

The Impact of Artificial Intelligent in Education toward 21st Century Skills: A Literature Review

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Abstract: This study aims to identify the impact of Artificial Intelligent in Education (AIED) toward 21st century skills. The method was a literature review. The research question was "What is the impact of artificial intelligent in education toward 21st century skills?". The selection and categorization of literature were carried out in the following procedures. The academic databases used to collect papers were Science Direct, Scopus, and Google Scholar. ("artificial intelligence" OR "AI" OR "AIED") AND ("21st century skills" OR "6C"). The time period under review was mainly from 2013 to 2023. It used MAXDQA for thematic analysis. The result shows that artificial intelligent in education have impact toward 21st century skills (6C); character, citizenship, critical thinking, creativity, collaboration, and communication. Various educational and learning issues are addressed using AI techniques. Learning is supported by AI, and students collaborate with AI. By collaborating students and AI, it gives the positive and negative impact toward students' 21st century skills. the impact of AIED is indeed able to facilitate students' problems in learning while the ability of students in critical thinking, creative thinking, and character will decrease.

Keywords: Artificial Intelligent, Artificial Intelligent in Education, 21st Century Skills

A. Introduction

The trend of using artificial intelligence (AI) is spreading rapidly. The phenomenon of the emergence of AI is unstoppable with the emergence of software that can be used to create, synthesize, and examine written works. A number of circles, support the development of technology because it can help humans. Meanwhile, there are many concerns circulating regarding the issue of honesty and learning ethics that have the potential to be violated.

According to searches conducted using publish or perish software, over a period of one year, there were 146 scientific studies that discussed the topic of ChatGPT in the educational context. More than 200 scientific articles about BERT and RoBERTa in the last 1 year. This means that this phenomenon is normal in the VUCA era (volatility, uncertainty, complexity, ambiguity). academics should be responsive and adaptive. However, in Indonesia there has been no scientific research that explores

this matter. The discussion about the pros and cons of AIED is an exciting and varied topic. Many educators from the baby boomers (those born before 1980) refused and questioned. Instead of detecting whether students are using this software to complete their assignments, these resistant educators are reluctant to find out how to use it. Meanwhile, millennial educators (born 1980 to 2000) can be neutral and instead are inspired to take advantage of opportunities. This software can help researchers write works, without the hassle of constructing sentences and paragraphs. Millennials are in their productive age with sufficient knowledge to control AIED. Then, how about students who are still growing in knowledge and age?

Meanwhile, to face the era of society 5.0, students must be equipped with 21st century skills (6C), namely culture, connectivity, critical thinking, creativity, collaboration, and communication. One of the characteristics of the implementation of 6C skills in the 21st century is the emergence of humanist aspects in education, such as values and character-centered education and curriculum, no longer only focusing on mastery of subject matter. Therefore, with the emergence of AIED at this time, does it have a good impact or not on students' 21st century skills?

B. Methods

This study was a literature review. The research question was "What is the impact of artificial intelligent in education toward 21st century skills?". The selection and categorization of literature were carried out in the following procedures. The academic databases used to collect papers were Science Direct, Scopus, and Google Scholar. ("artificial intelligence" OR "AI" OR "AIED") AND ("21st century skills" OR "6C"). The time period under review was mainly from 2013 to 2023. It used MAXDQA for thematic analysis.

C. Results and Discussion

The increasingly widespread use of Artificial Intelligence (AI) in daily life makes it easy for users to carry out activities. One of them is a trained language model program, namely ChatGPT. Through ChatGPT users can instruct various commands and get responses like they're talking to humans. In addition, there are still many elements of artificial intelligence that continue to help various sectors of life. Even though it has a positive impact that can speed up and provide efficiency in work, AI can be a threat to some workers. Some skills and jobs are starting to be replaced by AI.

AIED toward 21st Century Skills

Positive Impact

a. The using of AI in learning

The application of AI to student learning can be classified into four main roles: (i) assigning tasks based on individual competence, (ii) providing human-machine conversations, (iii) analyzing student work for feedback, and (iv) increasing adaptability and interactivity in digital environments (Chiu et al, 2023).

Assigning tasks based on individual competence means that tasks for student learning have been customized using AI-based environments. The most significant obstacle to the personalized learning offered by AI technologies is a lack of appropriate learning resources, both in terms of technology and implementation (Hiranker & Kittisunthonphisarn, 2020; Munawar et al., 2018; Yang & Shulruf, 2019).

Providing human-machine conversations mean AI chatbots and interactive books were used in the majority of studies, allowing students to converse with machines about their learning. Using structures that contain the expertise and knowledge of human experts, AI techniques mimic the processes of human thought. These methods have been used to create AI chatbots and language learning books that help students improve their communication skills through ongoing dialogue (Chew & Chua, 2020; Kim et al., 2021; Koc-Januchta et al., 2020; Palasundram et al., 2019; Vazquez-Cano et al., 2021). Using a question-and-answer format, students interacted with AI agents. The majority of students thought this was a useful and fun way to get answers to simple questions.

Analyzing student work for feedback means Giving students timely guidance and feedback by analyzing their work and learning process is another common use of AI (Fu et al., 2020; Porter & Grippa, 2020). An AI notebook application was used by Bonneton-Botte et al. (2020) to identify and acquire the handwriting of kindergarten students before analyzing its spatiotemporal characteristics (the shape, order, and direction of the segments). At the conclusion of each writing session, the application provided the students with feedback. Vahabzadeh et al (2018) monitored the socially aware emotions and behavior of autistic students using AI-enabled smart glasses to improve their attention.

Increasing adaptability and interactivity in digital environments mean in order to create digital environments that are more adaptable, AI technologies have been used to collect data on student learning and make interactions easier. Samarakou et al (2015) created an advanced environment for e-learning for engineering students. Westera et al (2020) used techniques like automatic difficulty adaptation, stealth

assessment, and facial emotion recognition to profile students. Additionally, they used techniques like nonverbal bodily motion and lip-synchronized speech to create non-playing characters. The adaptability and interactivity of learning were enhanced by the student characters and profiles. However, the effects of AI-supported digital environments on student learning outcomes were not addressed in these studies that focused on their creation and implementation.

b. The using of AI in teaching

AI has been given the three responsibilities of supporting teacher professional development, enhancing teachers' ability to teach, and providing adaptive teaching strategies in the classroom (Chiu et al, 2023). Not only have AI technologies been used to support teaching, but also teachers' professional development (Gunawan et al., 2021; Lampos et al., 2021). AI agents that analyzed real-time classroom data, such as teachers' responses to diagnostic tests of their pedagogical content knowledge and their behavior and questioning skills, provided teachers with suggestions and comments on their teaching. Teaching data have also been used to create models for teaching evaluation (Hu, 2021). Teachers are less likely to be offended by criticism and are encouraged to consider their teaching methods as a result of the objectivity of AI evaluators. However, only one of the reviewed articles focused primarily on teacher professional development, indicating that AI applications in teacher professional development are still in their infancy (Gunawan et al., 2021).

Enhancing teachers' ability to teach mean AI and computer-assisted instruction have been used to assist teachers in managing their classroom instruction (Yang, Oh, & Wang, 2020; Jaiswal & Arun, 2021; Nabiyeve et al., 2013; Wang & Zheng, 2020; Zhang, 2021). By efficiently uploading, assigning, and distributing learning materials and assignments, as well as by speaking out text-based problems, AI technologies have been used to support teaching in various subject classrooms (such as physical and language education). Teachers' ability to effectively manage their classrooms has been greatly enhanced by these applications (Gupta & Bhaskar, 2020; Huang et al., 2021; Jarke & Macgilchrist, 2021).

Providing adaptive teaching strategies in the classroom mean the goal of intelligent tutoring systems is to suggest lessons and activities that are appropriate for teaching needs (Aldeman et al., 2021; Bellod et al., 2021). Lampos et al (2021) analyzed the responses and characteristics of the students to make recommendations for teachers of autistic students regarding effective communication methods. Standen et al (2018) and Luo (2020) used multimodal sensor data and AI systems to determine the affective states of students and assist teachers in selecting the most effective presentation of content, teaching methods, and communication strategies. Based on the instant feedback that was provided by an academic writing software package regarding individual and class processing of learning material, educators modified

their teaching methods. However, our investigation revealed two major obstacles in this sector. First, these intelligent systems haven't been tested in real life. A lack of participants and a short experiment duration were cited as limitations by some researchers in their studies. Second, the objective evaluation of these systems and the beneficial advancement of associated technologies are hampered by the absence of any criteria for their effectiveness.

c. The using of AI in assessment

In assessment, AI has been given two primary responsibilities: predicting students' performance and providing automatic marking. Predicting students' performance mean predicting student performance appears to have been made easier by AI technologies, especially in online education (Akmese et al., 2021; Costa-Mendes et al., 2021; Yu, 2021). By looking at how much and how well students participate in learning activities like discussion forums, they have demonstrated that they can predict how well students will do in online courses. Because there are no teachers in distance education, this functionality is very important. However, it is difficult to select data for prediction. Costa-Mendes et al (2021) argued that AI predictive models may not be compatible with the student data used in traditional statistics. For instance, AI models could not use the existing data on scholarship assistance, family income support, and county socioeconomic status to accurately represent socioeconomic variables.

While providing automatic marking mean for language writing and speaking as well as mathematics, AI-enhanced grading systems outperformed teachers in terms of accuracy, speed, and safety when grading tests and exams. In online learning, the systems were also able to return immediate marks for formative feedback. However, the majority of the automated grading and marking was confined to a small number of disciplines and domains, such as language learning, indicating that this AI application is still in its infancy. The technology would be extremely difficult to implement in actual educational settings (Sun, 2021; Fu et al., 2020; Kumar & Boulanger, 2020).

d. The using of AI in administration

AI's three primary functions in administration are to (i) enhance the performance of management platforms, (ii) provide convenient and individualized services, and (iii) provide evidence-based support for educational decision-making (Chiu et al, 2023). Enhance the performance of management platforms Assigning AI-enabled routines to tasks like scheduling courses and managing personnel data made these platforms more efficient for administrators and made them more secure by adding a facial authentication function for portal management and examinations (Khan & Alotaibi, 2020; Li, 2020; Liu & Wu, 2019; Li, 2020).

Provide convenient and individualized services mean personalized academic and non-academic recommendations made by AI technologies have improved staff productivity and quality. Some administrative tasks can be done by AI technologies instead of staff. However, the user models' limited accuracy was a common flaw in these studies. Although the studies used data such as age, gender, and behavior, intelligent recommendations are based on the idea that systems can build user models (Li, 2021).

Provide evidence-based support for educational decision-making mean educational administrators and management teams now have evidence to back up their decisions thanks to AI technologies. AI agents can identify the factors affecting student academic performance, predict the likelihood of students dropping out of classes, and assist students in choosing courses if they have access to big data (Cukurova et al., 2019; Tsai et al., 2020). As a result, AI can provide information for academic advising and administrative decision-making. However, just like the other AI roles (such as selecting suitable data for predictive models), this area's applications face similar obstacles.

e. Negative Impact

Although AI has the potential to impact education systems, like any other technology, it depends on how this technology is used and applied. Therefore, it is important to carefully consider the potential impact of AI on education systems and to work with teachers to ensure that AI is used in ways that benefit all students.

- 1) Teachers and students will be lazier. It happens because most of the activities have been done automatically by AI (Zawacki-Richter et al, 2019).
- 2) Eliminating human jobs. When Ai is used for administrative matters at school, it does not rule out the possibility that it will eliminate the role of administration at school (Wang & Cheng, 2021).
- 3) Do not have common sense. AI is indeed able to learn and work on its own like humans. It's just that the AI cannot understand the purpose for which the information was created. Because a thorough understanding can only be possessed by humans (Zawacki-Richter et al, 2019).
- 4) Work according to instructions. AI will work according to the program settings made. So that AI will work according to data and instructions that have been entered for specific tasks, AI cannot function to carry out other tasks outside of what is programmed.
- 5) AI is still inferior to information processing that is vertical and requires a complex sense. AI until now has only been able to work in parallel for tasks that are routine/repetitive in nature. Even though it can learn on its own, AI will work specifically according to the programmed input and data. For example, AI which functions to correct student learning outcomes cannot

function to carry out other functions such as finding materials and learning resources.

- 6) High risk of cracking. AI has data and information stored digitally and online. This makes important information very likely to be hacked by other people who are irresponsible and harmful.
- 7) Definitely will be broken. Everything that is made by humans, especially technology and machines will one day be damaged. Likewise with AI systems, it is likely to experience interference or damage which can lose your important data and information. So always make sure that important data and information is duplicated.

It is important to adopt new innovations in the field of education, but we must realize that every new thing, especially related to technology, will always have positive and negative impacts. So as an educational person it is appropriate to use the existing technology wisely and well.

The Impact of AIED on 21st Century Skills

This era produces automation and artificial intelligence where jobs that require hard skills will decrease while jobs that require hard skills will decrease relying on soft skills will be even greater. Thus, humans are required not only to master knowledge and technology, but must master the soft skills that support success in work and society also. Soft skills are the character traits and interpersonal skills that characterize relationships someone with someone else (Purnami & Rohayati, 2013). soft skills refer to groups of personality traits accepted by society such as communication, language, habits a person, friendliness, and optimism that characterize relationships with other people.

Soft skills in 21st century includes: critical thinking, collaboration, communication, creativity, culture, and connectivity which is called 6C (Aslan, 2015; Binkley et al, 2012). Critical thinking refers to the way a person filters, analyzes and questions any information they may come across. Collaboration refers to a person's way use different personalities, talents, and knowledge to work together and produce something new. Communication refers to the ability to convey ideas and information in a clear and meaningful way. Creativity refers to a person's ability to utilize their knowledge and/or talent to create something new, or to produce something in a new way. Culture is a person's ability to relate with everything that surrounds them, to know and appreciate where they are originate from, and the values and beliefs held by people in their society, and their history. Connectivity is the ability of individuals to always be connected with the world (Rotherham & Willingham, 2009; Scardamalia, 2012; Ananiadou & Claro, 2009).

The 6C skills are very useful for success in the world of work and society so there needs to be an effort to develop this in the world of education, especially at the university level. This is in line with one of the goals of Higher Education, namely developing the potential of students to become human beings who believe and fear God Almighty and noble, healthy, knowledgeable, capable, creative, independent, skilled, competent, and cultured for the benefit of the nation. For this reason, the 6C skills need to be integrated learning so that students can behave well, are ready to enter the world of work, and be successful.

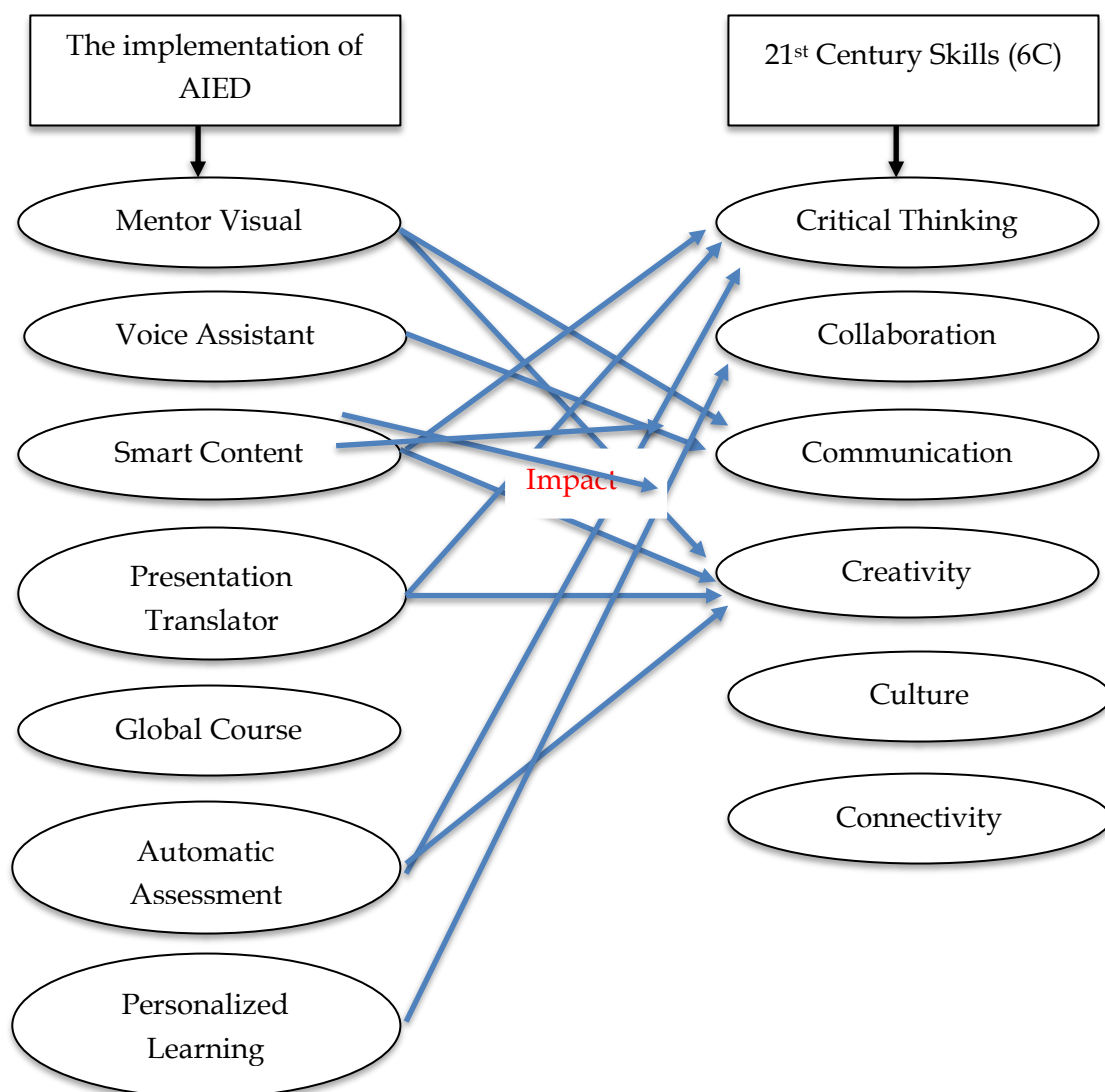


Figure 1. AIED impacts 21st century skills (6C)

AI has been used in various fields, one of which is education. However, the development of AI technology also brings challenges for the nation and state. One of the main challenges of AI is the loss of jobs. In recent years, AI has replaced the

routine and simple tasks that were previously performed by humans. It causes many people to lose their jobs and triggers social and economic problems. In addition to economic concerns, the use of AI also poses ethical challenges. As a technology that can make its own decisions, AI must be programmed with the right moral values. However, this is not always easy to do.

The development of local AI technology is also a challenge for the nation and state. Today, most of the AI technology comes from abroad. It leads to dependence on foreign technologies and a lack of innovation in developing local AI technologies. To overcome this challenge, support from the government and investment in research and development of local AI technology is needed. Thus, nations and countries can develop more independent and innovative AI technologies. innovative AI technology that can actually improve 21st century skills (Anugerahwati, 2019). So that students and teachers will not be disturbed by developments in this era of artificial intelligence. they will be ready to face the era of society 5.0, especially in Indonesia.

D. Conclusions

Government efforts to control or limit the use of AI technology in educational sectors by the regulation. It can be laws, rules or safety standards with the aim of ensuring the legal, moral and open use of AI technology while safeguarding the common good. Because artificial intelligence systems sometimes use incomplete or biased data. The outcome and choice of artificial intelligence systems can be affected by these biases. Humans may become too dependent on artificial intelligence when doing things that it is difficult to think critically and solve problems on their own.

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