

## The Role of Pancasila Values in Facing the Future of Science Education Based on Artificial Intelligence Technology: A Philosophical Perspective

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### Abstract

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This research aims to conduct a philosophical review of the role of Pancasila in facing the future of science education based on Artificial Intelligence technology. Given the application of Artificial Intelligence in science education continues to increase so that this can affect new opportunities in supporting the development of science education, learning innovation and present significant challenges. The type of research conducted is qualitative through library research. The results showed that the role of Pancasila ideology towards the application of Artificial Intelligence (AI) can act as an important ethical framework in facing the future of science education. The role of Pancasila as an ethical framework in the use of Artificial Intelligence in science education is to create the use of Artificial Intelligence technology that is more humane, fair, and has a positive impact on the world in general. Other results are detailed in this paper which include the potential and challenges that may arise in integrating the values of Pancasila as an ethical framework in the use of Artificial Intelligence in various fields, especially science education. Based on the findings of this research, it contributes to the view that the role of Pancasila in science education based on Artificial Intelligence technology needs to be understood through a philosophical perspective to ensure its relevance in the future.

**Keywords:** Artificial intelligence, Pancasila, natural science education, philosophy.

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### INTRODUCTION

Science education is an important aspect in the development of human knowledge and life skills (Santos, 2017; Shyla, 2015). In this era of globalization and rapid technological progress, the science education approach needs to be reviewed to ensure the goal of sustainable human resource development, to produce individuals who are skilled and interested in the world of science, so that they can view science as a support for their future careers (Ahzan et al. 2024; Ünal & Kaygin, 2020). In this case, the role of education is increasingly important in developing knowledge and skills as a sustainable support for human resources (Mulyani & Haliza, 2021), where individuals engaged in the world of science can utilize scientific resources to empower 21st century life skills.

Science education focuses not only on mastering scientific concepts, but also on developing students' 21st century life skills (Bahri et al. 2021; Kwok, 2018; Purmanna et al. 2024; Selamat, 2023). Amidst the challenges faced by modern society, such as climate change, global health, and technological advances, science education must be able to equip students by helping them make decisions based on evidence and also in improving their ability to solve everyday life problems (Verawati & Sarjan, 2023). Thus, in era that is increasingly influenced by technological advances, science education must also transform significantly in order to remain relevant and in accordance with the needs of the times to achieve the goals of science education (Ahzan et al., 2024; Pratiwi, Cari, & Aminah, 2019).

The use of technology in science education has opened the door to various innovations in teaching and learning strategies (Asy'ari & Da Rosa, 2022; Bilad, 2023; Verawati & Sarjan, 2023). Artificial Intelligence (AI) technology has great potential to improve efficiency, productivity, and the quality of human life in various areas of life (Harjanto & Najicha, 2024), such as increasing learning innovation in the world of science education. Artificial Intelligence is a machine that has the ability to complete a certain task according to the data provided quickly and automatically (Collins, Dennehy, Conboy, & Mikalef, 2021; Wang & Siau, 2019). Its enormous usefulness makes this technology very popular in various fields of life, especially in science education. However, along with the increasingly rapid progress of Artificial Intelligence technology, various philosophical questions arise regarding ethics in the development and use of Artificial Intelligence technology. The unethical use of Artificial Intelligence can have several negative impact in the world of academic education (Livberber & Ayvaz, 2023; Lukman, Agustina, & Aisy, 2024). Thus, with a philosophical review, we can offer our own solutions in viewing the progress of science and technology to make humans wise and prudent.

Furthermore, science education needs to continue to develop strategies to address the needs of today's students while maintaining the core values of true science education (Verawati & Sarjan, 2023). By involving a philosophical perspective, this review will certainly think about how to combine Artificial Intelligence technology which is popular in the world of education today with the vision of science education to suit the demands of the times without harming ethical values in the academic world. Thus, a philosophical review will be the basis for thinking in designing relevant and responsible learning designs in facing the challenges of future science education which is increasingly dominated by technology, especially Artificial Intelligence technology.

The unethical use of Artificial Intelligence technology can have a negative impact on the world of education (Harjanto & Najicha, 2024; Ma'wa, 2024). In Indonesia, Pancasila is the foundation that forms the moral and social values that underlie community life (Ainun, Dewi, & Furnamasari, 2021). Values such as humanity, unity, social justice reflected in Pancasila have the potential to shape ethics in the use of Artificial Intelligence in the field of science education. Pancasila as a guideline that underlies values that can be used as a strong ethical framework in using science learning innovations in the sustainability of Artificial Intelligence technology (Juanita, 2024). As a country with rapid and active

technological growth, Indonesia needs to use the moral values contained in Pancasila as a guideline in forming ethics in using and innovating science learning in the use of Artificial Intelligence technology (Harjanto & Najicha, 2024).

This study seeks to provide new insights into how advanced technologies such as Artificial Intelligence can be utilized and developed in science education while still paying attention to deep ethical and moral values. Although there is potential for integrating Pancasila values in Artificial Intelligence technology, information regarding a deep understanding of how this can be realized is still limited. Therefore, this study serves as an effort to explore the important role of Pancasila in forming ethics in the use of Artificial Intelligence in science education in accordance with the Pancasila ideology to achieve the country's goals in modernization and the advancement of science and technology that continues to develop. So this research was conducted to analyze the answers to the problem formulation proposed as follows.

RQ1. How is the positive impact of the role Pancasila on Artificial Intelligence technology in science education?

RQ2. What are the potentials and challenges when implementing Pancasila in Artificial Intelligence technology in Indonesia?

## **RESEARCH METHOD**

The method used in this research is a library research approach related to the role of Pancasila, Artificial Intelligence technology, science education, and philosophy. The library approach is a research activity carried out by collecting information and data with the help of various materials available in the library, such as reference books, previous similar research results, articles, notes, and various journals related to the problem to be solved (Sari & Asmendri, 2020). The preparation of the article is based on a qualitative approach. Qualitative methods are methods that focus on in-depth review. According to Faujan & Dewi (2023), an investigation provides a more complete study of a phenomenon. Meanwhile, according to Septianingrum & Dewi (2021), the qualitative method is a procedure for producing descriptive data such as relationships with an object.

The data collection technique used is documentation, which is done by tracing written sources containing various themes and topics discussed regarding the philosophical review of the role of Pancasila values as ethical guidelines in using Artificial Intelligence in science education wisely and responsibly. Data that has been collected and analyzed using descriptive methods describes what is being investigated. The data sources used are other articles and journals that support this paper. Then analyze the data using descriptive analysis.

## **RESULTS AND DISCUSSION**

### **1. The Role of Pancasila in Artificial Intelligence Technology in Science Education**

The first research question of this study is "*What is the impact of the role of Pancasila on Artificial Intelligence technology in science education?*" To answer this question, a qualitative analysis was conducted to interpret the results

obtained through a literature study of articles and journals. The results of the study carried out are as follows.

The application of Artificial Intelligence as part of the development of science and technology has been widely implemented in the world of education, including in science education, or in other sectors such as economics, health and others (Maulana & Najicha, 2023). The convenience offered provides access that can be enjoyed by all academics in the world of education. Research in the world of science education has found that the use of Artificial Intelligence in the scope of Science Education students at Universitas Negeri Semarang is quite high, there are several types of Artificial Intelligence that are used, such as ChatGPT, Question.AI, Canva, DeepL, Grammarly, Slide.co, Perplexity, Quill Bot. From the results of these observations, the one most frequently used by students is GPT Chat with 10 data. The same thing was conveyed by Nurrahman & Najicha (2024) that currently the use of Artificial Intelligence-based technology is in great demand because it is considered quite efficient and easy. However, in its implementation, it certainly does not only have positive impacts but also negative impacts.

The presence of science and technology in human life has positive and negative impacts (Nuraeni & Dewi, 2022). The positive aspects of using Artificial Intelligence include increasing efficiency, productivity, providing more personalized education, optimizing supply, and improving the quality of life through more accurate medical diagnosis. However, the negative impacts include job losses, economic disparity, bias in algorithms, as well as privacy issues and dependence on technology (Muzakir et al. 2023). Conditions that have a negative impact are vulnerability to dependency and feeling lazy, because they are used to technology that can help with difficult assignments and practice questions (Ramdhani & Dewi, 2022). Therefore, it is necessary to carry out a form of revitalization of Pancasila as the basic ideology of the state, where Pancasila is the basis for the development of science and technology with the aim of guaranteeing the welfare of society and protecting the nation from bad influences.

The existence of science and technology is of course the result of community culture which needs to be based on the noble values of Pancasila (Astuti & Dewi, 2021). Pancasila can act as a strong ethical framework in the development and implementation of Artificial Intelligence in Indonesia. This is reinforced in the manifestation of the implementation of the second principle, namely the principle of "*Just and Civilized Humanity*" which can be implemented in the development of Artificial Intelligence to prioritize the importance of humanity, justice, privacy, ethics in human interaction. AI must be used fairly and non-discriminatory for the purpose of advancing human welfare, reflecting fair and civilized equality (Maulana & Najicha, 2023). The same thing as conveyed by Harjanto & Najicha (2024), that Pancasila can act as an ethical basis in the application of Artificial Intelligence.

Pancasila acts as a guideline for Indonesian citizens in their attitudes and behavior. Each of the five precepts of Pancasila has a unique meaning. The essence and personality of the Indonesian nation are tied to the values contained in the Pancasila principles (Ulhaq & Najicha, 2023). Pancasila in its implementation can function as a solid ethical work plan in the development and

use of AI in Indonesia. The implementation of Pancasila values in AI not only ensures that this technology develops well and ethically, but also strengthens national identity in a global context (Maulana & Najicha, 2023). By adopting Pancasila values in the use of technology, Indonesia not only ensures that AI develops in accordance with local norms and values, but also provides global ethical patterns that are unique, characteristic and sustainable. From an ethical point of view, maintaining honor and upholding human values must be the most important basis of consideration in every development process, because in essence technological development or progress must actually aim to improve the quality of life as civilized and intelligent creatures (Maulana & Najicha, 2023).

Pancasila is a unity contained in the Pancasila principles which contain sources of values, norms and ethics, references for a framework of thought, and the basis of moral principles for the development of science and technology. Apart from that, Pancasila is also the basis of an ethical system (Nuraeni & Dewi, 2022). The existence of Pancasila as a foundation or basis for the development and progress of science and technology is expected to reduce public concerns regarding the negative influences resulting from the development and progress of science and technology. Therefore, in the development of science and technology, it is very necessary to have support from the attitudes and behavior of the community which can demonstrate the implementation of Pancasila values in the sustainable development of science and technology (Nuraeni & Dewi, 2022).

## **2. Potential and Challenges in Implementing Pancasila in Artificial Intelligence Technology in Indonesia**

The second research question of this study is "*What are the potential and challenges when implementing Pancasila in Artificial Intelligence technology?*" To answer this question, a qualitative analysis was also conducted to interpret the results obtained through literature studies from articles and journals. The results of the study are as follows.

### **Potential**

In a period of very rapid technological development, the development of artificial intelligence (AI) requires strong ethical references and guidelines to ensure that AI is utilized in a way that is in accordance with Pancasila values (Nurrahman & Najicha, 2024). The important role of Pancasila as an ethical guideline in AI development. The values contained in Pancasila, such as justice, unity, humanity, openness and democracy, must be applied in every stage of AI development. By paying attention to the values of Pancasila, the development of AI can make a positive contribution to increasing society's knowledge and insight and ensuring that this technology is used for wider interests and in accordance with sustainable goals (Nurrahman & Najicha, 2024). The presence of artificial intelligence (AI) has had a significant influence on the implementation of Pancasila values. AI can contribute positively to the implementation of Pancasila by promoting justice, equality, participation and prosperity for society.

## Challenge

The development of technological innovation moves so fast that we often do not have time to think and consider the consequences that occur and are undesirable. As a result, difficulties arise in responding to problems related to character. Examples include cyberbullying and sexting. Cyberbullying and sexting seem to just appear without any significant signs. Our challenge is to find ways to teach and familiarize students with how to navigate ethics to anticipate the negative impacts of the fast-moving digital era, consciously, proactively and reflectively. Some of the challenges that must be faced and resolved in this digital era include balance, safety and security, cyber bullying, sexting, copyright and plagiarism (Triyanto, 2020). If AI is directed at values that conflict with the principles contained in Pancasila, it has the potential, for example, that AI algorithms prioritize material profits alone without caring about ethical and moral values. Misuse of personal data and violations of privacy that can threaten the values of individual freedom in Pancasila are also serious challenges. For example, the use of AI for mass monitoring without proper authorization may violate human rights (Nurrahman & Najicha, 2024).

The use of AI is needed in every line of human daily life in an effort to improve their lives and livelihoods. Just one thing that needs to be remembered is that the convenience obtained from using AI should not paralyze human reasoning and thinking. Teachers as the spearhead of education are expected to directly and frequently remind their students to realize that AI is man-made, so that humans should be in control of AI, not the other way around (Wardani, Rukiyati, & Prabowo, 2022).

Pancasila, which has been ratified as the foundation of the Indonesian state, has a long history as the philosophical and ideological basis of the Indonesian nation and state. Pancasila is a guide and guideline for the Indonesian nation in national life (<https://bpip.go.id/berita/ideologi-pancasila-di-era-milenial>). Pancasila reflects the balance between rights and obligations. In the current era, Artificial Intelligence makes a significant contribution to the implementation of Pancasila values. Some of the benefits of implementing AI in strengthening Pancasila values as a form of opportunity include: AI plays a role in democracy where AI helps people access objective and accurate information, increasing accessibility and equalizing social justice by providing information on social issues such as poverty, economic inequality and access to basic services. So that it can help development planning and create equality in the distribution of resources and opportunities for all Indonesian citizens. In addition, other roles include improving education and outreach, data analysis for public policy, increasing public participation, preventing the spread of less than good content, and increasing accessibility to information (Nurrahman & Najicha, 2024). The same thing is expressed in Taruklimbong & Sihotang (2023) that the opportunities for AI in the world of education, especially science (chemistry), are that it can help personalize science learning, improve feedback and evaluation, become a virtual assistant to help teachers in independent learning and can improve student understanding.

Just like the two sides of a coin, the threats or challenges of AI to Pancasila values also need to be worried about if it is not used appropriately. In

fact, if it is done on a large scale it can cause social and economic injustice which is contrary to the values of Pancasila. The use of AI requires algorithms to analyze data, so if the algorithm only prioritizes financial gain over ethical values and justice, it can threaten the sustainability of Pancasila as a moral foundation for society. As expressed in Ratri & Najicha (2022), that this AI technology can also be a threat because it can make society more individualistic. When connected to science learning (chemistry), there are also challenges/threats in the use of this AI technology, namely the limited capabilities of AI which have limitations in understanding complex patterns in science data (chemistry), privacy and security of student data can be accessed freely, and student dependence on technology and cyberspace, and so on (Taruklimbong & Sihotang, 2023).

## CONCLUSION

The results revealed that Pancasila as the foundation of the Indonesian state has values that can be integrated in science education based on Artificial Intelligence technology, especially in developing the character of students. Values such as justice, humanity, and unity are very relevant in the context of science education based on Artificial Intelligence. On the other hand, the Artificial Intelligence era brings new challenges in science education, including ethics and social impacts. Pancasila can be a guideline to face these challenges, by emphasizing the importance of education that is oriented towards human values. Furthermore, by prioritizing the values of Pancasila, future science education based on Artificial Intelligence technology can produce individuals who are not only intelligent in science and technology, but also have high moral and social integrity.

This paper provides important insights into philosophical perspectives to help understand and explore the values of Pancasila and its application in science education based on Artificial Intelligence technology. The application of Pancasila values in the use of Artificial Intelligence in science education is an important step to ensure that the development of Artificial Intelligence technology complies with applicable ethical and moral principles. By understanding and applying the values of Pancasila in the use of Artificial Intelligence technology in science education, it can ensure that this technology is used wisely and responsibly, utilizing Artificial Intelligence that is more humane, fair, and has a positive impact on the world at large, leading to a more ethical and beneficial use.

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