CHALLENGES AND OPPORTUNITIES FOR IMPLEMENTING ARTIFICIAL INTELLIGENCE IN VOCATIONAL EDUCATION

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Abstract: The fourth industrial transformation, known as Industrial Revolution 4.0, is currently developing very rapidly, of course, the revolution that emerged perfected previous technology and caused the emergence of new things that had never existed and happened before. Technology currently uses computer assistance to mimic human intelligence in carrying out daily tasks and work. The emergence of Artificial Intelligence or what is commonly known as Artificial Intelligence (AI) has become a challenge and opportunity for vocational education in carrying out learning on campus. The development of AI technology has a very significant influence on learning, especially vocational education. This study aims to determine the challenges and opportunities of AI in vocational education. The method used in this research is a literature study technique sourced from articles, journals, and relevant documents to support this research. The results of the study show that AI has an important role in supporting learning in vocational education. However, Au can have harmful effects if not used according to proper science. In implementing artificial intelligence in learning, humans need to understand that AI imitates the human way of lifelong learning.

Keywords: challenges, opportunities, artificial intelligence, vocational education

INTRODUCTION

Developments in the current era of Industrial Revolution 4.0 are marked by extraordinary improvements in the field of internet technology. Computers with their abilities continue to develop like humans who continue to learn so that they become smarter and more powerful because they are connected to a large network called the internet as a source of continuous learning. A very well-known term marking the Industrial Revolution 4.0 is "Internet of Things" or known as IoT. The use of smartphones that are connected to the internet and become equipment that people use every day has also become a trigger for producing new services that were previously unknown to

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society. The industrial revolution 4.0 is marked by the existence of artificial intelligence better known as artificial intelligence (AI) and machines that can learn through programming are also developing very quickly. Due to technology advancements in this period, employment has been lost as AI replaces these jobs, yet many new jobs have evolved that may become professions of the modern era.

Era 4.0 education is education that is influenced by the presence of the Industrial Revolution 4.0 where the crit of education is the use of digital technology or cyber systems in the learning process. The use of digital technology can enable a learning process to take place without any limitations of space and time, learning is not limited to just the classroom and during study hours in general but can be done anytime and anywhere. The 21st century is experiencing very rapid changes in educational practices, most of which are caused by technological advances such as artificial intelligence (Baidoo-Anu & Owusu Ansah, 2023) This is homework for the world of education in Indonesia because it is not an easy thing to realize but it is also not impossible. The challenges that must be faced are changes in ways of learning, patterns of thinking, ways of acting, and availability of access to developing creative innovations in Indonesian education (Surani, 2019).

This is in line with Jack Ma (2018) who said that education is a big challenge in this century. The challenge for the world of education is that if we do not change the way we educate and how we teach, then in the next 30 years we will experience great difficulties. Changing the way of learning and education according to future needs and demands will produce students who have good attitudes, adequate skills, and can compete with machines. Therefore, it is necessary to prepare educators who have quality qualifications and competencies.

Artificial Intelligence is a reference to the ability of a computer or computer system to imitate and carry out tasks that usually require human intelligence or learning how humans think (Pongtambing et al., 2023; Supriyadi & Asih, 2020). Advances in artificial intelligence technology coupled with the Internet of Things (IoT) have changed human thought patterns, actions, and daily activities (Girasa, 2020).

Experts believe that the development of artificial intelligence will continue to accelerate and have a major impact on various aspects of human life, including aspects of business, transportation, health, and education. As Elon Musk stated AI is more dangerous than nuclear, therefore AI continues to develop very quickly and cannot be controlled, where its intelligence exceeds human intelligence, and creates unexpected events beyond human predictions (Rahardja, 2022). According to a 2018 Pew Research Center survey, 65% of respondents expressed concern that AI technology could eventually replace humans in their jobs, where some of the work done by humans would be replaced by AI or machines. Additionally, A Gallup survey in 2019 found that 58% of Americans worry that AI is being used unethically or incorrectly (Anggreaini, 2023). This is a challenge that humans must be prepared for, one of which is in the world of education, where the learning process can involve AI as a supporter rather than replacing the lecturer's position as a teacher.

The use of artificial intelligence is currently used in fields including the health sector (Pabubung, 2023), and businesses ranging from small to large businesses including Amazon, Netflix, Flipkart, and YouTube to improve the systems and processes carried out, generating more income, and taking the right decision (Rahardja, 2022), industrial

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sector, educational sector. In the banking sector, there are challenges and opportunities in developing AI which includes four things, namely data, human resources, ethics, and regulations, as well as research and innovation. The challenge with data is that the quality and quantity of data from units in Indonesia with open edicts is still minimal. However, the opportunity is the government's efforts to implement a data study program through Presidential Regulation Number 39 of 2019. Regarding human resources, the challenge faced is that talent and education in the field of AI are still limited. Apart from that, opportunities for AI talent need to continue to grow rapidly. Ethics and regulatory aspects are hampered by the absence of regulatory instruments that regulate AI ethics and regulations in Indonesia. So, a clear legal umbrella is needed for the use and development of AI. The development of AI, especially in the fields of research and innovation, is a challenge for harmonizing links and matches between the world of academia, industry, government, and the community which is still not optimal. A conducive start-up ecosystem in Indonesia is a big opportunity for the development of AI (Sari, 2023).

According to Prof. Dr. H. R. Poppy Yaniawati, M.Pd., in the field of education, AI offers promising potential, especially for increasing the efficiency and effectiveness of learning (Reta, 2023). AI can provide learning individually and according to student needs. Apart from that, teachers can also provide and provide more targeted learning and adapt it to students' learning styles, ability levels, and interests.

Vocational education is one of the levels of education contained in Law Number 20 of 2003. In the Law, it is written that vocational education is higher education that prepares students to have a job with the skills to have a job with certain applied skills as well as a *program sarjana* (explanation of chapter 15). The conclusion is that vocational education is education that prepares certain applied skills for students (Murnomo, 2010).

Vocational education is an important pillar in preparing the young generation to become competent, skilled, and competitive workers in the industrial world. This level of education is in line with the vision and mission of the Indonesian government through the Directorate of Vocational Education (*Ditjen Vokasi*) of the Ministry of Education, Culture, Research and Technology (*Kemendibudristek*) (Rosmanti, 2023). President Joko Widodo said on several occasions that the changes taking place in Peru need to be accompanied by improving the quality of Human Resources (HR) to keep up with these very rapid changes. The internet is now shifting to mobile internet, from mobile shifting to AI, robotics, and Tesla hyperloop. Vocational education such as polytechnics and vocations exists to produce superior Indonesian human resources so that they are not left behind by other countries (Dirjen Vokasi, 2020).

In the educational process at vocational universities, AI can be used to answer the challenges and role of vocational education in the world of work. There are five points of argument for vocational and vocational education taking a very big role, namely being able to face global trade, having intensive skills, having sufficient skills, having a good contribution to achieving national goals, and having a link and match perspective.

One of the biggest challenges related to AI in education is data security, technology dependency, and injustice in access some students have access to technology, and some are limited in being able to access technology in learning. Other challenges from AI such as technical skills, availability of resources, and changing roles (Pongtambing et al., 2023) are challenges that students need to be prepared for so as not

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to harm the learning process which must continue to be carried out with the help of AI, without relying completely on AI.

According to Wardiman (1998) in Suyitno, the characteristics of vocational education have the following characteristics (Suyitno, 2020) aimed at helping students prepare to enter the world of work, based on "demand-driven" (the needs of the world of work), emphasizes mastery of knowledge, skills, attitudes, and principles required by the world of work.

Evaluation and assessment of students' success must be based on their performance in the world of work, or "hands-on"

Establishing close relationships with the world of work is the key to successful vocational education,

Be responsive and anticipatory towards technological developments,

More emphasis on hands-on experience or practical experience and "learning by doing" or "learning by doing",

requires modern and up-to-date practice facilities,

Requires greater costs for operations and investment compared to general education.

These characteristics are very relevant to the existence of artificial intelligence where students pursuing higher vocational education must have the skills and knowledge needed in jobs that currently use technology. Therefore, students must be responsive to technological advances in learning by utilizing various sources including artificial intelligence. In the future, students will also be exposed to the process of "learning by doing" and hands-on experience, where students are ready to learn while trying and finding their own experience in learning something according to the field of science being studied.

According to Muhammad Yasin (2021), Mathematics Lecturer at FMIPA State University of Malang and Chair of the Kediri Regency National Education Commission, stated that AI can be used to present learning material, carry out assessments, and provide feedback for learning. Some examples of the application of AI to support learning include Intelligent Tutoring Systems (ITS), Virtual Mentors, Voice Assistants, Smart Content, Automatic Assessment, Personalized Learning, and Educational Games (Yasin, 2021).

Accelerated teaching and learning if supported by AI where previous research shows that generative AI and ChatGPT provide benefits related to the progress of teaching and learning. The great potential of AI is that it can be used to support personalized learning, carry out assessments both multiple choice and description automatically, language translation, interactive learning, and adaptive learning (Baidoo-Anu & Owusu Ansah, 2023)

The opportunity for implementation in Vocational Higher Education is personalized learning where AI can explain precision education from a personalized learning perspective by combining the knowledge and intelligence of experienced teaching staff into the decision-making process in the learning system to analyze the status of inferential behavior of individual learning students (Ingkavara, Panjaburee, Srisawasdi, & Sajjapanroj, 2022).

In this case, learning can be personalized according to students' learning needs and speed of learning. There is some recent research and it has even been made into a product, where AI has been used in the educational sector to facilitate a personalized and adaptive

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learning process. Not only that, in the health sector, AI is also used in diagnosing and providing better treatment. In contrast, in the field of agriculture, AI can support efficiency in producing products and managing resources. Thus AI should be applied by ethical and sustainable principles, the use of AI must be followed by a sense of responsibility, respecting each other's privacy, and avoiding negative impacts on society and the environment (Pabubung, 2023)

Furthermore, AI can be used to evaluate student assignments automatically. Utilizing AI to evaluate student assignments can help lecturers check student assignments and provide good feedback to students more quickly. Evaluation using e-learning can be in the form of quizzes, tests, or forms of assessment such as Quizizz, Google Classroom, Google Form, and Kahoot which can be used to evaluate learning to make it more optimal and enjoyable (Choiroh, 2021) With the help of AI to automatically check assignments, students can quickly display results and evaluations in the form of grades or feedback from the assignments they have complete

The purpose of evaluation in education is: a) providing clarification about the nature of the learning outcomes that have been carried out, b) providing information to students about the short-term achievements of the objectives that have been implemented, c) providing input suggestions for further learning progress, d) providing information about the difficulties experienced in learning and choosing appropriate learning methods based on the learning experiences experienced (Pambudi & Wibawa, 2020).

Artificial Intelligence (AI) can help in creating and developing interesting, interactive, and applicable learning content. AI can be used in creating learning videos, e-learning modules, tutorials, simulations, experiments, and gamification in learning (Pendy, 2023).

The challenge of AI in vocational higher education is related to privacy because it requires student access and data. These activities are the main challenges, namely maintaining student privacy and complying with data protection, however, students must take contradictory actions (Tsai, Whitelock-Wainwright, & Gašević, 2020) because of the need for AI accessibility. Implementing AI certainly requires the ability to use and utilize AI. Teachers and students need training and education to use AI according to their needs so that it can be useful according to their scientific field (Holmes, Bialik, & Fadel, 2019).

Several things that become challenges where there are possible shortcomings in the use of AI and ChatGPT in education that need to be considered so that they can be anticipated, include: lack of human interaction due to communicating with computers/machines, limited understanding where AI learns and knows what has been taught, contains bias in data, lack of creativity, dependence on data, lack of contextual understanding, limited ability to personalize teaching (Baidoo-Anu & Owusu Ansah, 2023).

The application of AI in higher education, especially vocational education, is currently continuing to develop and is easily accessible. Therefore, teachers need to anticipate plagiarism and the originality of student works and assignments. This is done to improve the quality of education in vocational colleges. Stakeholders also prepare students to use AI as a medium for completing and increasing student learning abilities.

METHOD

This research is descriptive research using a qualitative approach. Where research data is collected using literature study techniques. A literature review is an in-depth evaluation of previous studies and research (Surani, 2019) (Darwin, Afifah, & Prajati, 2023) (Sari, 2023), namely using various written sources such as articles, journals, and relevant documents as material. study in this research. Then carry out data analysis through recording, presenting literature reviews, and current developments related to AI.

RESULTS AND DISCUSSION

Based on the explanation given in the introduction, the development of the Industrial Revolution 4.0 era cannot be avoided. Artificial intelligence continues to learn as humans learn so that AI developments become smarter and more powerful. AI is currently growing very rapidly and is being used in various fields such as business, education, health, social, and industry. Computer and internet technology which is currently popular with the use of smartphones has become a basic need for society. The use of IoT is increasingly being used because it has intelligence that can help human tasks.

The development of the Industrial Revolution Era 4.0 is marked by improvements in internet technology. This phenomenon includes tremendous growth in computer capabilities, especially with the concept of the "Internet of Things" (IoT), where devices are connected to the Internet for continuous learning. In addition, this revolution has brought significant changes to the world of education with the emergence of artificial intelligence (AI) and machines that can learn through programming.

Educational Challenges in the Era of Industrial Revolution 4.0 shows that learning is no longer limited to certain classrooms and times but can occur anywhere and at any time through the use of digital technology. The biggest challenge is changing mindsets, ways of learning, and actions, as well as ensuring equal access to creative innovation in the educational context in Indonesia. As stated by Jack Ma, it is important to change the way we educate and learn to face the challenges of this century. This change is aimed at producing students who have good attitudes, adequate skills, and the ability to compete with machines. Therefore, future educational success requires the preparation of qualified and competent educators.

The role of AI in Education is very important because artificial intelligence in education is recognized to have a lot of influence, with its ability to facilitate efficient and effective learning. AI can provide learning tailored to student needs, allowing teachers to provide more targeted guidance according to student's learning styles, ability levels, and interests. Vocational education, as part of higher education, is very relevant in preparing the younger generation to become a competent workforce in the industrial world which continues to develop. Vocational education in Indonesia is expected to improve the quality of human resources so they can keep up with rapid changes in the era of the industrial revolution.

Challenges of Using AI

The main challenges faced by vocational education in adopting AI include data

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security, unequal access to technology, and uncertainty regarding the roles of humans and machines. Nonetheless, there are significant opportunities to leverage AI in personalized learning, automated evaluation, and the development of engaging and applicable learning content.

1. Data Security

   Although AI offers many benefits, data security and dependency on technology are major challenges that need to be overcome. Vocational universities must safeguard student privacy and comply with data protection while ensuring students and teachers have sufficient skills and training to use AI well.

2. Technology Dependence

   The challenge in implementing AI is dependence on technology, where humans depend on AI assistance. The use of technological devices and the internet is an important need because it requires the results of AI processing which can be used in various ways, one of which is in decision making. When this technology is unavailable, work will be hampered or impossible to carry out.

3. Dependence on Data

   As the way AI works is by following the way humans learn, when AI works with great capabilities it needs a large amount of data to be trained so that the AI increases its ability to provide answers or solutions. AI depends on the quality and quantity of data. If the data required is insufficient or irrelevant then AI will not run optimally. As in the previous discussion, the challenge in Indonesia is that there are no open data units to become input data that can be used in utilizing AI.

Opportunities for Utilizing AI

1. Personalized Learning and Automated Evaluation:

   AI can provide benefits in personalizing learning by providing learning experiences tailored to students' needs and pace. In addition, automatic evaluation using AI can speed up the process of providing feedback to students, increasing efficiency in the educational process.

2. Learning Content Development

   AI can be used to create and develop interesting, interactive, and applicable learning content. By using AI in creating videos, e-learning modules, and educational games, vocational education can become more effective and relevant to industry demands.

3. Student and Educator Preparation:

   Vocational education needs to prepare students to face change by providing training and education related to the use of AI. Students need to have technical skills, the courage to face change, and the ability to adapt to succeed in the era of Industrial Revolution 4.0.

CONCLUSION

By understanding the opportunities and challenges of using AI in vocational education, educational institutions can design appropriate strategies to integrate this technology effectively. By ensuring that challenges such as data security and unequal access to technology are addressed, vocational education can provide better and more

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relevant learning experiences for students, preparing them for the challenges of the modern world of work. The application of AI in vocational higher education can be used to accelerate learning by utilizing AI to support learning, assist in conducting research, create innovation, and automated learning systems. The use of AI tools that are currently developing can be quickly studied and adopted to help technology-based learning.

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