A Comparison Of Artificial Intelligence, Automation, Emerging Technologies And Demonstration Pedagogy In Education

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Abstract: The study investigated a comparison of artificial intelligence automation, emerging technologies and demonstration pedagogy in education. Two research questions were raised and two hypotheses were stated to guide the study. Questionnaires were administered on 200 secondary school students in Delta State of Nigeria. The data obtained were analyzed using Z-test and Pearson Product Moment Correlation statistics. The study revealed that there was a significant difference between mean scores of students taught using artificial intelligence and demonstration method. In addition, there was a significant students taught by artificial intelligence those taught by the demonstration method. Based on the findings, some recommendations were made which were: teacher training institutions should include artificial intelligence technologies in the scientific methodology content and make provisions to train pre-service and in-service teachers in the use of artificial intelligence technologies, education Curriculum planners and developers should make provision for and emphasize the use of artificial intelligence technologies that school administrators should ensure proper supervision of teachers to see that a combination of teaching methods is used during teaching to enhance learners' understanding of concepts.

Keywords: Artificial Intelligence, Demonstration method.

Introduction

The use of AI involves integrating machine learning, deep learning, algorithm development, and natural language processing into various applications (Akgun and Greenhow, 2022). Organizations and individuals stand to benefit from AI due to its potential to enhance efficiency, productivity, time savings, effort reduction, and overall performance improvement (Ali, Abdelbaki, Shrestha, and Dwivedi, 2023; Flavian and Casalo, 2021). However, despite its numerous advantages, AI also presents challenges such as data security, privacy, and its potential to contribute to unemployment (Becue, Praca, and Gama, 2021; Perc, Ozer, and Hojnik, 2019). In summary, the influence of AI is expanding into various aspects of our everyday lives and is increasingly utilized in professional fields such as education (Chen, Chen, and Lin, 2020; Hwang, Xie, Wah, and Gašević, 2020), healthcare provision (Matheny, Whicher, and Israni, 2020), and marketing (Vlačić, Corbo, Silva, and Dabić, 2021).

AI technology has been applied to education within the recent twenty years. The Intelligent Tutoring Systems (ITS) cowl all major AI topics (e.g., data illustration, machine learning, tongue, planning, reasoning, explanation), and therefore the systems has shaped a motivating test-bed to formalize psychological feature theories and to experiment with their operationalization. AI in education has been applied to numerous domains, like physics, programming, writing essays, and reading yet because the development of educational systems. the foremost typical AI applications within the academic field involve data illustration, intelligent tutoring, tongue process, and autonomous agents. AI in education has created powerful learning environments and positive interactive experiences for college students over the decades. Artificial Intelligence can be defined as machines that can perform the tasks that humans carry out through their thinking (Dörfler, 2022). The usage of Artificial intelligence is growing at an unprecedented rate and it is rapidly changing the aspects of human life (Xue & Wang, 2022a). One of the significant challenges in teacher education is ensuring that teachers have a strong foundation in the subject matter they teach. AI can automate administrative tasks such as test evaluation, allowing teachers more time to focus on teaching rather than grading tests. Since the origin of the establishment of education, the strategies of teaching and also the bond shared between learners and educators have evolved considerably. Teaching strategies across the world became additional structured to administer higher, additional efficient results. This transformation will be majorly attributed to the continued intervention of technology.

How AI is currently being used in Education

" Microsoft and McKinsey's recent report of over 2,000 students and 2,000 teachers from Canada, Singapore, the UK, and America shows that artificial intelligence (AI) is already providing teachers and schools with innovative ways to understand how their students are progressing, as well as allowing for a fast, personalized, targeted duration of content."

Statement of the problem

The researchers observed that teachers continue to use the old system of teaching that has nothing interesting or enjoyable to offer to the learners to teach education. However, the traditional demonstration method of teaching often fails to engage students into activity and promote a deep understanding of the subject matter. To address this issue of poor performance, educators have sought alternative teaching methods. There are much computer-based, student-centered pedagogy in use in today's digital world. Due to their teacher-centered approach, the majority of traditional teaching methods do not allow for student participation in teaching and learning activities. This may be the main cause of the low performance noted in the majority of external exams. In today's digital world, artificial intelligence (AI) has modernized the way both instructors and learners approach education matters. This research work attempts to find out which of these pedagogies is more beneficial in delivery of education content.

Purpose of the Study

The broad objective of the study is to investigate the role which the incorporation of AI and other instructional strategies by teachers in comparison with the demonstration instructional strategy on the academic performance of students in education. It specifically sought to:

1. Establish the difference between incorporation of AI and the use of the demonstration instructional strategy.
2. Ascertain whether the use of AI enhances better performance of students in education
3. Examine whether teachers' use of AI and other instructional strategies improves students academic performance.

Research Questions

To effectively carry out this research, the following questions were raised:

1. Does AI enhance better performance of students in Education?
2. Does teacher's use of appropriate instructional strategy improve students' academic performance?

Statement of hypothesis

Ho1: There is no significant correlation between teachers' use of AI and better performance of students in education.

Ho2: There is no significant correlation between teachers' use of appropriate instructional strategy improve students' academic performance

Scope of the Study

This study will be limited to the inclusion of AI and other similar instructional strategies as compared to demonstration method by teachers in Delta State. It will also investigate the impact of AI and other instructional strategies on education. It will be conducted in Delta State Senior Secondary Schools. The state is located in South-South Nigeria.

Significance of the Study

The findings of the study will broaden students knowledge, steer up their interest in the use of Artificial Intelligence (AI), and improve the teaching skills of teachers in various senior secondary schools in the study area and Nigeria at large. It is hoped that the findings of this study will build a proper link between students academic performance in education in Delta State and the quality needed for teachers effective handling of education.

Literature review

Artificial Intelligence can be defined as machines that can perform the tasks that humans carry out through their thinking (Dörfler, 2022). The usage of Artificial intelligence is growing at an unprecedented rate and it is rapidly changing the aspects of human life (Xue & Wang, 2022a). One of the significant challenges in teacher education is ensuring that teachers have a strong foundation in the subject matter they teach. AI can automate administrative tasks such as test evaluation, allowing teachers more time to focus on teaching rather than grading tests. decisions, and judge like humans. Buckingham Shum et al. (2016) elaborate on how AI can In conclusion, artificial intelligence refers to the development of systems and machines that can simulate intelligent human behavior and through the use of algorithms and complex mathematical models enable machines to learn, adapt and improve their performance in an autonomous way. The goal for AI is to be able to do things such as recognize patterns, make analyze individual student performance, preferences, and learning styles through machine learning algorithms. Teaching and learning have utilized different technologies as improvement on traditional teaching methods such as discussion, inquiry and demonstration methods. Artificial intelligence (AI) is the simulations of human intelligence in machines that are programmed to think and act like

humans. Learning, reasoning, problem-solving, perception, and language comprehension are all examples of cognitive abilities. The application of machines in learning environments is only one variable in a multifaceted equation.

Using AI in education

AI has many uses in the field of education, including support, feedback, assessment, design, and delivery of content. AI can make it possible to create friendly and adaptable content in terms of design. Culican (2024) asserts that AI algorithms can sift through vast amounts of data to fill in the blanks, producing engaging and fashionable content. AI is additionally useful. for creating content that is tailored to the intended audience, such as interactive courses, personalized learning materials, and textbooks. Artificial intelligence (AI) tools facilitate the creation of educational content that leverages natural language processing capabilities, guaranteeing content that is coherent, succinct, and grammatically accurate (Dawes, 2023). Artificial Intelligence (AI) facilitates the efficient and flexible delivery of content by replacing traditional classroom instruction and offering students the ability to learn at any time, from anywhere in the world. AI systems may eventually take the place of lecturers in some subjects. Some educational programs now use artificial intelligence (AI) to scaffold students' acquisition of fundamental skills. Classroom AI systems have, according to Fahimirad and Kotamjani (2018), AI systems in classrooms are highly capable of analyzing data from various sources and comparing it to established patterns. According to Chen et al. (2020), they possess the ability to identify the root cause of issues and provide lecturers with guidance to attain more uniform results in different classes. Stated differently, educators and AI can collaborate to design the most effective teaching strategy that yields the greatest benefits for students. The advantages of implementing AI in the delivery of educational content include universal access for all students, regardless of their language proficiency or disability (Marr, 2024), as well as the ability to provide individualized and customized learning.

Furthermore, according to Dawes (2023), AI can be used to analyze advanced insights about how students are receiving educational delivery and making progress thus enabling a more personalized learning experience. Thus, it can be argued that AI-based education delivery is more learner-centric compared to the traditional method of educational delivery and is beneficial for learners as well as tutors. In terms of assessment, AI can enable automated assessment (Holmes and Tuomi, 2022). For example, AI can automate grading homework and tests usually take a significant amount of time. This time could be used to work on professional development, interact with students, and prepare for class. As AI is also AI systems in classrooms are highly capable of analyzing data from various sources and comparing it to established patterns. According to Chen et al. (2020), they possess the ability to identify the root cause of issues and provide lecturers with guidance to attain more uniform results in different classes. Stated differently, educators and AI can collaborate to design the most effective teaching strategy that yields the greatest benefits for students. The advantages of implementing AI in the delivery of educational content include universal access for all students, regardless of their language proficiency or disability (Marr, 2024), as well as the ability to provide individualized and customized learning.

Artificial intelligence (AI) automated grading can grade almost fill-in-the-blank and all types of multiple-choice tests, eventually replacing human grading. Though it's still in its infancy, essay grading software will advance in the upcoming years. The European School Education Platform (2023), claims that tutors can use AI to tailor assessments and deliver timely feedback that meets each student's unique learning needs. AI in assessment has the advantage of minimizing human subjectivity and assessment time (ibid). Additionally, Sarker (2022) contends that the application of AI to educational assessment improves scalability, personalization, and consistency. Individual consideration, flexibility, and the capacity to analyze large amounts of data from multiple sources are among the advantages of AI in educational assessment that have been reported (Mishra and Deep, 2023). It is widely acknowledged that learners require timely, relevant, and objective feedback in order to receive support and guidance. AI may also be able to offer feedback that satisfies these requirements. AI is already being used to provide feedback to students on their assignments and assessments (Hooda, Rana, Dahiya, Rizwan, and Hossain, 2022). For instance, some educational institutions are using AI systems to track and monitor students' progress and alert tutors to any problems with their performance. Artificial intelligence is used in some tutoring programs to assist students with writing, fundamental math, and other subjects (Leite and Blanco, 2020). These AI systems are limited to teaching students basic subjects; they are not ideal for imparting higher-order thinking skills or creativity.

Furthermore, generative AI tools like ChatGPT or Microsoft Bing can provide customized and quick feedback on students' work. According to Mollick and Mollick (2023), AI is being used in providing feedback to students which is personalized and asks students to take a different perspective. However, the authors noted that AI-based feedback is limited in the sense that it cannot replace human-grounded knowledge that a teacher has about their students. It is widely acknowledged that learners require timely, relevant, and objective feedback in order to receive support and guidance. AI may also be able to offer feedback that satisfies these requirements. AI is already being used to provide feedback to students on their assignments and assessments (Hooda, Rana, Dahiya, Rizwan, and Hossain, 2022). For instance, some educational institutions are using AI systems to track and monitor students' progress and alert tutors to any problems with their performance. Artificial intelligence is used in some tutoring programs to assist students

with writing, fundamental math, and other subjects (Leite and Blanco, 2020). These AI systems are limited to teaching students basic subjects; they are not ideal for imparting higher-order thinking skills or creativity.

Demonstration method of teaching

The majority of courses in senior secondary schools, in particular, conduct a lot of practical activities; in this situation, instructors who teach in pu schools, of course, pick teaching methods that include practical activities, such as the demonstration method (Winardi & Dwijanto, 2017) Whereas this approach is a style of learning that begins with a teacher's example, is then done directly, and pupils will follow what the instructor has illustrated (Journal et al., 2021). This method no longer has to prioritize absorption through information attainment, but rather focuses on developing students' abilities so that they can apply the knowledge they have acquired, thereby increasing the learning activity of students in sss 2 in the teaching and learning process, particularly in the fundamentals of graphic design (Hayati, 2021). The demonstration method is a teaching method that uses demonstrations to clarify an understanding or to show students how to do something or the teacher's method of teaching by demonstrating and showing students a process, situation, event, sequence of doing an activity, or certain objects that are being studied either in actual or imitation form through the use of various types of media that are relevant to the subject matter to make it easier for students to learn (Deandels, 2018) (Stern, 2019). The demonstration approach focuses the pupils' attention on what is being displayed (Alba, 2014). As a result, the student process will be more focused and students' attention will be diverted to other problems; it can stimulate students to be more active in participating in the learning process; it can increase student experience; it can help students remember the material presented for longer; and it can reduce misunderstandings because teaching is better. clearly and concretely, can address all of the difficulties that emerge in each student's thinking because they engage directly, stimulate development and bravery, take initiative, be responsible and autonomous, so that learning results are consistent with what is intended.

Methodology

This study adopted a quasi-experimental design; specifically, the pre-test and post-test design. A quasi-experiment is an empirical interventional study used to estimate the causal impact of an intervention on the target population without random assignment (Dinardo, 2008). The population of the study consists of 1,200 Senior Secondary 2 students in 20 Senior Secondary Schools in Warri metropolis, Delta State. A total of 200 Senior Secondary Schools Class two students comprising 120 male and 80 female students of intact classes in the selected schools formed the sample. A sample of 79 students was in the experimental group and 41 students in the control group. The selected classes were randomly assigned experimental and control groups in each school. The instrument was an Education Performance Test (EPT) developed by the researcher which contains 25-multiple choice questions based on the contents of the Senior Secondary School Curriculum. The items were selected from the West Africa Examinations Council Senior Secondary School Certificate Examination (WASSCE) past question papers. The instrument was given to two lecturers in science education department at the Delta State University, Abraka for face and content validation. Their corrections and suggestions were made before the mass production and administration of the instrument. The reliability coefficient was determined by the split-half method and calculated to be 0.78 using Person Product Moment Correlation Coefficient. Mean, Standard Deviation and t-test independent were statistical tools used for data analysis and hypotheses were tested at a 0.05 level of significance. Students in the experimental group were taught using artificial intelligence technologies and those in the control group were taught using the conventional demonstration method. The lesson lasted for two weeks of two units each. Before treatment, the instrument was administered to the experimental and control group as a pre-test and after treatment as a post-test.

Research Question One

Does AI enhance better performance of students in Education?

Table 4.3 percentage response to use of AI to enhance better performance of students in Education

S/N	ITEMS	RESPONSE			
		SA	A	D	SD
1	Students perform better when taught by using the use of AI.	61 (30.5)	104 (52.0)	22 (11.0)	13 (6.5)
2	Teachers have better skills for effective teaching and learning in education when they use AI	45 (22.5)	107 (53.5)	30 (15.0)	18 (9.0)
3	Learning is usually not boring when teachers use other instructional strategies like AI.	65 (32.5)	75 (37.5)	45 (22.5)	15 (7.5)

| 4 | Experienced teachers make use of a combination of different teaching strategies | 46 (23.0) | 101 (50.5) | 39 (19.5) | 14 (7.0) |
| 5 | Artificial Intelligence is good to use in the class | 54 (27.0) | 86 (43.0) | 44 (22.0) | 16 (8.0) |

In table 4.1 the opinion of the respondents varied on the use of AI. 165 of the respondents (82.5%) agreed that the students perform better when taught by the use of AI while 35 of the respondent (17.5%) disagreed. Moreover, 152 agreed that, teachers have better skills for effective teaching and learning in education while only 48 of the respondents (24%) disagreed. Also 140 of the respondents (70%) agreed that learning is usually not boring with the incorporation of AI while 60 of the respondents (30%) disagreed. Then, 147 of the respondents (73.5%) agreed that experienced teachers mostly make use of a combination of different teaching strategies while 53 of the respondents (33.5%) disagreed. 140 of the respondents (70%) agreed that, AI is friendly in the class while 60 of the respondents (30%) disagreed. The above analysis shows that the use or incorporation of AI enhances students performance in education generally.

Research Question Two

Does teacher's use of appropriate instructional strategy improve students' academic performance?

S/N	ITEMS	RESPONSE			
		SA	A	D	SD
11	Teachers use projector and AI where applicable while teaching	34 (17.0)	65 (32.5)	36 (18.0)	65 (32.5)
12	Artificial Intelligence tools are used during education lessons	20 (10.0)	154 (77.0)	19 (9.5)	7 (3.5)
13	Your teacher encourage the use of Artificial Intelligence	40 (20.0)	80 (40.0)	65 (32.5)	15 (7.5)
14	Teaching is enhanced by the use of AI as a teaching strategy.	67 (33.5)	92 (465.0)	17 (8.5)	24 (12.0)
15	The use of AI improves retention ability of students	39 (19.5)	143 (71.5)	9 (4.5)	9 (4.5)

In response to this question, the opinion of the respondents varied on teachers' use of appropriate instructional strategy. 99 of the respondents (49.5%) agreed that their teachers sometimes make use of projector and AI during lessons while 101 of the respondents (50.5%) disagreed. Furthermore, majority of the respondents 174 agreed that, their teachers sometime use AI during education lessons while 26 of the respondents (13.0%) disagreed. Also 120 of the respondents (60.0%) agreed that their teachers encourage the use of AI while 80 of the respondents (40%) disagreed. Then 154 of the respondents (79.5%) agreed that their teachers' use of AI improves their retention while 41 of the respondents (20.5%) disagreed. 182 of the respondents (91.0%) agreed that their teachers make use of AI when teaching to improve retention ability of the students while 18 of the respondents (9.0%) disagreed. Therefore from the above findings it is clear that teachers' use of AI improves the academic performance of students in secondary schools.

To test the two null hypothesis of the study, z-test was used to compute scores for the table. A z-test statistics and Person Product Moment Correlation were used to test if there is any significant difference between mean scores of students taught by the use of AI and demonstration strategy. It was observed at 0.05 level of significance.

Hypothesis one: Hypothesis one states that "there is no significant correlation between teachers' use of AI and better performance of students in education".

From table 4.2 below shows the mean, standard deviation and r-calculated as shown below.

Table 4.2 r-test of difference in mean perceptions.

CATEGORY VARIABLE	N	X	SD	DF	r-cal	r-cri	DECISION
X	200	1034.7	32.72	1.07	3.88	0.113	Rejected
Y	200	70.00	987.5				

Significant at 0.05 level of significance.

Decision rule;
When r-cal is greater than r-critical it means that there is a significant difference, and so the hypothesis is rejected. However If r-cal is less than r-crit, then, the Null Hypothesis is accept. This means that there is no significant difference. The data in table 4.2 indicates that the calculated value of r is 0.20 which is higher than the table value of r-critical of 0.113. Therefore, the null hypothesis was rejected. This implies that there is significant correlation between teachers' use of AI and better performance of students in education.

Hypothesis Two
Null Hypothesis two states that "there is no significant correlation between teachers' use of appropriate instructional strategy and students' academic performance.

From table 4.3 below shows the mean, standard deviation and r calculated as shown below.

Table 4.3: r-test of difference in mean perceptions

CATEGORY	N	X	SD	DF	r-cal	r-cri	DECISION
X	200	77.4	1091.9	398	0.19	0.113	Rejected
Y	200	70.00	987.5				

Significant at 0.05 level of significance

The data in table 4.3 indicates that the calculated value at r is 0.19 which is higher than tabled valued of r-critical of 0.113. Therefore, the null hypothesis was rejected. This implies that there is significant correlation between teachers use of AI and other appropriate instructional strategies improve students' academic performance.

Summary of Findings

Results of the study showed there is a significant difference between mean scores of students taught by the use of AI and demonstration strategy in secondary schools. There is also a correlation between teachers' use of AI and other related strategies and better performance of students. However, there is a significant correlation between teachers use of appropriate instructional strategies to improve students' academic performance. These indicate that poor academic performance of students in secondary school education is majorly caused by lack of the use of AI and other similar instructional strategies.

Conclusion

Based on the findings it can be deduced that the use of artificial intelligence technologies enhance student learning outcomes in education more than the use of the conventional demonstration method of teaching although, a combination of both methods would bring a better learning outcome.

Recommendations

1. Teacher training institutions should include artificial intelligence technologies in the scientific methodology content and make provisions to train pre-service and in-service teachers in the use of artificial intelligence technologies.

2. Education Curriculum planners and developers should make provision for and emphasize the use of artificial intelligence technologies by the curriculum implementers (teachers) because this method has enhanced students' learning outcome-performance in education.

3. School administrators should ensure proper supervision of teachers to see that a combination of teaching methods is used during teaching to enhance learners' understanding of concepts.

References

Alba, F. M. (2014). Keefektifan Model Pembelajaran Generatif Dan Missouri Mathematics Project Terhadap Kemampuan Pemecahan Masalah. *Unnes Journal of Mathematics Education*, *3*(2). https://doi.org/10.15294/UJME.V3I2.4473

Akgun, S., and Greenhow, C. (2022). Artificial intelligence in education: Addressing ethical challenges in K-12 settings. *AI and Ethics*, *2*(3), 431-440. https://doi.org/10.1007/s43681-021-00096-7

Ali, O., Abdelbaki, W., Shrestha, A., Elbasi, E., Alryalat, M. A. A., and Dwivedi, Y. K. (2023). A systematic literature review of artificial intelligence in the healthcare sector: Benefits, challenges, methodologies, and functionalities. *Journal of Innovation and Knowledge*, *8*(1), 100333. https://doi.org/10.1016/j.jik.2023.100333

Bécue, A., Praça, I., and Gama, J. (2021). Artificial intelligence, cyber-threats and Industry 4.0: Challenges and opportunities. *Artificial Intelligence Review*, *54*(5), 3849-3886. https://doi.org/10.1007/s10462-020-09942-2

Buckingham Shum, S., & Ferguson, R. (2016). Social Learning Analytics. In J. Gardner & M. G. Potosky (Eds.), Learning Analytics in Higher Education: Current Innovations, Future Potential (pp. 249–272). Routledge.

Chen, L., Chen, P., and Lin, Z. (2020). Artificial intelligence in education: A review. *IEEE Access*, *8*, 75264-75278. https://doi.org/10.1109/ACCESS.2020.2988510

Culican, J. (2024). The impact of AI on educational content creation: shaping the future of learning materials. Available from https://www.linkedin.com/pulse/impact-ai-educational-content-creation-shaping-future-jamie-culican-o7nxe

Dawes, S. (2023). How AI can deliver personalised learning and transform academic assessment. Available from https://www.unisa.edu.au/connect/enterprise-magazine/articles/2023/how-ai-can-deliver-personalised-learning-and-transform-academic-assessment/

Deandels. (2018). Introducing educational design research | Jan Van Den Akker, Koeno Gra.

Dörfler, V. (2022). Artificial Intelligence (pp. 37–41). https://doi.org/10.4135/9781071872383.n15

European School Education Platform (2023). How can artificial intelligence assist teachers with formative and summative assessment? https://school-education.ec.europa.eu/en/insights/news/how-can-artificial-intelligence-assist-assessment

Fahimirad, M., and Kotamjani, S. S. (2018). A review on application of artificial intelligence in teaching and learning in educational contexts. *International Journal of Learning and Development*, *8*(4), 106-118. http://doi.org/10.5296/ijld.v8i4.14057

Flavián, C., and Casaló, L. V. (2021). Artificial intelligence in services: current trends, benefits and challenges. *The Service Industries Journal*, *41*(13-14), 853-859. https://doi.org/10.1080/02642069.2021.1989177

Hayati, R. R. (2021). *Aplikasi Jurnal Penelitian Ilmu Dan Teknologi Komputer Berbasis Web Di Jurusan Teknik Komputer*.

Holmes, W., and Tuomi, I. (2022). State of the art and practice in AI in education. *European Journal of Education*, *57*(4), 542-570. https://doi.org/10.1111/ejed.12533

Hooda, M., Rana, C., Dahiya, O., Rizwan, A., and Hossain, M. S. (2022). Artificial intelligence for assessment and feedback to enhance student success in higher education.

Hwang, G. J., Xie, H., Wah, B. W., and 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.2020.100001 *Mathematical Problems in Engineering*, *2022*, 1-19. https://doi.org/10.1155/2022/5215722

Journal, C. D., Dermawan, A., Saputra, E., & Hutagalung, J. E. (2021). *Peran masyarakat dalam menaati hukum dan mendukung perkembangan teknologi komputer dalam bisnis digital*. *2*(3), 569–573.

Leite, A., and Blanco, S. A. (2020, February). Effects of human vs. automatic feedback on students' understanding of AI concepts and programming style. In *Proceedings of the 51st ACM Technical Symposium on Computer Science Education* (pp. 44-50).

Marr, B. (2024). How is AI used in education — real world examples of today and a peek into the future. Available from https://bernardmarr.com/how-is-ai-used-in-education-real-world-examples-of-today-and-a-peek-into-the-future/

Matheny, M. E., Whicher, D., and Israni, S. T. (2020). Artificial intelligence in health care: a report from the National Academy of Medicine. *Jama*, *323*(6), 509-510. https://doi.org/10.1001/jama.2019.21579

Mishra, S., and Deep, A. (2023). Advancing Education: Evolving Assessments with AI. https://mgiep.unesco.org/article/advancing-education-evolving-assessments-with-ai

Mollick, E., and Mollick, L. (2023). Part 1: AI as feedback generator. https://hbsp.harvard.edu/inspiring-minds/ai-as-feedback-generator

Perc, M., Ozer, M., and Hojnik, J. (2019). Social and juristic challenges of artificial intelligence. *Palgrave Communications*, *5*(1). https://doi.org/10.1057/s41599-019-0278-x

Sarker, I. H. (2022). AI-based modeling: techniques, applications and research issues towards automation, intelligent and smart systems. *SN Computer Science*, *3*(2), 158. https://doi.org/10.1007/s42979-022-01043-x

Stern, W. (2019). Educational research: Quantitative and qualitative approaches. - PsycNET.

Vlačić, B., Corbo, L., e Silva, S. C., and Dabić, M. (2021). The evolving role of artificial intelligence in marketing: A review and research agenda. *Journal of Business Research*, *128*, 187-203. https://doi.org/10.1016/j.jbusres.2021.01.055

Winardi, W., & Dwijanto, D. (2017). Analisis Kemampuan Literasi Matematika melalui Model Missouri Mathematics Project dengan Pendekatan Open-Ended. *Unnes Journal of Mathematics Education Research*, *6*(2), 175–183.