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The Role of Artificial Intelligence (AI) in Vocational Education

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ABSTRACT

Artificial Intelligence is a technology that has rapidly developed in this decade. Its capability to perform tasks previously achievable only by humans has made this technology popular and utilized across various sectors, including vocational education. In vocational education, Artificial Intelligence plays a role in enhancing the efficiency and effectiveness of teaching. One example is the development of adaptive learning programs that can adjust the curriculum according to students' abilities and needs. Additionally, Artificial Intelligence is also used to evaluate student performance and provide automatic feedback. This system can assist in assessing and monitoring student performance, enabling teachers to focus on teaching and student development. This study used the Systematic Literature Review (SLR) method. This method is used to identify, assess, evaluate, and interpret all available research within the field of the relevant phenomenon, guided by specific research questions. By using this method, a systematic review and identification of journals can be conducted, following predefined steps. The data for this study is obtained from relevant journals between the years 2013 to 2021, totaling 15 literature journals from various countries. The primary goal of this research is to provide a deeper understanding of the role of this technology in vocational education and to present a framework that can be used as a guide for the implementation of Artificial Intelligence. It is anticipated that this research will assist educators and decision-makers in effectively utilizing Artificial Intelligence to enhance learning, skills, and vocational student preparation for the continually evolving job market.

Keywords: *Artificial Intelligence (AI), Systematic Literature Review (SLR) Method, vocational education*

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INTRODUCTION

Vocational education plays a vital role in preparing skilled and trained workers. In an increasingly complex and rapidly changing world, vocational education must continuously adapt to technological advancements and

relevant industries. We cannot deny that the rapid pace of technology has brought significant changes to the education sector, including a shift in focus from a teacher-centered approach to a student-centered approach in learning (Anitah, 2009). The advancements in science and technology have raised awareness among the public about the importance of technology mastery. One technology that has experienced rapid development and has the potential to transform the way vocational education is

conducted is Artificial Intelligence. The utilization of this technology has grown rapidly from year to year. Its presence, with features, functions, and interfaces that impact various aspects of human life, including education, should not be underestimated (Luger, 2005). Artificial Intelligence can play a role in schools or higher education institutions in the learning process. Artificial Intelligence represents an initial step in the development of learning technologies. This situation is likely to have implications for everyday human life.

Artificial Intelligence has several definitions. According to Kusumadewi (2003), as depicted in Figure 1, Artificial Intelligence is a branch of computer science that aims to make machines (computers) perform tasks as effectively as possible, tasks that are typically performed by humans (Kusumadewi, 2003). Meanwhile, according to John McCarthy, AI is a science and technique of creating intelligent machines, especially in developing intelligent computer programs or applications. AI is a step towards creating computers, robots, or applications/programs that work intelligently, much like humans. Another research, proposed by Rich and Knight (1993), states that Artificial Intelligence is a study of how computers can effectively perform tasks that are currently done by humans (Rich, 1983).

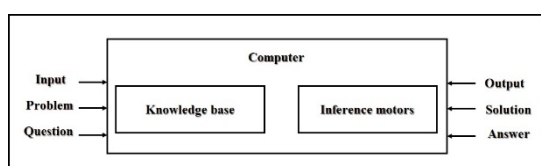


Figure 1. Application of Artificial Intelligence Concept in Computers

Artificial Intelligence can present media or test theories about intelligence, as stated in the definitions given above. These theories can be expressed in programming languages, and their implementation can be tested on a computer. Similar to how humans have a brain, computers can have software that functions as a brain. Humans are capable of solving various problems not only because they have a brain that can analyze and process data, but also because they possess knowledge acquired through experience and learning. There are two main components that are essential for building intelligence-based applications: 1) Knowledge Base, which consists of facts, theories, thoughts, and relationships between entities and related matters; 2) Motor Inference (the ability to draw conclusions based on experience).

The use of Artificial Intelligence technology in education has become an increasingly popular topic in recent years. AI offers a lot of potential to enhance students' learning experiences, assist teachers in delivering more effective instruction, and even identify learning issues that may go unnoticed by humans.

However, the use of Artificial Intelligence in education also raises some concerns and challenges. One major concern is that the use of this technology may replace the role of humans in teaching and learning, thereby reducing important human interaction for students' social and emotional development. Additionally, concerns arise regarding student data privacy and ethical issues related to the use of this technology in instruction. From its development, several opportunities and challenges for the

future development of Artificial Intelligence have emerged. Three of them include regulations related to algorithms and organizations, regulations related to employment, and regulations that must respect democracy and peace (Kaplan & Haenlein, 2019). Firstly, the increasing use of this technology in everyday life raises concerns about the potential bias in Artificial Intelligence systems, as it can persist and even amplify biases present in its training data. There is a need for the development of requirements for training and testing Artificial Intelligence algorithms and holding organizations accountable for any mistakes or biases they create. For example, deep learning (DL) algorithms are essentially black boxes that can be intentionally or technically obscured, which can raise concerns in specific applications such as medical diagnosis. Secondly, the increased use of this technology may result in job displacement, particularly in professional occupations. It is not guaranteed that an equal number of new jobs will be created to replace them, which can lead to high unemployment and potential income reduction. Regulations play a role in mitigating such impacts, such as requiring companies to invest in employee training for new jobs, limiting automation usage, or restricting the number of working hours per day. Lastly, regulating Artificial Intelligence also raises questions about who will govern its regulations. Artificial Intelligence can be utilized not only by companies or individuals but also by the state itself. Each jurisdiction has taken different regulatory approaches, for example, the European Union implementing the General Data Protection Regulation (GDPR).

Therefore, the role of Artificial Intelligence in education becomes an important theme that needs to be well understood and approached wisely in order to provide optimal benefits for students and society as a whole. To address the aforementioned challenges, the author conducted a literature review on the application of Artificial Intelligence in the field of education, which currently has a significant positive impact. When discussing educational technology, it is important to note that this technology is not yet fully integrated into classrooms. In the increasingly competitive environment today, there are still educational institutions that do not incorporate technology into their learning objectives. In line with this, schools in the modern era should leverage new technologies that facilitate the work of teachers or other staff members (Tjahyanti et al., 2022). Schools can utilize software or other media that can automate their tasks.

There are two approaches that can be used to implement this technology in the educational environment. First, the assistance of teachers with Artificial Intelligence systems, which function as teachers for each student. Any intelligent technology that provides customized content for each learner is now exclusively used in many classrooms in the form of intelligent tutoring systems (Molenaar, 2021). One alternative use of Artificial Intelligence is to enhance human understanding and assist humans in executing effective and efficient educational programs.

As society advances, education is driven in all fields to adapt or collaborate in solving problems. Like it or not, technology will

continue to change and rapidly transform civilization. Particularly in the Vocational and Technical Education (VTE) environment, it plays a crucial role in the social and economic growth of a nation, according to Anane (2013), who also provides information on this topic (Anane, 2013). Traditionally, vocational education has played a significant role in the development of social and economic sciences in any country, especially Indonesia. Learners who are truly prepared to work and contribute, possessing vital competencies for the industrial world, should be a focus to ensure their well-being.

According to Hidayat K. (2019), vocational education can be a solution to address unemployment issues and prepare the younger generation to face challenges in the digital era (Hidayat & Abdillah, 2019). It can be concluded that vocational education plays a vital role in preparing a skilled workforce, enhancing economic growth, and reducing unemployment rates. Vocational education should also be directed towards the needs of the job market and keep up with technological advancements. By integrating Artificial Intelligence into vocational teaching strategies, it will undoubtedly bring about significant changes and improvements in education.

The main objective of this research is to identify and analyze how Artificial Intelligence can be used to enhance the quality of learning, skill development, and the relevance of vocational education programs. The primary contribution of this research is to provide a deeper understanding of the role of Artificial Intelligence in vocational education and to

provide a framework that can be used as a guide in implementing Artificial Intelligence in this context. It is expected that this research will assist educators and decision-makers in effectively harnessing Artificial Intelligence to improve learning, skills, and the preparation of vocational students for the ever-evolving workforce.

RESEARCH METHOD

This research utilizes the literature review method, which provides an overview of studies conducted on a specific topic, identifies what has been studied and what remains to be explored, and can guide further research on the topic (Tewksbury & Mustaine, 2012). The aim of this research is to provide literature on the role of Artificial Intelligence in vocational education. Literacy refers to the language used in the research data. Data collection for this study involves gathering journals, dissertations, and books related to Artificial Intelligence, as well as relevant websites that address the same research variables. The implementation process of the literature review method includes: determining the research topic, searching for literature sources, selecting relevant literature, analyzing the articles, and compiling the literature review report. The procedure of the literature review method being illustrates in Figure 2.

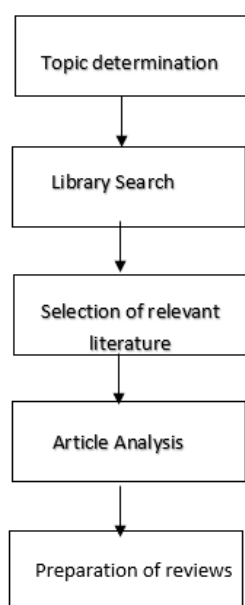


Figure 2. Literature review procedure

RESULTS OF RESEARCH AND DISCUSSION

In the field of education, Artificial Intelligence has many potential applications, as stated by Agnes Ethel (2019), who claims that Artificial Intelligence can simplify the work of teachers, especially in administrative contexts such as calculating graduation rates using student test results. Artificial Intelligence can also facilitate teachers in teaching teaching and learning activities and other types of classroom activities.

One of the benefits of Artificial Intelligence is its current ability to automate many tasks and processes that were previously only achievable by humans. Artificial Intelligence has great potential to transform the way we learn and teach in the field of vocational education. Here are some results and discussions regarding the role of Artificial Intelligence in vocational education.

Personalizes Learning

Personalized learning is a form of education that is based on personalization, tailoring learning to the strengths, needs, and interests of each student (Patrick et al., 2013). Artificial Intelligence can help personalize the learning experience for each student. By monitoring students' progress in real-time, Artificial Intelligence can adjust the content and difficulty level of the material according to the students' needs and abilities. This will help ensure that every student receives a learning experience tailored to their needs. One example of the use of Artificial Intelligence in personalized learning is the adaptive learning system. Adaptive learning leverages Artificial Intelligence technology to collect data on students' learning performance and adjust the learning experience based on that data.

According to Sfenrianto (2009), they explain the model of adaptive learning system, as shown in Figure 3 (Hernawati, 2012).

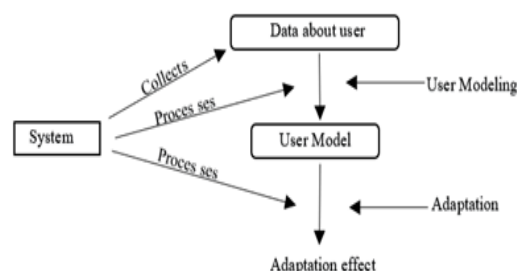


Figure 3. Adaptive Learning System Model

The process of the Adaptive system model consists of three stages, namely:

- Data collection process about the learner's profile (user profile)
- Learner model building process (user model)
- Adaptation model process

Another example is in the mathematics learning system that is tailored to the needs and abilities of students. This system will monitor and analyze students' performance in each topic and provide learning materials that are suitable for their needs. For example, if a student is struggling with geometry, the system will provide additional exercises and supplementary learning materials to help them understand the topic. In addition, Artificial Intelligence technology can also assist teachers in personalizing the learning experience. A teacher can utilize Artificial Intelligence technology to make recommendations for appropriate learning materials for each student based on the data obtained from students' learning performance. A virtual tutoring system that can assist students in understanding concepts and overcoming learning difficulties. This system will provide feedback and additional exercises automatically based on the students' answers and correct their mistakes. By utilizing Artificial Intelligence technology for personalized learning, students can acquire a more effective and efficient learning experience according to their needs and abilities.

Prediction of Student Progress

Artificial Intelligence can gather data from various sources to assist in predicting students' future progress. By utilizing historical data, Artificial Intelligence can estimate whether students will succeed or require additional support in achieving their goals. This will enable teachers and educators to more effectively assist students in reaching their full potential. An example of using Artificial Intelligence in

predicting student progress is by employing Machine Learning methods to analyze patterns in students' past progress data and using those patterns to forecast their future progress. Machine learning can be defined as the application of computer algorithms that learn from data and generate predictions for the future (BOLDBERG, 1989) . The learning process involves two stages, namely training and testing, which are aimed at acquiring intelligence (Huang et al., 2006). Recent research reveals that machine learning can be categorized into three types: Supervised Learning, Unsupervised Learning, and Reinforcement Learning (Somvanshi et al., 2016).

The relationship between artificial intelligence and machine learning can be explained in Figure 4.

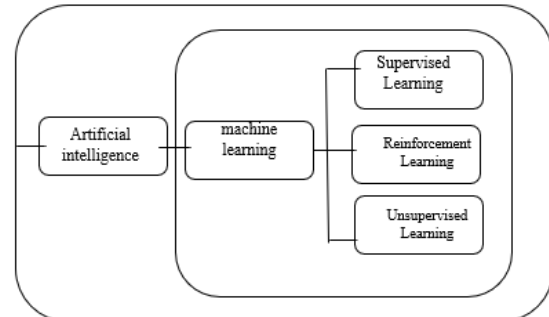


Figure 4. Artificial Intelligence & Machine Learning Diagram

Supervised Learning is a classification method where a labeled dataset is provided to classify unknown classes. On the other hand, Unsupervised Learning techniques, often referred to as clustering, do not require labeled data and the results do not identify examples in predetermined classes (Thupae et al., 2018). Meanwhile, Reinforcement Learning typically lies between Supervised Learning and

Unsupervised Learning. This technique operates in a dynamic environment where the concept is to achieve goals without explicit notification from the computer when the goals have been accomplished (Das & Nene, 2017). For example, an Artificial Intelligence system can learn from students' progress data such as grades, classes, gender, attendance records, etc., from previous years. Then, the Artificial Intelligence system can use this data to create a model that can predict students' future progress based on the available characteristics and data. With this model, teachers or school administrators can monitor and predict students' progress more accurately, and they can also provide appropriate recommendations or interventions if needed. For example, if the Artificial Intelligence system predicts that a particular student is likely to face difficulties in a subject, the teacher can provide additional guidance or take other actions to support the student. In the development of Artificial Intelligence systems for predicting student progress, it is crucial to consider privacy and data security factors concerning the students involved in the system.

Automated Assessment System

Artificial Intelligence can assist in automatically and quickly evaluating students' performance. By utilizing natural language processing and machine learning technologies, Artificial Intelligence can read and assess student assignments within a very short time. This enables teachers and educators to provide instant feedback and help students improve their skills. In Figure 5, the Automated Assessment Systems is explicated. This system utilizes optical character recognition (OCR) technology and artificial intelligence to collect, analyze, and evaluate students' written exam answers. The system can generate student scores automatically, reducing the time and costs required for manual assessment. Automated Essay Scoring (AES) is defined as computer technology that evaluates and scores written prose. AES systems are developed to assist teachers in low-stakes classroom assessment and provide contributions to companies and governments in large-scale high-stakes assessment. It is used to help address issues of time, cost, reliability, and generalization in writing assessments (Bereiter, 2005).

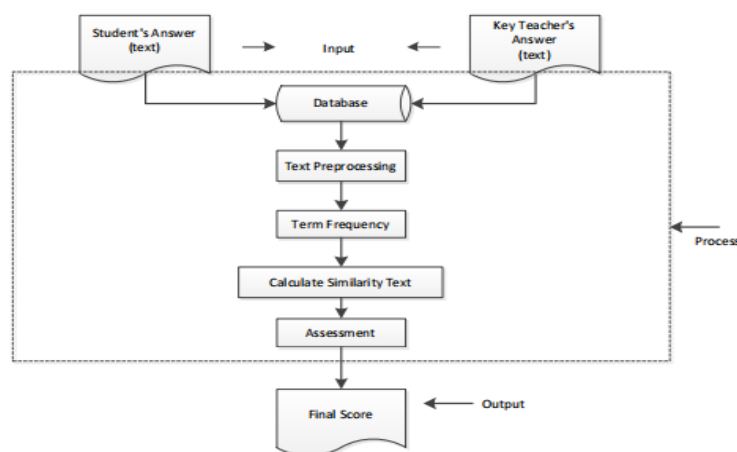


Figure 5. Design Architecture System AES

Automated Employee Selection System. This system utilizes Artificial Intelligence to evaluate candidates' resumes, interviews, and online tests. The system can select the most suitable candidates for the job based on their skills, experience, and qualifications. Automated Performance Evaluation System. This system can be used to evaluate employee performance based on data such as productivity, work quality, attendance, and punctuality. By utilizing machine learning technology, the system can identify patterns in the data and provide feedback to employees and managers. Automated Plagiarism Detection System. This system utilizes artificial intelligence technology to analyze and compare texts to detect suspicious similarities. With this system, plagiarism assessments can be conducted quickly and accurately. Automated Credit Assessment System. This system is used by banks and financial institutions to assess the credit risk of customers based on financial data, credit profiles, and other personal information. The system can process data automatically and provide credit decisions within a short time.

Game-Based Learning

Artificial Intelligence can help make learning more enjoyable and engaging through games. By utilizing machine learning technology, Artificial Intelligence can adapt games and content to the appropriate difficulty level based on students' abilities. This will help students become more interested in learning and enhance their motivation to achieve learning goals. Game-Based Learning is a teaching method that utilizes game applications or

specially designed games to facilitate the learning process and enhance students' effectiveness in learning. Research shows that GBL has the ability to increase students' motivation in learning. This is because game-based learning environments can inspire students and provide them with ample opportunities to enhance their learning in an enjoyable manner (Jean-Charles, 2018). One example of game-based Artificial Intelligence is Duolingo. Duolingo is an intelligent application designed to assist students in the process of learning foreign languages in a modern and user-friendly way. Duolingo was developed by Luis von Ahn and his colleague Severin Hacker, starting in 2009 and launched in 2012. Initially, Duolingo only offered English, Spanish, and French courses. However, as it evolved, Duolingo now provides 66 different language courses and is available in 23 languages. In addition to the web version, Duolingo is also available on various operating systems such as Android, iOS, and Windows Phone. Duolingo teaches us how to write sentences correctly in the context of the English language. It also teaches us to practice pronunciation and listening skills until we become proficient. Moreover, we can gradually learn English step by step, starting with the basics such as introducing objects and describing qualities. Learning through the Duolingo application is highly engaging for students.

Virtual Mentor

Internet is now widely used as a means of disseminating information, acquiring understanding, and exchanging ideas on various topics. The main partner program of the Lab

System, which functions more like a multimedia learning environment with integrated e-Learning, is called Virtual Mentor. According to the Journal of Computer Information Systems, virtual mentoring is a more useful feature compared to traditional classroom instruction. AI functions that are currently widely implemented in various educational technology platforms, especially those based online, serve as virtual mentors. AI can provide feedback on students' learning activities and exercises, and then recommend materials that need to be reviewed, just like a teacher or tutor. One example of its implementation is Blackboard, which is widely used in universities in Europe and America. This AI tool is frequently used by professors to publish lecture notes, assignments, quizzes, and tests, allowing students to ask questions and submit assignments for assessment. The tool can identify the reasons behind students' misunderstandings and offer solutions that have been provided by the professor and programmed in advance. This AI system will continue to learn and update information autonomously based on the needs and constraints faced by students. The concept of Blackboard is actually inspired by the conventional chalkboard present in every classroom and discussion room. In learning, Blackboard serves as the center and medium for displaying instructional materials from the teacher to the students, as well as the place for generating ideas, discussions, problem-solving, and new insights. How Blackboard AI works, by developing comprehensive and cooperative solutions and problem-solving, illustrated in Figure 6.

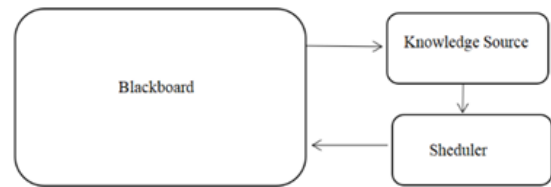


Figure 6. Working System of Blackboard AI

a. Blackboard

Blackboard is a common data structure for knowledge sources. The blackboard represents the current status of the problem space. The blackboard typically contains multiple levels of descriptions about the problem space. These levels may have some relationships with each other. These levels are part of the same data structure. If multiple data structures are needed, the representation is divided into panels, and each panel can now accommodate multiple levels.

b. Knowledge Source

Knowledge sources are components that contribute solutions to the problem. They are everything that reads from the blackboard and suggests some changes to the blackboard. Typically, knowledge sources are disconnected from other knowledge sources.

c. Scheduler

The scheduler controls and decides which knowledge source will have the opportunity to modify the blackboard. For each execution cycle, the scheduler observes the changes made to the blackboard and activates the knowledge source to execute the next change.

Voice Assistant

Voice assistants serve as aids in information absorption without the need for

reading. Different human cognitive abilities, such as absorbing information through auditory means as opposed to reading, have led to the emergence of voice assistants. In a proceeding, Voice Assistant is described as a specific IoT device that provides an understanding from the teacher's perspective. The article reports on the perception of teaching services in integrating voice assistant technology, which will indicate the future classroom conditions (Jean-Charles, 2018). Voice Assistant is a technology that enables users to command devices to perform various services and answer any user queries. Voice assistants are artificial intelligence (AI) programs designed to assist humans in using smartphones or computers, as they can detect the language we speak. Virtual assistants are increasingly being developed by various companies. Apple has its virtual assistant called Siri, Microsoft has Cortana, and Amazon has Alexa. Most smartphone markets are equipped with Google Assistant technology (Supiandi, 2016). Not wanting to be left behind in the information technology industry, a company as large as Google, which operates in the internet services and products sector, has created a virtual assistant named Google Assistant. Voice assistants allow students to search for materials, reference questions, articles, and even books by simply speaking or mentioning keywords.

Smart Content

Smart Things is one of the Internet of Things (IoT) devices. Smart Things play an active role in daily life. In an article from the Journal of Future Computer and Communication, one of the implementations

mentioned is Nabaztag. Violet Nabaztag rabbit interacts with music via Wi-Fi (Madakam et al., 2015). This application provides information such as weather updates, current news (RSS feeds), alarm clock functionality, and stock market reports. In the field of education, this application serves as Smart Content that provides the latest material content, reading materials from newly published books, and information search based on the learning needs covered. In a study on the quality development of Smart Contents in the field of education, an article discusses a comparison of traditional learning, e-learning, m-learning, u-learning, and smart learning. This comparison is based on intelligent personalized study, cooperative activities, bi-directional communication, participant activities, sharing activities, intelligent study information management, time limitations, information generation study, social networking implementation, convergent educational media implementation, and non-linear study. With the presence of smart learning, learning will embody characteristics such as self-directedness, motivation, adaptability, resource availability, and technology integration. The implementation of smart content as a teaching and learning strategy aligns with smart quality standards.

CONCLUSIONS AND SUGGESTIONS

Conclusion that in vocational education, Artificial Intelligence can be used to enhance students' learning experience by providing customized content based on individual needs and abilities. Artificial Intelligence can also assist teachers in assessing student progress

more effectively and providing timely and accurate feedback. Furthermore, Artificial Intelligence can also aid in the development of a more relevant curriculum aligned with the demands of the current and future job market. By utilizing this technology, educators can predict future industry needs and design relevant training programs to equip students with the necessary skills. However, the use of Artificial Intelligence technology in vocational education also poses several challenges, such as concerns about the replacement of educators by Artificial Intelligence and the potential biases in the algorithms used by Artificial Intelligence. Therefore, it is important for educators to consider ethical aspects and develop policies that ensure responsible and effective use of Artificial Intelligence technology in vocational education.

REFERENCE

- Anane, C. A. (2013). Competency based training: Quality delivery for technical and vocational education and training (TVET) institutions. *Educational Research International*, 2(2), 117–127.
- Anitah, S. (2009). *Teknologi pembelajaran*. Yuma Pustaka.
- Bereiter, C. (2005). *Education and mind in the knowledge age*. Lawrence Erlbaum Associates.
- BOLDBERG, D. E. (1989). Genetic algorithms in search. *Optimization and Machine Learning*.
- Das, S., & Nene, M. J. (2017). A survey on types of machine learning techniques in intrusion prevention systems. *2017 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET)*, 2296–2299.
- Hernawati, K. (2012). Desain elearning adaptif berbasis cognitive style untuk pembelajaran matematika SMA kelas XII IPA. *PYTHAGORAS Jurnal Pendidikan Matematika*, 7(1). <https://doi.org/10.21831/pg.v7i1.2835>
- Hidayat, R., & Abdillah, A. (2019). *Ilmu pendidikan: konsep, teori dan aplikasinya*. Lembaga Peduli Pengembangan Pendidikan Indonesia (LPPPI).
- Huang, G.-B., Zhu, Q.-Y., & Siew, C.-K. (2006). Extreme learning machine: theory and applications. *Neurocomputing*, 70(1–3), 489–501. <https://doi.org/10.1016/j.neucom.2005.12.126>
- Jean-Charles, A. (2018). Internet of things in education: Artificial intelligence voice assistant in the classroom. *Society for Information Technology & Teacher Education International Conference*, 883–885.
- Kaplan, A., & Haenlein, M. (2019). Rulers of the world, unite! The challenges and opportunities of artificial intelligence. *Business Horizons*, 63. <https://doi.org/10.1016/j.bushor.2019.09.03>
- Kusumadewi, S. (2003). Artificial intelligence (teknik dan aplikasinya). In *Yogyakarta: Graha Ilmu*. Graha Ilmu.
- Luger, G. F. (2005). *Artificial intelligence: structures and strategies for complex problem solving*. Pearson education.
- Madakam, S., Lake, V., Lake, V., & Lake, V. (2015). Internet of Things (IoT): A literature review. *Journal of Computer and Communications*, 3(05), 164. <https://doi.org/10.4236/jcc.2015.35021>
- Molenaar, I. (2021). Personalisation of learning: Towards hybrid human-AI learning technologies. *Blockchain, and Robots*, 57–77. <https://doi.org/10.1787/589b283f-en>
- Patrick, S., Kennedy, K., & Powell, A. (2013). Mean what you say: Defining and integrating personalized, blended and competency education. In *International Association for K-12 Online Learning*. ERIC.
- Rich, E. (1983). *Artificial intelligence*. McGraw-Hill, Inc.

- Somvanshi, M., Chavan, P., Tambade, S., & Shinde, S. V. (2016). A review of machine learning techniques using decision tree and support vector machine. 2016 *International Conference on Computing Communication Control and Automation (ICCUBEA)*, 1–7. <https://doi.org/https://doi.org/10.1109/ICCUBEA.2016.7860040>
- Supiandi, I. (2016). Analisis digital assistant versi cortana, siri dan google now. *INFOTECH Journal*, 1(2). <http://dx.doi.org/10.31949/inf.v1i2.39>
- Tewksbury, R., & Mustaine, E. E. (2012). Cracking open the black box of the manuscript review process: A look inside Justice Quarterly. *Journal of Criminal Justice Education*, 23(4), 399–422. <https://doi.org/10.1080/10511253.2011.653650>
- Thupae, R., Isong, B., Gasela, N., & Abu-Mahfouz, A. M. (2018). Machine learning techniques for traffic identification and classification in SDWSN: A survey. *IECON 2018-44th Annual Conference of the IEEE Industrial Electronics Society*, 4645–4650. <https://doi.org/10.1109/IECON.2018.8591178>
- Tjahyanti, L. P. A. S., Saputra, P. S., & Santo Gitakarma, M. (2022). Peran artificial intelligence (AI) untuk mendukung pembelajaran di masa pandemi Covid-19. *KOMTEKS*, 1(1).