidayanti & Azmiyanti, 2023).	17
Gemini	Gemini is an AI from Google's innovation that can facilitate collaborative learning and discussion between students, collaborate on projects, exchange ideas, and provide feedback to each other (Imran & Almusharraf, 2024).	3
Canva	Canva is an online design program that provides various features such as presentations, resumes, posters, flyers, brochures, graphics, infographics, banners, bookmarks, bulletins, and more (Junaedi, 2021).	20
Brainly	Brainly is an application issued by an educational company based on digital technology. This technology makes it easier for users to share or pose questions and answers about various school subjects freely and flexibly (Indrayani et al., 2023).	25
Meta AI	Meta AI is an AI feature integrated with the WhatsApp application that can provide the desired information reference and be used as a place for discussion (Solehudin & Al-Nur, 2025).	6
CheckMath	Checkmath is an app that helps students check the answers to different math questions. The application is supported by features that are easy to understand and flexible (Rahanra, 2025).	2
Question AI	Question AI can provide adaptive answers or questions according to the user's needs (Sigh et al., 2024).	1
Total		136

Based on the research results in Table 5, the AI applications most commonly used by students are Google Assistant, Gemini, and ChatGPT. This finding is consistent with the study by Susanto et al. (2024), which reported that 61% of students choose AI tools such as ChatGPT and Gemini. This preference is largely due to the ease of access of these applications for students. In addition, many of the smartphones used by students already have built-in AI features. Consequently, frequent exposure to AI in daily digital use contributes to students' familiarity and confidence in applying these technologies within school learning activities.

Table 6 shows that this research is also essential regarding the frequency of use of AI applications in science learning. In the previous topic, the majority of students already demonstrated an understanding of AI concepts; however, the frequency data indicate that AI is rarely used in actual science learning practices. This discrepancy suggests a gap between students' conceptual awareness of AI and its practical integration into classroom learning activities. Moreover, limited guidance and structured opportunities to use AI-based tools may contribute to students' continued dependence on textbooks and teacher explanations. From the results of the interviews with the students, they rarely use AI because they still rely on books and explanations from teachers. It requires further socialization regarding the benefits of AI in learning science. Several studies also explain that technology-based learning media can improve students' understanding of concepts and learning achievement (Nuryadin, 2023). This proves the need for technology integration in learning, including science learning (Anggraeni & Meilina, 2024).

Table 6. AI usage frequency

Frequency of AI usage	Frequency	Percentage (%)
Never	8	5.9
Infrequently	107	78.7
Often	19	14
Always	2	1.5
Total	136	100

**The Use of AI on Learning Characteristics in Science Learning**
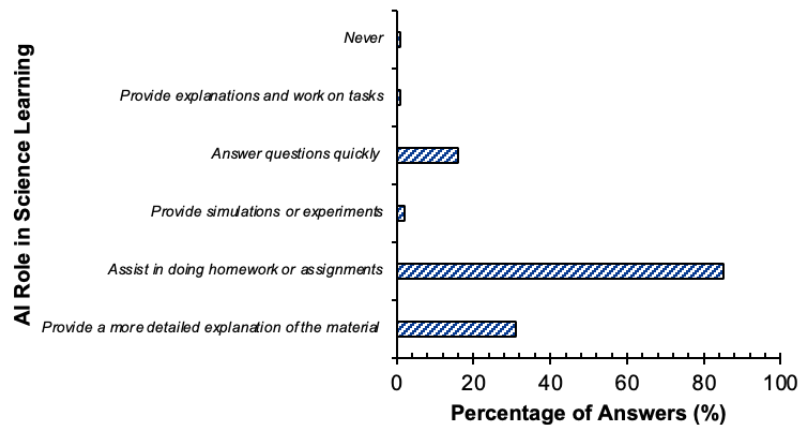
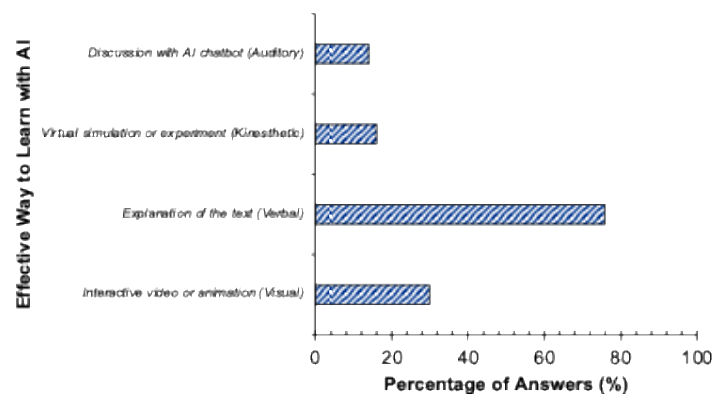**Figure 2.** AI role in science learning according to students

Understanding the characteristics of students utilizing AI in science learning is also necessary. From the research results in Figure 2, it was found that most students use AI to do assignments or homework. Several reasons behind this include ensuring student answers, speeding up the work, and being lazy to think of answers that need to be further studied. These results also align with research conducted on grade IX students of SMPN 8 Palangka Raya. Based on the results of observations, the majority of students used AI to do assignments. Students tend to copy answers from AI without regard to the source's credibility (Ikhsan et al., 2025). Despite the advantages, there is a challenge to wisely use AI without letting it control humans (Zein, 2023).

Figure 3 shows several things related to the obstacles faced by students. The biggest problem was 50% because the answers from the AI were not very accurate. This answer choice is strengthened by

research conducted by Baharuddin et al. (2023), which found that Chat GPT provides an accuracy rate of 92%. There is a need to consider when getting answers from AI. It is necessary that meaningful learning is given to students to research further AI answers, rather than receiving information directly from AI. The data in Figure 4 shows that 56.3% of grade VII students chose to learn using text explanations. Text can be considered an effective medium in conveying information and explanations in science learning. In addition, 22.2% of students also choose videos or a visual form. Abstract science concepts can be aided by visualization through interesting images, graphics, animations, and videos. According to Snoring et al. (2023), students learn according to individual learning styles due to the feedback provided by AI to the questions asked, and it helps students who have difficulty learning in real time.
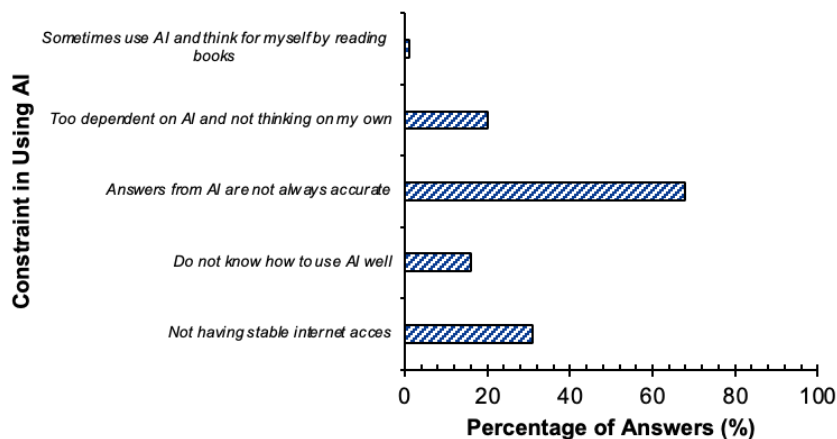
Figure 3. Constraints faced by students while using AI

Figure 4. Effective learning with AI

Figure 4 shows the students' opinions regarding the desire to use AI assistance in science learning activities. Of the 136 students, 100 (73.5%) answered "Yes" and 36 (26.5%) answered "No". The high percentage of students who want to use AI more in science learning activities shows positive results, and there is hope for the potential of AI in improving the quality of science learning. However, as many as 36 students disagreed with more AI in science learning, showing that students were more comfortable learning using conventional learning methods. These results are also supported by some of the suggestions the students wrote in the last question, showing some opinions about learning about AI. Most students love learning using AI because of the quick AI answers. Some students also argue that they prefer to learn without AI because the answers from the technology are not 100% accurate.

Although AI can help education, it has negative effects. When responding to the adverse impact of AI in education, students need to consider many things. The effect to be considered is the possibility of students' dependence on AI, which can reduce students' desire to think critically and learn on their own (Nasution et al., 2024). Teachers can identify students who are unwise in using AI by examining students' answers to AI technology. Typically, AI answers have consistent writing patterns, the use of specific punctuation, repetitive minor errors, and a distinctive uppercase and lowercase format. In this way, teachers can guide students to use technology correctly and responsibly. Also, academic integrity can be maintained while utilizing artificial intelligence's positive potential

(Ikhsan et al., 2025). Utilizing technology is essential to be applied to learning activities. Still, it is also necessary to pay attention to the frequency of use and needs to be researched first; the answers given can be used as a reference for student learning.

STUDY LIMITATION

Limitations such as sample homogeneity, the lack of longitudinal perspective, and reliance on self-reported data suggest the need for future research employing mixed methods, broader participant pools, and validated instruments to assess AI literacy more objectively.

CONCLUSION

The use of AI among grade VII students revealed that 92.6% were already familiar with AI, primarily through social media and internet platforms. However, only a few students demonstrated a deep understanding of using AI technology effectively. In addition, many were unaware of AI's presence in their everyday lives and reported infrequent use of AI tools in science learning. This gap underscores their growing curiosity and motivation to explore how AI can support their understanding of scientific concepts. The most commonly used applications included Google Assistant, Gemini, and ChatGPT, which students utilized to complete assignments and homework. Most students favored AI tools that offered textual, verbal, or visual explanations, aligning with their learning styles. A key challenge identified was the inaccuracy of AI-generated

responses, emphasizing the need to cultivate critical digital literacy skills to evaluate and verify information sources. To address this, teachers should be encouraged to integrate guided AI into science instruction through carefully designed tasks emphasizing inquiry, validation, and ethical reflection. Professional development programs can help teachers model critical thinking when using AI, demonstrate how to verify content accuracy, and encourage students to use AI for exploration rather than passive consumption.

ACKNOWLEDGEMENT

REFERENCES

Anggraeni, F. K. A., & Meilina, I. L. (2024). Pelatihan Pengembangan Media Berbasis Artificial Intelligence untuk Menambah Wawasan Guru MGMP IPA Kabupaten Jember: Training on Media Development Based on Artificial Intelligence to Broaden the Knowledge of Teachers MGMP IPA Northern Region of Jember District. *Your Service: A Scientific Journal of Community Service*, *9*(10), 1803–1813. https://doi.org/10.33084/pengabdianmu.v9i10.7637

Annur Fitri Hayati, Oknaryana, Mega Asri Zona, & Jean Elikal Marna. (2019). Digital Learning-Based Learning Media Training for Senior High School (SMA) Economics Teachers in Padang City. *Journal of Community Service*, *1*(1), 83–088. https://doi.org/10.56670/jcs.v1i1.12

Astawa, N. L. P. N. S. P., & Permana, P. T. H. (2020). Learning Media with Artificial Intelligence in Generation-Z English Learning. *Journal of Socio-Humanities Sciences*, *4*(2), 756–767. https://doi.org/10.22437/jssh.v4i2.11540

Ayuningtyas, G. F., Fahranie, H. K., Muslimah, I., Hadiansyah, S., Elzahra, S., & Setiawan, B. (2024). The Effect of the Use of AI on Improving Critical Thinking of Educational Technology Students. *Action Research Journal Indonesia (ARJI),* *6*(4). https://doi.org/10.61227/arji.v6i4.234

Central Statistics Agency. (2024). More than 60% of School Children Access the Internet for Social Media.

Baharuddin, B., Angielevi, D., & Sukmaya Prawitasari, D. (2023). Analysis of ChatGPT Performance in the Case *of Problem Based Learning. Proceedings of National Science and Technology*, *13*(1), 101–107. https://doi.org/10.36499/psnst.v13i1.9591

Barus, O. P., Pangaribuan, J. J., Romindo, R., Anggara, A., & William, W. (2023). Counseling on Artificial Intelligence for Junior and Senior High School Students of Sekolah Lentera Harapan Medan. *ABDIKAN: Journal of Community Service in the Field of Science and Technology*, *2*(4), 486–494. https://doi.org/10.55123/abdikan.v2i4.2281

Chassignol, M., Khoroshavin, A., Klimova, A., & Bilyatdinova, A. (2018). Artificial Intelligence trends in education: A narrative overview. *Computer Science*, *136*, 16–24. https://doi.org/10.1016/j.procs.2018.08.233

Chen, L., Chen, P., & Lin, Z. (2020). Artificial Intelligence in Education: A Review. *IEEE Access*, *8*, 75264–75278. https://doi.org/10.1109/ACCESS.2020.2988510

Fitriani, N. L. P., & Yudiana, K. (2022). Wondershare Filmora-Based Learning Videos on Science Learning for Class V Students. *MIMBAR PGSD Undiksha*, *10*(1), 73–83. https://doi.org/10.23887/jjpgsd.v10i1.43386

Hidayanti, W., & Azmiyanti, R. (2023). The Impact of the Use of Chat GPT on Accounting Students' Competency: Literature Review. *National Seminar on Accounting and Call for Paper (SENAPAN),* *3*(1), 83–91. https://doi.org/10.33005/senapan.v3i1.288

Holmes, W., & Luckin, R. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson: UCL Knowledge Lab.

Hwang, G.-J., Xie, H., Wah, B. W., & Gašević, D. (2020). Vision, challenges, roles and research

issues of Artificial Intelligence in Education. *Computers and Education: Artificial Intelligence*, *1*, 100001. https://doi.org/10.1016/j.caeai.2020.10000 1

Ikhsan, I., Artasoma, P., Karliani, E., & Sunarno, A. (2025). Ethics in the Utilization of Artificial Intelligence in Class IX of SMP Negeri 8 Palangka Raya. *SCIENCE: Journal of Innovation in Mathematics and Science Education*, *5*(1), 212–223. https://doi.org/10.51878/science.v5i1.4518

Imran, M., & Almusharraf, N. (2024). Google Gemini as a next generation AI educational tool: A review of emerging educational technology. *Smart Learning Environments*, *11*(1), 22. https://doi.org/10.1186/s40561-024-00310-z

Indrayani, N., Jazuly, A., Kurnia, N., & Zahro, I. (2023). Distance Teaching and Learning: Technology-Based Business English Learning Strategies for Undergraduate Students at University Level. *Education Journal: Journal of Educational Research and Development*, *7*(1), 25–35. https://doi.org/10.31537/ej.v7i1.972

Ismanto, E., Vitriani, & Ajeng Safitri. (2024). Socialization & Education: Optimizing Students' Talents and Interests Based on Expert Systems with an Artificial Intelligence Approach. *Journal of Devotion to Mu NegeRI, 8*(3), 307–312. https://doi.org/10.37859/jpumri.v8i3.7947

Jan Setiawan, Noni Dwi Sari, & Yuniar Istiyawati. (2024). The Utilization of Artificial Intelligence in Mathematics Learning for Students at Insan Rabbany Junior High School. *ASPIRATION: Publication of the Results of Community Service and Activities*, *2*(4), 114–127. https://doi.org/10.61132/aspirasi.v2i4.882

Junaedi, S. (2021). Canva Application as an Online Learning Media to Improve Students' Creativity in *English for Information Communication and Technology Courses. Bangun Rekaprima*, *7*(2), 80. https://doi.org/10.32497/bangunrekaprima .v7i2.3000

Kusumaningtyas, R., Sholehah, I. M., & Kholifah, N. (2020). Improving the Quality of Teacher Learning Through Learning Models and Media for Generation Z. *LPM Gazette*, *23*(1), 54–62. https://doi.org/10.23917/warta.v23i1.9106

M Mahfudz Siddiq, Karel Kholis Aditya, Angga Pratama, Resko Ardiyansyah, & Umi Sahara. (2025). Getting to Know Artificial Intelligence: Artificial Intelligence Education for Junior High School Students in Sinar Bhakti Village. *Sejahtera: Journal of Inspiration Serving the Country*, *4*(1), 172–180. https://doi.org/10.58192/sejahtera.v4i1.301 4

Maola, P. S., Karai Handak, I. S., & Herlambang, Y. T. (2024). The Application *of Artificial Intelligence* in Education in the Era of the Industrial Revolution 4.0. *Educatio*, *19*(1), 61–72. https://doi.org/10.29408/edc.v19i1.24772

Meganingrum, R. W., Harahap, H. S., & Harahap, A. S. (2023). The Influence of Google Assistant Utilization in Meeting Information Source Needs. *CoverAge: Journal of Strategic Communication*, *13*(2), 122–132. https://doi.org/10.35814/coverage.v13i2.33 96

Nasution, I. A., Jupriaman, Dwina Putri, D. P., & Munthe, M. Z. (2024). Potential And Challenges Of Implementing ArtificialIntelligence In The Field Of Education: The Potential And Challenges Of Implementing ArtificialIntelligence In The Field Of Education. *Zeniusi Journal*, *1*(1). https://doi.org/10.70821/zj.v1i1.9

Nurfidari, Ahyar, A., & Ita Fitriati. (2024). Implementation of Artificial Intelligence Technology as a Learning Means for Students at SMAN 2 Monta Bima. *Expert Net: Exploration Journal of Technological Education Trends*, *1*(1), 14–23. https://doi.org/10.59923/expertnet.v1i1.12 1

Nuryadin, R., & M, M. (2023). The use of Artificial Intelligence in education (Literature Review). *Indonesian Journal of Primary Education*, *7*(2), 143–156. https://doi.org/10.17509/ijpe.v7i2.64290

Pertiwi, G. R., Jailani, M. S., & Isma, A. (2024). Implementation of Artificial Intelligence in an Educational Perspective. *EDUCATIVE:*

JOURNAL OF EDUCATIONAL SCIENCES, *6*(4), 3725–3733. https://doi.org/10.31004/edukatif.v6i4.7436

Rahanra, S. J. (2025). Analysis of the Use of AI in the Checkmath Application Using the K-Nearest Neighbor (KNN) Algorithm Case Study: Anak Arrow Christian High School Nabire - Papua. *Djtechno: Journal of Information Technology*, *6*(1), 114–124. https://doi.org/10.46576/djtechno.v6i1.6065

Resnawita, R., & Karmanita, D. (2024). Systematic Literature Review: Intelligent System in the World of Education. *Journal of Information System and Education Development*, *2*(4), 51–55. https://doi.org/10.62386/jised.v2i4.113

Ronsumbre, S., Rukmawati, T., Sumarsono, A., & Waremra, R. S. (2023). Digital Learning with Artificial Intelligence (AI): The Correlation of AI to Student Learning Motivation. *Journal of Educatio FKIP UNMA, 9*(3), 1464–1474. https://doi.org/10.31949/educatio.v9i3.5761

Serdianus, S., & Saputra, T. (2023). The Role of ChatGPT Artificial Intelligence in Learning Planning in the Industrial Revolution 4.0 Era. *Masokan: Social Sciences and Education*, *3*(1), 1–18. https://doi.org/10.34307/misp.v3i1.100

Solehudin, M. & Widya Rahmawati Al-Nur. (2025). The Impact of the Use of Meta Artificial Intelligence on WhatsApp on the Way Students Think During Classroom Discussions. *Journal of Education*, *13*(1), 45–58. https://doi.org/10.24090/jk.v13i1.13189

Subakti, H. (2024). Educational Media About the Importance of Artificial Intelligence for the World of Education in the Nusantara Capital City (IKN) Area. *JOURNAL OF ACADEMIC COMMUNITY SERVICE*, *2*(1), 56–60. https://doi.org/10.59024/jpma.v2i1.603

Susanto, S., Kriswinarti, A., Christiani, Y. H., Bahari, Y., & Warneri, W. (2024). Description of the Utilization of Artificial Intelligence (AI) by Junior High School and Senior High School Students. *JIIP - Scientific Journal of Education*, *7*(12), 13760–13764. https://doi.org/10.54371/jiip.v7i12.6364

Uripno, G., Yuliastuti, R., Nurfalah, E., & Islami, I. F. (2024). Combinatoric Thinking: The relevance of AI to Mathematical Learning Models. *Journal of Exemplary Studies: Journal of Education and Learning*, *9*(2), 77–86. https://doi.org/10.55719/jt.v9i2.1510

Wenas, M. L. (2024). Generation Z's Learning Style in Christian Education in Church, School and Family: A Proposal in National Education. *Proceedings of the National Conference of Christian Education and Theology*, *2*(1), 1–9. https://doi.org/10.46445/nccet.v2i1.842

Yanti, M. & Mawarwati. (2023). Analysis of Technological Pedagogical and Content Knowledge (TPACK) of Prospective Elementary School Teacher Students in Science Materials. *Journal of Elementary Education*, *6*(3), 1138–1148. https://doi.org/10.31949/jee.v6i3.6312

Zendrato, C. P. (2024). Responding to the development of AI technology (ChatGPT) in accordance with biblical truth. *REI MAI: Journal of Christian Theology and Education*, *2*(1), 23–37. https://doi.org/10.69748/jrm.v2i1.105