

AI's Role In Education For A Sustainable Future: Integration Of Technology In Achieving Sustainable Development Goals (SDGs)

Wan Malinda
Universitas Riau

Article Info

ABSTRACT

Article history:

Received 10 22, 2024
Revised 11 18, 2024
Accepted 11 22, 2024

Keywords:

AI,
Education,
Technology,
SDGs

This research was conducted with the aim of discussing the role of AI in education for a sustainable future with the integration of technology in achieving the SDGs. This research uses descriptive qualitative research with a literature review research method. The research conducted will involve analysing various primary sources such as books, scientific journals, articles, and documents relevant to the research topic. This research analyses the application of AI technology in several Asian countries, including China, South Korea, Japan, and Singapore, which have successfully integrated AI into their education systems. The findings of this research highlight the potential of AI to improve educational accessibility, especially for students in remote areas, and the importance of a cautious approach to ensure maximum benefits from AI technologies. The application of AI in education can enhance the personalisation of learning, develop relevant skills, and improve evaluation efficiency. In addition, this study also highlights the importance of considering barriers such as data security and the role of teachers in the use of AI.

Corresponding Author:

Wan Malinda
wanmalinda86@gmail.com

INTRODUCTION

Sustainable Development Goals (SDGs) are a set of goals set by the United Nations (UN). The SDGs are a global agenda that includes 17 goals consisting of 169 targets. These goals are interconnected, mutually influencing, inclusive and integrated with each other. The concept is universal, ensuring that no individual is left behind, with a deadline for achievement set until 2030 (Guntari et al., 2023). This proves that achieving one goal can positively impact another. For example, improving quality education not only helps individuals acquire knowledge and skills, but also contributes to poverty reduction and improved public health.

Arifah (2023) said that education has a very important role in achieving the 2030 SDGs, which are set by the United Nations to promote sustainable development worldwide. In addition to serving to transfer knowledge, education also serves as a tool to empower individuals and communities, so investment in education is key to achieving the goals of the SDGs. In this case, quality education is the progressive SDG 4 goal in achieving the SDGs targets compared to the other SDGs goals. Alvira et al (2022) also argue that education can affect the achievement of sustainable development.

Education is key and has a great influence on human development. However, to achieve quality education, we must face a number of major challenges that affect efforts to achieve the SDGs. Hariyanti et al. (2023) said that education is one of the efforts to build and improve the quality of human resources amid the challenges of the globalisation era. In other words, education can be interpreted as a process carried out by humans to develop their potential, both physically and mentally, in order to optimise their abilities. In this case, education has several challenges to face, such as access gaps, uneven quality of education, limitations in inclusive education, education financing crisis, technological disruption and digital inequality, and many more challenges that must be faced. Solehudin (2023) argues that the challenges in education continue to grow along with the changing times and technological developments. This means that overcoming these challenges requires a strong commitment from the government, educational institutions, the private sector and civil society to work together to improve access,

quality and inclusion in education. Proper investment in education infrastructure, human resources and technology, as well as equitable and inclusive policies, are key to building a more resilient and sustainable education system, in line with the targets of the SDGs.

In line with these efforts, the concept of society 5.0 comes as a solution that integrates advanced technologies, such as AI (Artificial Intelligence) and the Internet of Things (IoT), into all aspects of life, including education. The concept of the society 5.0 era brings various benefits that can improve the quality of human life (Siti Umi Khoiriah et al., 2023). That means, society 5.0 does not only focus on digitalisation, but also aims at creating a human-centred society, where technology is used to improve welfare, and solve social problems, and can create an inclusive environment. In education, society 5.0 brings artificial intelligence such as AI, which supports the creation of a more efficient and effective learning experience, ensuring that technology does not replace the role of teachers, but instead strengthens the role of teachers in creating a better learning environment.

Quoting from Statista, the number of AI device users worldwide surpassed 250 million by 2023, while according to data from the Secretary General of Kominfo, in Indonesia alone there are around 213 million AI device users, which means more than 77% of the population has utilised this technology. Such rapid growth shows how AI has become an integral part of various sectors, including education. In line with the opinion of Isdayani et al. (2024), in education, the use of AI offers various benefits that can improve the learning experience for students and be efficient for educators. One example is the largest learning application in Indonesia Ruang Guru has used an AI tutor called AiRIS to improve the learning experience. The AI tutor in Ruang Guru can help students access educational content and improve the learning process. In addition, the adaptive learning platform can also utilise AI to customise materials based on students' abilities. Ummah (2019) said, technology now enables the development of more dynamic and adaptive content, which can respond to changes in curriculum and student needs in real-time. In this case, students can certainly learn more efficiently, focus on areas that need improvement, and avoid material that has already been mastered.

AI also enables personalisation of education by analysing students' performance data and adjusting learning materials according to their abilities. For example, the Fully Fluent app uses AI to customise foreign language speaking practice according to the user's current level and development. The app uses AI technology to provide personalised feedback, allowing users to practice speaking naturally and independently without pressure. Another example is Duolingo, the most popular and globally recognised language learning app. Herlina et al. (2021) said, Duolingo is a free online language platform that provides translation tasks to learn vocabulary and grammar, as well as tasks to practice pronunciation and listening. This means that in this case, AI not only accelerates the learning process, but also creates opportunities for more inclusive, adaptive, and personable education, allowing students to learn in a way that suits their needs.

In this digital age, AI technology provides a great opportunity to improve the global education system, especially through personalisation of learning, automation of administrative tasks, and adaptive learning. However, the application of AI in education also poses a number of challenges or gaps that need to be addressed. Some of these challenges include unequal access to technology, and student data being managed and protected from misuse, the use of AI may replace the role of humans. Over-reliance on AI technology can reduce human involvement in the learning process, eliminating teachers' flexibility to respond to students' individual needs (Rochmawati et al., 2023). These challenges require global solutions that include regulation, inclusive policies, and improved digital infrastructure across the world. This research will further discuss how AI can effectively support the achievement of SDG 4 (quality education) that will fulfil the SDGs. SDG 4 emphasises equitable, inclusive and quality access for all. In addition, the research will also focus on the ethical aspects of using AI, such as the protection of student data and how AI can be used to support the role of teachers without replacing the important human interaction in the teaching and learning process.

Similar research was also conducted by Irma Arifah with the title of the article "AI-Supported Education for a Sustainable Future: Integrating Technology to Achieve Sustainable Development Goals 2030" published in 2023. The similarities between Irma's research and the author's research are that both discuss the integration of technology in education, especially in the context of achieving the Sustainable Development Goals (SDGs), and both emphasise the importance of technology such as artificial intelligence (AI). The difference between Irma's research and the author's research is that the author's research has a clearer focus on the successful use of AI in Asia, and the author also discusses the direct support of AI to SDG 4 (quality education), while Irma's research tends to be global without providing in-depth analysis of regional contributions, and emphasises more on the integration of AI in education as a whole in supporting the SDGs.

This research aims to review how AI can significantly contribute to the education sector to support a sustainable future, in line with the SDGs. Through a literature review and comparison of previous research, this study will explore how AI can be integrated to support SDG 4, as well as how AI can be a solution to educational challenges in the digital age. In addition, this research will also discuss the use of AI in some ASIA regions that have successfully implemented this technology.

METHODS

This research uses descriptive qualitative research, with the research method used is a literature review. According to Subahan et al. (2021), literature review is an important step in preparing a research plan. In this case, the research conducted will involve analysing various primary sources such as books, scientific journals, articles, and documents relevant to the research topic. Data collection techniques are carried out by reading and understanding the sources of the selected literature, recording important information, and organising the data that has been obtained. In this research, the literature synthesis technique is used to combine various findings into a coherent and structured conclusion. In addition, thematic analysis was used to identify and categorise themes or patterns that emerged from the analysed literature.

RESULTS AND DISCUSSION

Artificial intelligence (AI) has a major role to play in supporting the Sustainable Development Goals (SDGs) or SDG 4, namely quality education, such as the ability of AI to personalise learning, making AI a primary part of the growth of education technology. The use of AI in education has provided many benefits, such as several countries in the Asian region that have successfully integrated this technology in their education system. Some of these countries, such as China, South Korea, Japan and Singapore, have successfully applied AI in the education sector in innovative ways.

China has developed AI-based learning platforms, such as Squirrel AI, AI-Powered Smart Classrooms, and Big Data in Education, which help improve education quality through personalised learning and student data analysis. In Darmawan's study (2020), China has an advantage in the application of AI in the education sector due to the abundant quantity of data, which is one of the important aspects in the development of data-driven technology. Next is South Korea, which has planned to replace traditional textbooks with tablets equipped with AI technology, as the AI textbooks to be introduced are capable of customising learning materials according to each student's pace and learning style. There are no researchers who discuss South Korea's success in applying AI in education, but seeing from the news circulating about South Korea replacing learning tools such as learning textbooks to tablets that have AI features has proven that AI is an important part of education there, even quoting from the Event News Agency (ANTARA), South Korea contributed in pouring funds as much as 230.9 billion won or the equivalent of 2.7 trillion rupiah allocated for government projects that integrate educational programs and AI ethics, this initiative shows South Korea's commitment to creating a more adaptive and relevant education in the digital era. This transformation not only aims to improve the learning experience, but also equip the younger generation with the necessary skills to face the future.

The next Asian country that has successfully implemented AI in the education sector is Japan, as the country proves its commitment to technological advancement, one of which is integrating AI into its education system. In Rahmansyah's study (2022), some of the best universities in Japan such as Tokyo University, Keio University, Nagoya University, and Kyoto University have also conducted AI technology R&D. These universities not only focus on education, but also collaborate with Japanese conglomerate companies to apply AI technology in various sectors, including education. This collaboration allows Japan to drive innovation in teaching, especially through AI-based personalisation of learning and improving operational efficiency in education, as well as developing curricula relevant to the digital age. This strengthens Japan's position as one of the countries that has successfully applied AI technology significantly in the field of education.

Furthermore, Singapore is one of the Asian countries that has successfully applied AI technology in the education sector. The country has been digitalising its learning system since the introduction of AI, both in schools, campuses, and in the career world or on the job site. In 2019, Singapore released the National AI Strategy (NAIS) which provides a strategic plan to integrate artificial intelligence in various sectors, including education, with the aim of building a smart nation (BPPT, 2020). This means that Singapore is not only applying AI to improve administrative and operational efficiency, but also in the personalisation of learning.

After seeing how countries like China, South Korea, Japan, and Singapore have successfully applied AI technology in the education sector, it has proven that AI provides many benefits to its users. However, these successes are not without challenges that need to be faced. While these countries have shown rapid progress in AI integration, the same challenges may be more complex for developing countries like Indonesia. To achieve quality education through AI, several barriers need to be addressed, especially related to technical skills, limited resources, and the changing role of educators, as pointed out by Suryokta et al. (2023). In addition, countries such as China utilising big data have challenges regarding student data privacy, and South Korea replacing physical books with AI-integrated tablets have challenges such as parental concerns that the increased use of digital devices in the school environment will exacerbate the existing negative effects of technology exposure on children.

Having identified the challenges faced in the integration of AI in the education sector, there is a need for solutions to be implemented. The first solution, related to technical skills, needs to consider the readiness of teachers, which is key, in this case a teacher must undergo a comprehensive training programme to ensure educators are not only able to operate AI technology, but also understand how to integrate it effectively in the learning process (Fitri & Dilia, 2024). To complement the first solution and the second solution of limited resources, there is a need for cooperation between the government, educational institutions, and the private sector to improve technology infrastructure. Efforts such as government grant programmes that distribute tablets and laptops to underprivileged schools can be very helpful. In addition, partnerships with technology companies can open up opportunities to procure affordable and innovative educational tools.

The third solution to overcome the challenges of the changing role of educators, as expressed by Viranny & Wardhono (2024), is to improve the competence of educators to be able to support learning that encourages exploration and creativity, and allows students to learn independently. This means that teachers need to adopt a more flexible and student-orientated teaching approach. In this case, the teacher does not only function as a conveyor of information, but also a facilitator who can assist students in developing critical thinking skills and creativity.

The fourth solution to the challenge of student data privacy is to implement clear policies regarding the collection and use of student data, and involve parents in this process. Schools need to ensure that all parties understand how the data will be used and protected. In Rifky's study (2024), the AI system used must comply with applicable data privacy regulations and standards, and implement appropriate security measures to protect student information. In addition, school staff are also given training on security, which is useful to ensure that they can handle student information carefully and in accordance with established policies.

Furthermore, the fifth solution, related to the challenge of parents' concerns regarding the excessive use of digital devices in schools, is the importance of setting clear boundaries in the use of technology. In Fitri & Dilia's study (2024), it was suggested that the use of digital devices, especially involving AI, should be limited to specific tasks that require creativity and critical thinking. Thus, digital devices will not be overused, nor will students become dependent on technology. Schools should set clear rules and guidelines regarding when and how digital devices can be used in the teaching-learning process. In addition, involving parents in discussions about this policy can increase their confidence in understanding the benefits that AI can provide without compromising the balance in their children's education.

Based on the problems and solutions described, AI-powered education can support Sustainable Development Goal (SDGs) 4, which focuses on quality education. AI technology has the potential to enrich people's educational experience and support the goal of resilience by 2030 (Wulansari et al., 2024). AI can improve the quality of education by providing personalised learning experiences, where teaching materials can be tailored to the needs of each student's learning style. In addition, the use of AI in the education sector provides many other benefits, such as increasing accessibility so that AI can be reached by students in remote or underserved areas, and AI can also perform data processing to support better decision making in the education environment. For example, one Indonesian university, Teknorat Indonesia (UTI), has pioneered the use of AI in teaching and learning, where the use of AI enables more personalised and effective learning, with accurate performance analysis and better interaction between lecturers and students. However, UTI also faces challenges in implementing AI in teaching and learning, such as difficulties in adjusting to cultural differences, financial challenges, data security challenges, and challenges to the quality of learning. To overcome these challenges, UTI uses AI technology carefully and considers various aspects in order to provide optimal benefits for students and educational institutions. Thus, the role of AI in education is crucial to creating a sustainable future and aligning with efforts to achieve the Sustainable Development Goals (SDGs).

CONCLUSION

The conclusion of this study shows that artificial intelligence (AI) has a significant role to play in supporting quality education in line with the Sustainable Development Goals (SDGs). Countries such as China, South Korea, Japan, and Singapore have successfully integrated AI in their education systems, providing benefits such as personalised learning, improved operational efficiency, and better educational accessibility. However, challenges in implementing AI in education, especially in developing countries such as Indonesia, require special attention to technical skills, resources, data privacy, and the role of educators. Solutions to overcome these challenges involve teacher training, co-operation between the government and the private sector, and the implementation of clear policies on data privacy. With a careful and planned approach, AI has the potential to enrich educational experiences and support resilience goals to 2030, while creating a more relevant and adaptive education in the digital age.

REFERENCES

- Alvira Oktavia Safitr, Vioreza Dwi Yunianti, D. R. (2022). Jurnal basicedu. *Jurnal Basicedu*, 6(4), 7096–7106.
- Arifah, I. (2023). Pendidikan yang Didukung AI untuk Masa Depan Berkelanjutan: Mengintegrasikan Teknologi untuk Mencapai Sustainable Development Goals 2030. *Seminalu*, 1(1), 47–55. <http://prosiding.unipar.ac.id/index.php/seminalu>
- BPPT. (2020). Strategi Nasional Kecerdasan Artifisial Indonesia 2020 - 2045. *Badan Pengkajian dan Penerapan Teknologi*, 194. <https://ai-innovation.id/server/static/ebook/stranas-ka.pdf>
- Darmawan, A. B. (2020). Kekuatan Artificial Intelligence Tiongkok dan Kekhawatiran Masyarakat Global: Resensi Buku. *Indonesian Perspective*, 5(2), 216–220. <https://doi.org/10.14710/ip.v5i2.34135>
- Fitri, W. A., & Dilia, M. H. H. (2024). Optimalisasi Teknologi AI dalam Meningkatkan Efektivitas Pembelajaran. *Cendekia Pendidikan*, 4(4), 50–54.
- Guntari, Y., Aditiani, F. J., Haq, H. D., Firmansyah, R. Y., & Murtado, R. K. A. (2023). Sustainable Development Goas (SDGs) Implementasi SDGs Pendidikan Desa Berkualitas di Desa Tanjungsari Kecamatan Sadananya Kabupaten Ciamis. *Peran Desa dalam Pemulihan Pasca Pandemi Covid-19 melalui Percepatan Transformasi Digital*, 243–247.
- Hariyanti, D. P. D., Fakhruddin, F., Kardoyo, K., & Arbarini, M. (2023). Menuju Era Globalisasi Pendidikan: Tantangan dan Harapan Terhadap Mutu Pendidikan di Indonesia. *Prosiding Seminar Nasional Pascasarjana*, 6(1), 222–225. <http://pps.unnes.ac.id/pps2/prodi/prosiding-pascasarjana-unnes>
- Herlina, E., Yundayani, A., & Astuti, S. (2021). Penggunaan Duolingo sebagai Media Pembelajaran Berbasis Teknologi dalam Meningkatkan Keterampilan Berbicara Siswa. *Penggunaan Duolingo sebagai Media Pembelajaran Berbasis Teknologi dalam Meningkatkan Keterampilan Berbicara Siswa, 2012*, 244–253.
- Isdayani, Thamrin, A. N., & Milani, A. (2024). Implementasi Etika Penggunaan Kecerdasan Buatan (AI) dalam Sistem Pendidikan dan Analisis Pembelajaran di Indonesia. *Digital Transformation Technology*, 4(1), 714–723. <https://doi.org/10.47709/digitech.v4i1.4512>
- Rahmansyah, F. (2022). *Dampak Teknologi Artificial Intelligence Terhadap Pendidikan*. 1–9. <https://www.academia.edu/35128936>
- Rifky, S. (2024). Dampak Penggunaan Artificial Intelligence bagi Pendidikan Tinggi. *Indonesian Journal of Multidisciplinary on Social and Technology*, 2(1), 37–42. <https://doi.org/10.31004/ijmst.v2i1.287>
- Rochmawati, D. R., Arya, I., & Zakariyya, A. (2023). Manfaat Kecerdasan Buatan untuk Pendidikan. *Jurnal Teknologi Komputer dan Informatika*, 2(1), 124–134. <https://doi.org/10.59820/tekomin.v2i1.163>
- Siti Umi Khoiriah, Lia Karunia Lam Uli Lubis, & Diva Kayla Nazwa Anas. (2023). Analisis Perkembangan Sistem Manajemen Pendidikan di Era Society 5.0. *JISPENDIORA Jurnal Ilmu Sosial Pendidikan dan Humaniora*, 2(2), 117–132. <https://doi.org/10.56910/jispendiora.v2i2.650>
- Solehudin, S. (2023). Tantangan Dunia Pendidikan Islam dan Implikasinya Terhadap Perubahan Kebijakan. *BAHTSUNA: Jurnal Penelitian Pendidikan Islam*, 5(2), 130–140. <https://doi.org/10.55210/bahtsuna.v5i2.308>
- Subahan, A., Dista, D. X., & Witorsa, R. (2021). Kajian Literatur tentang Kebijakan Pendidikan Dasar di Masa Pandemi dan Dampaknya terhadap Pembelajaran. *Jurnal Review Pendidikan Dan Pengajaran*, 4(1), 1–9. <https://doi.org/10.31004/jrpp.v4i1.1662>
- Suryokta, E., Taruklimbong, W., & Sihotang, H. (2023). Peluang dan Tantangan Penggunaan AI (Artificial Intelligence) dalam Pembelajaran Kimia. *Jurnal Pendidikan Tambusai*, 7(3), 26745–26757.
- Ummah, M. S. (2019). No 主観的健康感を中心とした在宅高齢者における健康関連指標に関する共分散構造分析Title. In *Sustainability (Switzerland)* (Vol. 11, Issue 1). <http://scioteca.caf.com/bitstream/handle/123456789/1091/RED2017-Eng-8ene.pdf?sequence=12&isAllowed=y%0Ahttp://dx.doi.org/10.1016/j.regsciurbeco.2008.06.005%0Ahttps://www.researchgate.net/publication/305320484>
- Viranny & Wardhono, 2024. (2024). Cendekia pendidikan. *Cendekia Pendidikan*, 4(4), 50–54.
- Wulansari, S., Putri, F. I., & ... (2024). Peluang dan Tantangan Digitalisasi Pendidikan dalam Pencapaian SDGs 2030. ... dan *Pemberdayaan* ..., 2(2), 129–137. <https://mediacendekia.my.id/ojs/index.php/jppm/article/view/143%0Ahttps://mediacendekia.my.id/ojs/index.php/jppm/article/download/143/90>