Contribution of Artificial Intelligence (AI) in Education to Support the Achievement of Sustainable Development Goals (SDGs) 2030

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Abstract: This research aims to find out the contributions and threats of AI in education so that it can contribute to technological development in the SDGs 2030 era. The method in this research is qualitative using literature study. The contributions of AI in education include personal virtual tutors, adaptive learning systems, learning Chabot, game-based learning, AI based assessment systems, educational data analysis, automatic evaluation, accessibility and inclusiveness, assistants for learning, and helping to develop curriculum. The contribution of AI in education is very helpful for students to improve their skills and knowledge. It is expected that more will be able to participate in SDGs 4 (Quality Education). Threats of AI in education include data privacy and security, technology gaps, dependence on technology, fraud, and algorithm imperfections. Thus, there should be collaboration with AI experts to develop strategies and data simulations to minimize the threats.

Keywords: AI; Education; Platform; Technology

Introduction

Indonesia has contributed to the achievement of the 2030 Sustainable Development Goals (SDGs) 2030 (Fadilah et al., 2024). Sustainable Development Goals (SDGs) aim to meet sustainable development globally in the form of action plans for society, environment, welfare, and world peace. There are 17 sustainable development goals in the field of education. Education is included in point 4, namely "Quality Education". The goal of equality education ensures inclusive equality education and increases lifelong, learning opportunities for all (https://sdgs.bappenas.go.id/17-goals/goal-4/). Thus, this goal supports the reduction of disparities and inequities in education, both in terms of access and quality. It recognizes the need to provide quality education for all, and most especially vulnerable populations, including poor children, children living in rural areas, persons with disabilities, indigenous people and refugee children. Sustainable development hinges on every child receiving a quality education (https://data.unicef.org/sdgs/goal-4-quality-education/).

Indonesia's education quality according to UNESCO is now ranked 64th out of 120 countries in the world. Based on the Indonesian Education Development Index, Indonesia ranked 57th out of 115 countries in 2015 (Fadilah et al., 2024). Meanwhile, according to the Program for International Student Assessment (PISA) 2022, which was announced on 5 December 2023, Indonesia is ranked 68th in terms of education quality. In 2022, there was an average decline of 2-13 points in math, reading, and science compared to 2018. The PISA scores for 2022 are the lowest overall. The inconsistently low PISA scores of Indonesian 15-year-old students suggest that Indonesia's 21st-century competencies such as problem-solving and critical thinking are still inadequate (Nurfatimah et al., 2022).

Education is an important aspect in reviewing the development of digital technology (Sholichin et al., 2023). Currently, Indonesia has entered the super smart society 5.0 era, which is marked by the increasingly

important role of technology in human life (Gladden, 2019). The super smart society 5.0 era, has a vision of a super smart society that accepts changes in the presence of technology while maintaining the human side (Cathrin et al., 2023). Digital technology supported by Artificial Intelligence (AI) makes it easier for us to connect interact, understand, and comprehend people, business, the economy, and life in general. Artificial Intelligence (AI) can be understood as the general combination and integration of applications with other digital technologies to create machines that can think like humans. The processes that occur in artificial intelligence include learning, reasoning, and self-correction. The process is similar to humans who analyze before making a decision (Sobron et al., 2021). Digital technology is taking an important role in the 2030 Agenda of Sustainable Development Goals (SDGs) and its implementation is an important decision for both developed and developing countries (Pigola et al., 2021).

Figure 1. Seventeen sustainable development goals

The way to improve learners' capabilities and knowledge in education is through the use of AI technology. Even Microsoft founder Bill Gates is a proponent of the use of AI in education. Gates believes that AI will improve education in many ways (Mulianingsih et al., 2020). In addition to supporting the learning process in schools or universities, this technology also supports independent learning (Karyadi, 2023). It is important to explore the benefits of artificial intelligence in the context of education including aspect of learning, teaching methods, and improving overall effectiveness (Holmes et al., 2019). In Indonesia, AI is closely related to STEM. STEM refers to science, technology, engineering, and mathematics. These four aspects are the cornerstones of AI technology (Pabubung, 2021). The use of AI can increase the accessibility of education, namely by providing distance education (e-learning) with good quality and enabling wider access to education for students in remote areas or who have physical limitations (Rifky, 2024). Artificial Intelligence (AI) has been applied AI is applied in

education as a promising opportunity for educational innovation (Du et al., 2024). Obtaining hard skills such as artificial intelligence can be obtained through formal education and training programs, including lectures, internships, short-term training classes, online courses, and certification programs, as well as on-the-job training (Baihaqi et al., 2021).

Based on research that has been conducted by Zahara et al. (2023) stated that the implementation of AI technology in education is useful to facilitate educators in teaching and learning activities. In line with research that has been conducted by Mambu et al. (2023) the utilization of AI can provide significant benefits for teachers in facing challenges in the digital area. Another case with research that has been conducted by Lukman et al. (2024) stated that the use of AI among STIT Pemalang, students realized the risk of plagiarism, lack of critical thinking, and inhibited skills. Although the application of AI technology has considerable positive potential, in the world of education, it can also have a negative impact. Clear regulations and guidelines are needed to ensure responsible use of technology (Lukman et al., 2024). The rapid development of technology, especially in the form of artificial intelligence (AI), has significantly changed the global education landscape. The presence of AI in education is not only considered new trend, but a revolution. Therefore, the author endeavors to explain the recent developments related to artificial intelligence (AI) contributions and threats in education. This research is expected to contribute to the development of technology in the era of SDGs 2030. In addition, it is expected to provide a foundation for the application of advanced technology in the future and can contribute to scientific development in the field concerned.

Method

This research method is a descriptive qualitative method using data analysis technique in the form of literature studies. A literature study is a research approach that involves analyzing and synthesizing information obtained from relevant literature sources (Masrichah, 2023). Literature studies are carried out by collecting, reading, recording, and processing data from various literature such as magazines, books, documents, and others (Zed, 2008). The steps of literature study in this research include collecting data from textbooks, journals, articles, which are relevant to the theme as reference material. Furthermore, analyzing and recording the sources of information, make a conclusion, and listing in bibliography. In this case, researchers used previous research data that focused on the contributions and threats of AI in the field of education.
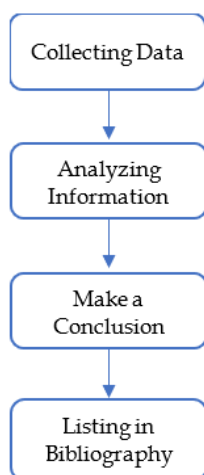
Figure 2. Research flow scheme

Result and Discussion

Artificial Intelligence (AI) Contribution in Education

The education sector today is greatly facilitated by the existence of AI. Whatever is needed can be easily accessed using AI in a fast time. One of them is students can do independent learning by utilizing applications made with AI. The use of AI in independent learning requires independence from the users or learners themselves. Learners can have a learning experience that is more adaptive, personalized, and focused on individual needs (Karyadi, 2023). The utilization of AI to support self-directed learning is like personalized virtual tutoring, which provides individual guidance related to learners' needs and weaknesses. Example: The "RoboTutor" platform developed by SRI International can be a personal tutor for children who have limited access to formal education (Karyadi, 2023). In addition, an innovation that stands out from the use of AI-based personalized virtual tutors is ChatGPT.

ChatGPT was developed by OpenAI to naturally interact with users, answering questions, providing explanations, and having complex conversations. In the world of education, ChatGPT can help the learning process because it can assist teachers in providing answers to students' questions in a short and precise manner (Farman et al., 2024). Since its launch on 30 November 2022, ChatGPT has been the fastest growing app in terms of users as it reached 100 active users in early 2023 (Acosta-Enriquez et al., 2024). In the world of education, ChatGPT can help the learning process because it is able to assist teachers in providing answers to students' questions in a short and precise manner (Farman et al., 2024). ChatGPT can increase efficiency in education such as the creation of problem based learning cases writing national exam questions, and developing discussion questions (A-Fuller et al., 2024). Meanwhile,

AI can help as an assistant for learning, i.e. to learn together and interacting.

AI can be a friend who can find information, summarize material, or provide practice questions. An implementation of AI as a learning assistant is "ELSA Speak", an AI-based platform for English learning mentors. Its speech of non-native speakers with more than 95% accuracy. ELSA provides detailed feedback for scripted and non-scripted text including word stress, pronunciation, fluency, intonation, grammar, and vocabulary analysis (Abdulmalik, 2024). Another utilization of AI in educational learning can be to create an adaptive learning system, which is to develop learning plans that are tailored to the needs of learners. Example: "Duolingo" an interactive web-based language learning platform that adapts materials and exercises to each user's language ability (Karyadi, 2023). "Google Workspace for Education", there is a practice sets feature in Google Classroom. This feature creates more individualized feedback (Abdulmalik, 2024). So, AI greatly facilitates learning in today's modern era. Various platforms are available to facilitate an efficient self-learning process. AI facilitates the independent needs of each learner which will support the development of their interests.

Another convenience in the use of AI is the emergence of learning chatbot, a program to simulate human conversation through voice commands, text chat, or both (Karyadi, 2023). Chatbots are programs in AI designed to communicate directly with humans. The difference between chatbots and natural language processing systems lies in the algorithms used. The main components of a chatbot are chat which is defined as a conversation and bot which is defined as a program that contains a number of data, when given input it will provide an answer. Therefore, chatbots can answer questions by reading the text typed through the keyboard (Parina et al., 2022). So, going through a chatbot feels more natural and personalized. Chatbot recommends answers that are made quickly according to the question asked.

Education to be engaging and interactive is aided by AI that is specific to game-based learning, where by analyzing learners' behavior and progress during gameplay lessons, AI can be used to adjust difficulty and challenge levels to suit learners' abilities. Example: "Kahoot" a game-based interactive learning platform that provides questions and answer options that match the user's ability (Karyadi, 2023). The application of gaming methods can affect learners' social-emotional development in completing and collaborating. The Kahoot platform has the advantage of fostering a competitive spirit in students against their friends in participating in the learning process.

The results of the answers to the questions that come out on the monitor screen will be seen at the end of the game for each question. Each question will immediately be seen as the results of the answers of the learners who answer correctly the fastest. Learners complete to be the winner in every question that appears. The quiz in this Kahoot application can be declared as effective learning because learning is centered on students and can hone and develop the thinking skills of each student in dealing with problems. Therefore, it is hoped that it can become a golden generation in the future for the success of the nation's progress (Sakdah et al., 2021). In line with the facts, students are more interested in collaborative learning. Conventional methods are no longer attractive. The use of AI-based teaching methods combined with games makes students more active and interactive.

Teachers in this case can helped by the existence of AI-based assessment system, which is used to build a fair and comprehensive assessment system. AI can be used to analyze learners' written or spoken (voice or audio) responses and provide a comprehensive assessment. Example: "Turnitin" an assessment and plagiarism detection platform used to check for similarities and errors in learners' written work (Karyadi, 2023). Besides AI-based assessment system, it can also be used for educational data analysis is used to analyze big data about test results, learner behavior, and other factors. These analyses can help educators and policymakers to understand trends, identify potential problems, and determine more effective learning strategies. Example: "Edmodo" an online learning platform that uses AI-based data and can provide information about learners' learning progress to educators and parents (Karyadi, 2023).

The use of Edmodo learning media can be used as a forum for collecting students' assignments and recording students' academic achievements (Latapamei et al., 2021). Meanwhile, teachers are also facilitated by the automatic evaluation by AI which was brought efficiency in grading assignments and exams. The quick and automated evaluation process provides instant feedback to students, helping them understand their strengths and weaknesses more effectively. The presence of AI for teachers helps in advising on the best teaching methods, providing additional learning materials, and assisting in the curriculum planning (Rochmawati et al., 2023). Example: "Coursera" is an online learning platform that uses an AI-based automated evaluation system to assess learners' work in several programming courses (Karyadi, 2023). In addition, automatic evaluation can be done with the help of an AI-based platform called "Quizizz Paper Mode". Teachers can scan barcodes to view learners'

answers directly. It can enable instant evaluation of correct or incorrect answers. Barcode-based learner answer sheets can be reused as different quiz materials, while each learner has one QR code sheet to avoid the possibility of cheating answers from friends (Andriani et al., 2023). So, there are several AI-based assessment system that makes teachers' work easier. Teachers can provide feedback to learners quickly. The existence an AI-based evaluation system can accelerate teachers to determine learning methods that are suitable for the conditions of the students.

For learners with special needs, AI education also provides access. Example: "Parrotron" a platform used to help learners with speech impairments. This platform can understand speech that is not clearly heard due to impaired speech and rephrase sentences so that they can be heard and understood by others (Abdulmalik, 2024). Parrotron is an end-to-end speech-to-speech model that converts an input spectrogram directly into another spectrogram, without any intermediary symbolic representation speakers into the speech of a single target speaker voice while preserving linguistic content and projecting non-linguistic content (Biadsy et al., 2019). Thus, AI not only facilitates learners with normal conditions but also facilitates learners with special needs. Equal education has become an issue of concern so that every learner has the right to a proper education.

In addition to the application of technology, digital literacy is also an important aspect in the context of modern education. The ability of learners to analyze, think critically, and filter information effectively through digital literacy is an indispensable skill in today's information age. The development of digital literacy and the integration of technology in education are important steps to create a generation that is competent, creative, and ready to face the increasingly complex challenges of the future. Close collaboration between governments, educators, parents, and related institutions is needed to improve digital literacy to support sustainable development and improve the overall quality of education worldwide (Fadilah et al., 2024). Thus, the more sophisticated technological developments must be balanced with vigilance in filtering the information received. We must be able to distinguish between true and hoax sources by improving, digital literacy skills.

The last contribution of AI in education is to help develop the curriculum. AI has crucial role in developing an education curriculum that is relevant to future needs. First, through analyzing data and job trends. AI's role can help provide deep insights into the most sought-after skill in the job market. Educational institutions can adjust the curriculum by understanding industry needs and economic developments so that

students are equipped with related skills. Second, AI can help track of technological and scientific developments. Curriculum can be updated regularly with an eye changes and advancements such as artificial intelligence, robotics or sustainability to keep up with the latest developments so that students gain relevant and up-to-date understanding. Third, AI can be used to identify individual student learning styles and preferences. Curriculum can be customized to the way students learn best. Learning can be more effective and can help develop students' interests and skill. Fourth, AI can support the integration of 21st century skills in the curriculum such as problem solving skills, creativity, interpersonal skills which are increasingly valued in the world of work (Rochmawati et al., 2023). Thus, AI assisted curriculum development can make it easier for stakeholders. AI can help provide an overview of future needs related to work, technological and scientific developments, learners' learning styles, and 21st century skills.

Thus, the contribution of AI in education greatly helps learners to improve their skills and knowledge. In addition, AI provides promising potential, especially for improving the efficiency and effectiveness of learning. AI technology will continue to evolve so that it can create new opportunities to simplify teaching so that teachers must always keep abreast of AI technology, think creatively, and innovate in order to make a contribution. The achievement of SDGs is greatly assisted by information technology. SDG 4 (Quality Education) serves as an illustration of the relationship between information technology and the SDGs. Digital platforms can be used to spread awareness of the SDGs throughout society and encourage more people to participate in achieving the goals.

The Threats of Artificial Intelligence (AI) in Education

The use of AI in education has many positive impacts. However, we must also pay attention to the negative impacts or threats. Here are some of the threats that must be known such as data privacy and security, it is necessary to ensure that the personal data of AI users are well protected from security breaches and misuse by AI providers (Abdulmalik, 2024). The use of AI can pose a threat to individual privacy due to its ability to identify patterns in personal data. AI algorithms can analyze data with a level of accuracy and speed that traditional methods can't achieve. Sensitive information contained in personal data may be revealed without the consent or knowledge of the individual concerned (Masrichah, 2023). Personal data protection and information security become imperative to prevent potential misuse or unwanted privacy violations (Rochmawati et al., 2023). So, privacy and data security are very crucial. This

relates to someone's personal data. Personal data can be stolen by hackers and used for criminal purpose.

Another threat is the technology gap. Not all people or institutions have equal access to technology, especially in Indonesia. The use of AI can increase the technological gap between regions that have sufficient resources and those that do not have sufficient resources (Abdulmalik, 2024). In areas with easy access to technology, it can create dependency. Excessive reliance on AI may reduce learner's ability to develop interpersonal skills and critical problem solving skills or they may become lazy thinkers (Abdulmalik, 2024). Over-reliance on AI technology can reduce human involvement in the learning process, removing teachers' flexibility to respond to the students' individual needs (Rochmawati et al., 2023). For example, when learners are given questions in the form of descriptions, they use the "ChatGPT" or "Perplexity" platform to generate answers and directly copy them to complete the task (Abdulmalik, 2024). Easy access to technology can lead to cheating. AI can be used to cheat in exams or in drafting work.

AI can be a good plagiarism engine for copying other people's work (Abdulmalik, 2024). Therefore, the use of AI in education should not be too lulled by its convenience due to the imperfection of algorithm. This is a concern because it can result in decisions that are difficult to explain, creating challenges in explaining the decision-making process to end users. Relying on AI can erode the human ability to think critically and use common sense (Abdulmalik, 2024). Thus, the gap in the use of technology means that regions with insufficient resources will be left behind. Conversely, areas with sufficient resources will be more developed. Even have dependence on AI technology. As a result, cheating will appear in various matters and make it difficult for a person to think critically.

Thus, the use of AI can't be separated from the negative impact or threats. A wise balance between technology and human presence, as well as careful regulation, is needed to ensure that AI is properly integrated and provides benefits without introducing unwanted risks. While AI brings efficiency, it is necessary to ensure sufficient human involvement in the learning and decision-making process to maintain the aspects of togetherness and empathy. Therefore, we can utilize AI by minimizing the risks. Ensure that learners' rights are protected and learners have a fair and rewarding educational experience. Implementation of strict privacy policies and strong security measures are necessary to protect someone's data and maintain public trust in the use of AI. Educators should collaborate with AI experts to develop strategies and simulate data based on research.

Conclusion

In today's modern era, technology and education play an important role. Technology not only serves as a tool to simplify daily life but also becomes the main foundation in the advancement of education. The integration of technology in education contributes to achieving the Sustainable Development Goals (SDGs) in the education sector. This opens up opportunities for everyone to get quality and equitable education. The contribution of AI in education is diverse and related to the platform that supports it. The use of AI must be balanced with ethics in using technology. However, the threats of AI in education should be considered to minimize the risks.

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