



# Reimagine Education with AI: the Challenges and Opportunity for Improving Quality and Access Education in Higher Education

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**Abstract.** The development of Artificial Intelligence (AI) has brought changes to society on how to use digital technology to gain knowledge, and information, and make certain choices based on information and knowledge obtained from AI. AI as a technology has a significant role in integrating information and knowledge, analyzing data, and assisting in making certain decisions for stakeholders. AI is currently widely used by various interest groups such as industry, academia, researchers, policy stakeholders, including education. The use of AI in education still faces various problems and challenges. One of the fundamental challenges is how AI can leverage the teaching and learning process particularly understanding media and information literacy, understanding learning materials, and to what extent teachers and students are adaptive to the existence of AI for education. This research focuses on examining the use of ESisbot (Education-STEM-Indigenous science), one particular AI type in WhatsApp, to help students and lecturers improving their understanding on STEM, System Thinking and Indigenous Science in Higher Education. Moreover, we would like to emphasize on beyond AI through developing Artificial neural network for education. This research method uses a mixed methods approach (quantitative and qualitative). Quantitative data is obtained through tests and simulations. qualitative data is obtained through interviews with lecturers and students, simulations, and FGDs. Research locations in eastern Indonesia take place in Palu, and also in Java (Yogyakarta and Semarang) Juli and August 2024. The result of this study show that the usage of AI technology has brought changes to the teaching and learning patterns in higher education, one of which is access to learning, effectiveness and efficiency in accessing learning resources, obtaining adequate learning methods, and gaining inspiration that can support the improvement of quality and access to learning in higher education that still has isolated access to technology. In addition, the utilization of technology faces unavoidable challenges.

**Keywords:** AI, Education, Improving Quality and Access Education

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## 1 Introduction

The digital technology advancement era has brought changes to society. These changes are related to the way society uses technology and utilizes technology for various needs and interests. The development of artificial intelligence (Artificial Intelligence) has created various kinds of social innovations to solve various social problems. Some studies have demonstrated the role of artificial intelligence (AI) in social innovation. The AI approach to answering social and environmental problems has helped and made it easier for humans to simplify problems, carry out simulations, and identify problems through modeling or scenario planning before making decisions [1].

AI is considered a new technology to assist in conducting research and studies, developing theories, using research methods, and applying systems and technology for simulation [2]. In education, AI has an important role and advantages in the teaching and learning process. AI in higher education helps students to get access to learning resources quickly, get answers instantly, and help them to study independently to reach their goals [3]. The use of AI in higher education has increased in the last 5 years [4]. From an educational technology perspective, the role of AI needs to be reviewed concerning the accuracy and transparency of the data presented. AI is a technology that works depending on the quality of the data stored and the devices owned such as algorithm systems [5].

The growing use of AI with various models and systems in education has raised critical questions concerning copyright and intellectual property, biased data, and the accuracy of the data presented. AI has been developing rapidly. It is not just a platform, website, or metadata, but it has also been integrated with various other technological elements and platforms such as ChatGPT, Chatbot, Grammarly, Google Translate, Google Docs, and Microsoft Word. According to Hodges and Ocaik, "Integrating AI into higher education is not a futuristic vision but an inevitability" [6]. This research is very important to review the position and role of AI in education, especially in higher education. This research will focus on the role of AI in the process of forming a thinking system for students and lecturers in formulating STEM and indigenous science-based learning. So far, AI has a general function to provide general information and knowledge in various fields with tools that have been integrated in the form of a platform.

The STEM and indigenous science learning approach can be adopted as a national education method. National Science Foundation (2020) [7] stated that the future of STEM education combines an advanced understanding of how people learn with modern technology to create more personalized learning experiences, inspire learning, and foster creativity from an early age. [8] explained that the benefits of using material on cultural relationships and continuity provide a better understanding of the tools and resources used in civilizations. Culturally relevant material includes key concepts, which are core to high-level mathematical and scientific ideas [8].

Systems thinking can be applied to STEM education. Sarah York, Rea Lavi, Yehudit Judy Dori, and Mary Kay Orgill stated that system thinking is a holistic approach to studying complex problems and systems that focuses on the interactions between system components and the patterns that emerge from these interactions [9]. Systems thinking can help students develop high-level skills to understand and overcome the complex real world. International Labor Organization (ILO) believes that systems thinking understands the larger context of a system, its emergent properties, and its behavior over time by knowing the relationships, interrelationships, and dynamics of its constituent parts. System thinking-based STEM can also be used outside of formal education. There are an increasing number of educational programs in the fields of science and STEM education that aim to improve educational outcomes for students outside of formal education who have long been underrepresented in the current education system [10].

Social media can help in the application of thinking systems to STEM based on indigenous science in national education methods. Singh, Alka stated that social media has become a routine activity for everyone. Today's digital natives usually start their day by checking notifications and end it by checking news feeds. Social networking sites have become an important part of life that cannot be separated from social, professional, academic, or individual life [11].

One of the most widely used social media with more than 5 billion downloads is WhatsApp. According to Baguma, R., et al, WhatsApp has great potential to support the development of HOTS due to its wide reach. While Afzal, I & Abdullah, N.A. believe that stakeholders have recommended the app as supporting technology [12]. Gasaymeh, Al-Mothana M said that students use WhatsApp for personal business and social. however, the use of it for education is still very limited. Students consider the integration of WhatsApp into education to be easy, fun, and useful [13]. Enakrire, R.T. and Kehinde, F.J. argue that WhatsApp functions as a learning and teaching tool that makes most students, regardless of their geographic location, become technology savvy, self-expressive, and open to new ways of doing things, including the use of social media [13].

From Bouhnik, D., & Deshen, M, it is learned that students mentioned technical advantages in education from WhatsApp usage. It is convenient, low-cost, and fast. WhatsApp also provides a pleasant environment that helps fellow students get acquainted with each other. It has a positive impact on the way of communicating [14]. Students also demonstrated academic excellence as they were supported in terms of accessibility of learning materials, teacher availability, and time availability in learning outside of class hours. Rosenberg, H., & Asterhan, C. S. C stated that WhatsApp groups have become the main communication channel for school-related topics. It is used primarily for organizational purposes (sending and receiving updates and managing learning activities), as well as as a means for educators to enforce discipline. Students mentioned many advantages of WhatsApp communication. It offers convenience,

community features, options for personal privacy, and many communication formats (written, mediated, personal, or group) [15].

However, the use of WhatsApp also brings negative impacts on its implementation in education. Abdullateef, H.A., et al in their study argue that the use of WhatsApp causes students to burnout. They are overwhelmed by information, communication, and privacy violations. The study shows that burnout has a negative impact on students' performance. It also shows that the negative impact should be carefully calculated in the planning of distance learning implementation [16]. On the other hand, Ocheba, Habibat O. CLN, in his study shows that undergraduate students who use WhatsApp for academic purposes with high intensity found it helpful in their learning process. The study further reveals that WhatsApp is a good collaboration platform [17].

Oriji, Abraham & Anikpo, Fanny believe that digital technology plays a big role in education in modern times. WhatsApp mobile technology is very valuable, as it is frequently used globally in online teaching at universities. In addition, it also offers students more choices and opportunities in online teaching. However, lecturers and students have not yet utilized WhatsApp instant messaging optimally to create effective academic activities [18]. Therefore, WhatsApp still has a lot of potential to improve the academics even better. WhatsApp combined with artificial intelligence (AI) has never been used before in education. WhatsApp with AI technology can be used to increase educational accessibility in Indonesia.

According to the OECD, digital technology has a great impact on the economy. It changes the way we work, communicate, involved in social activities, and have fun. It also encourages innovation in many life aspects [19]. The technology's innovative capacity is greatly influenced by the people's digital skill level. It is not surprising that there is a very strong correlation between education and skills as well as the uptake and use of digital technology in many aspects of life. The role of education and skills in encouraging innovation is very important. According to the World Bank, Indonesia is large and is developing rapidly with a population of 268 million people (2018). It consists of more than 17,000 islands, spread over 5,000 kilometers and spanning three time zones, and is strategically located between the Pacific Ocean and the Indian Ocean [20]. This condition requires Indonesia to carry out an education and training system that can improve the welfare of its citizens, increase its human resources, and achieve its economic and development goals. However, the current education system is still inadequate in supporting the students in learning.

Rosser, A, in his study, argued that Indonesia's biggest challenge regarding education is not the access, but the education quality [21]. UNICEF provides practical recommendations for education in Indonesia with the following three actions: strengthening digital learning content and platforms, developing digital skills of students and teachers, and expanding connectivity [22]. Cahyati, T & Diah Pudjiastuti suggested to improve the delivery of education services in Indonesia, the government has implemented various innovative approaches and initiatives [23]. One of these

approaches is the integration of technology-based learning in the classroom. Based on the previous studies, this research finds a research gap.

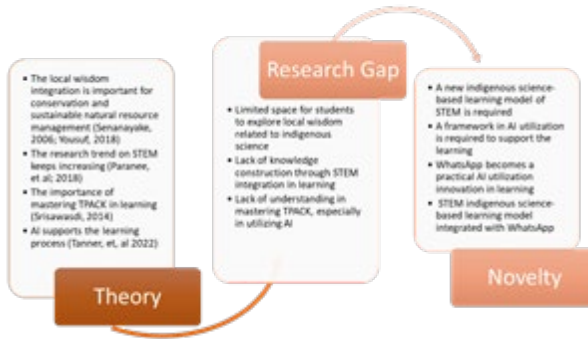


Fig. 1. Research gap.

Education with AI can help to fundamentally reorganize education in Indonesia. This research aims to examine the effectiveness of ESisBot (WhatsApp Edubot), as the digital application, in helping students and lecturers to better understand the concept of STEM and System Thinking and Indigenous Science. It will help to increase access to education as almost all Indonesian people use WhatsApp. Implementing an AI-based collaborative project in skills development accessed via WhatsApp with a STEM (Science, Technology, Engineering, and Mathematics), indigenous science and systems thinking approach can be carried out in the following steps: (1) Identifying Skills and Indigenous Science Concept, (2) Selecting an Appropriate AI Platform, (3) Developing Collaborative Projects, (4) Providing Education and Guidance, (5) Encouraging Collaboration, (6) Integrating Technology and Indigenous Knowledge, (7) Providing Feedback and Evaluation, (8) Carrying out documentation and presentations, (9) Promoting Local Culture, and (10) Carrying out maintenance and development. Involving elements of Indigenous Science in AI projects value and preserve local wisdom, while STEM provides a modern scientific and technological approach. This research will provide the latest information about the use of WhatsApp which is integrated with AI as the main platform for presenting educational material. It is an innovative and responsive approach to users in Indonesia. WhatsApp is very popular and easy to access. Likewise, WhatsApp EduBot will facilitate discussion groups within WhatsApp groups to stimulate interaction between students and facilitators, creating a collaborative learning environment. It is hoped that WhatsApp EduBot can change the education paradigm in Indonesia, increase accessibility, and provide high-quality education to communities that have accessibility issues, especially in Eastern Indonesia. This research aims to respond carefully to the challenges of accessibility and quality in the educational sphere. The implementation of WhatsApp EduBot is designed to change the traditional dynamics of learning by introducing elements of artificial intelligence and information technology into the educational framework.

Paradigm shift in this case will improve the quality of education by integrating the approach of STEM, science, and thinking systems. This interdisciplinary integration is carried out to allow the students to improve their critical thinking and analytical skills besides mastering the scientific concept.

In facilitating interaction between students and facilitators, WhatsApp EduBot that we called as ESisbot=Education-STEM-Indigenous science adopts a collaborative model through the formation of discussion groups on the WhatsApp platform. This interaction is expected to not only enrich the learning experience but also create a dynamic learning community. Through this research we would like to answers some critical issues on the relations between human and technology and how technology and give contribution for human existence. The objective of this study are: a. to examine the technological policy framework in higher education. b.to evaluate the contributions of WhatsApp-integrated AI in the formulation of thinking systems for students and lecturers in higher education institutions. c. to study how the user responds to the learning method using WhatsApp AI as the digital application of learning indigenous science-based STEM.

## 2 Method

The procedure that will be used is qualitative and quantitative research (mixed-method). Quantitative data will be obtained from the results of field trials related to students' conceptual understanding of learning material. Meanwhile, qualitative data will be obtained by observing the implementation of indigenous science-based STEM learning activities using WhatsApp AI, interviews with lecturers and students, and questionnaires. It will determine the user responses regarding the use of WhatsApp AI in indigenous science-based STEM learning. This research will be carried out in 3 locations; Yogyakarta, Semarang, and Palu. The research subjects will be lecturers and undergraduate students in various universities in these three locations. The Eastern Indonesia region was chosen to see how adaptive the students and lecturers in the Eastern Indonesia region are to this AI technology. Thus, the effectiveness and practicality of learning are analyzed through the implementation of the learning process and the student's understanding of concepts related to the material being studied, supported with observation sheet documents, interviews, and questions that tested the concept understanding. User responses (lecturers and students) were obtained using user response questionnaire instruments. Primary data will be obtained through interviews and FGDs with lecturers and students. Secondary data will be obtained through research and literature. The data processing and analysis process uses SPSS and Ms Excel. The expected result of this research is a comparative study of learning outcomes between Indonesian universities in the eastern and western regions on the application of systems thinking in STEM and Indigenous Science with AI-integrated WhatsApp.

## **3 Result and Discussion**

### **3.1 Technological Policy in Education**

The trend of technological development in the world has had a significant impact on human life [23]. Various human activities today are inseparable from the use and utilization of technology. This includes a fundamental and revolutionary transformation in the field of education due to the impact of technological development. The Minister of Education, Culture, Research, and Technology of the Republic of Indonesia, Nadiem Anwar Makarim, at the High-Level Conference on Transforming Education held by the UN in New York, USA, on Monday, September 19, 2022, during the session on “Digital Learning and Transformation.” This special session featured leaders from countries that are pioneers in digital learning. The Minister of Education, Culture, Research, and Technology (Mendikbudristek) Nadiem Anwar Makarim mentioned that the needs of teachers and students are the root of the educational technology policies implemented in Indonesia [24].

A study conducted by Bariah and Angranti stated that essentially the government has a commitment and determination to solve educational inequality issues through a technological approach, but it is necessary to consider efforts and synergy by integrating and utilizing the development of science and technology with educational resources [25].

The role and contribution of technology in learning are assessed to have a significant and substantial impact, especially in facilitating the formation of collaborative relationships and building meaning in a more easily understood context. For example, by utilizing technology, collaborative communication networks can be established among teachers, lecturers, students, and learning resources [26]. The Indonesian government, in the last four years, has continuously enhanced the role of technology to be used in various aspects of life, including improving access and good governance following the Covid-19 pandemic. The technology ecosystem is being built by the government specifically in the education sector by developing various technology platforms such as independent learning and educational reports. This effort is made by the government to improve the quality of teachers, make fundamental changes to the school management system, and strive to address educational disparities [27].

### **3.2 Artificial Intelligence (AI) and Education**

The development of technological innovation has brought a revolution in education worldwide, including in Indonesia. One of the technological innovations that has become a topic of discussion is the emergence of Artificial Intelligence (AI) in various levels and forms. UNESCO explains that:

“Artificial Intelligence (AI) has the potential to address some of the biggest challenges in education today, innovate teaching and learning practices, and accelerate progress towards SDG 4. However, rapid technological developments

inevitably bring multiple risks and challenges, which have so far outpaced policy debates and regulatory frameworks” [28].

According to Lukman, Agustina, and Aisy regarding the use of AI for learning, it is concluded that the utilization of AI in the field of education has reached several developed countries in recent years and continues to experience rapid development; however, a wise approach is needed to ensure that the use of AI technology in learning does not sacrifice skills and knowledge capacity [29].

Based on the results of research and studies conducted by the team, AI can be developed for more specific purposes, namely to improve the quality of education and accessibility to education. The survey conducted with 60 respondents from among students at three universities where the use of AI integrated with WhatsApp was tested has made a significant contribution, indicating that AI has not yet been innovated by integrating it with existing applications.

The results of the research activities through discussions and focus group discussions with lecturers indicate that the utilization of AI as tools and media for learning is very important because it can enhance the effectiveness of classroom learning, including making classroom activities more interactive. The research team develops this AI not merely as a tool but as an effort to build a database in the fields of STEM and indigenous science that can bring students closer to local values and knowledge.

Based on the results of the trials and experiments conducted, it shows that this AI has strategic functions but is still overlooked, including building local knowledge integration, enhancing understanding of STEM based on indigenous science, and facilitating access to learning with AI integrated with WhatsApp. With this integration, students are not dependent on Wi-Fi but can use cell phones to access AI through the available WhatsApp media. Therefore, the challenges of AI in education are not only about the potential threats to data security or issues of technology misuse but also how this AI technology can provide accurate, adequate, and comprehensive knowledge to be used in research and national policy-making in education. Meanwhile, the opportunities that need to be pursued are that this technology is expected to contribute to access and improve the quality of education.

## 4 Conclusion

Based on the research results that have been conducted, it shows that technological development has influenced human life, and this also occurs in the field of education. The entry of new technology and the technological revolution in various forms have affected the way people think and view technology. On one hand, technology is considered beneficial, but on the other hand, it has negative impacts. "Reimagine education with AI" aims to build a technological infrastructure base for AI that can be independently utilized in education in Indonesia. So far, the development of AI

technology has been adopted and borrowed from Western systems, which sometimes do not align with Indonesian values. Therefore, the role of policymakers is essential to be more attentive in using technology, especially AI, to improve quality, access, and build technological independence. Consequently, we conclude that the use of technology is not inherently good and positive; rather, it should be accompanied by the country's capacity to have policies and budgets to build technological independence and AI to advance local knowledge and modern science sustainably.

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