

Analysis of the Utilization of Artificial Intelligence Technology in Learning in Indonesia

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Abstract

In the contemporary digital era, integrating Artificial Intelligence (AI) into educational practices is vital for enhancing educational effectiveness. This study assesses the readiness of educational institutions in Indonesia, and to some extent in regions like Taipei, Thailand, Malaysia, and Lao PDR, to adopt AI in their learning processes. Employing an Exploratory Research approach, the study involved a Likert scale-based survey with 250 respondents, including educators and students from various educational levels, predominantly from Vocational and Secondary High Schools, as well as Higher Education Institutions. Findings indicate a moderate level of preparedness among educators and students for AI integration in education. Educators exhibit basic digital skills but show significant variation in AI-related competencies, highlighting the need for enhanced professional development in AI learning strategies. Students display moderate access to AI-supportive technology and a foundational understanding of AI applications and digital ethics, suggesting a necessity for improved digital literacy training and resources. The study underscores the importance of structured AI-specific training and collaboration among educational stakeholders to optimize AI's potential in education.

Keywords: Artificial Intelligence, Digital Literacy, Educational Readiness, Professional Development, Technological Integration.

Background

In the last decade, the application of Artificial Intelligence (AI) technology in the education sector has seen significant growth globally (L. Chen et al., 2020; X. Chen et al., 2020; Chui, 2017; Huang et al., 2021; Lu, 2019; Luan et al., 2020; Majid & Lakshmi, 2020; Pedro et al., 2019). In Indonesia, the integration of AI in learning has opened new possibilities for delivering more interactive and personalized educational content (Chui, 2017; Huang et al., 2021; Yusriadi et al., 2023). The use of AI has increase significantly (Diantama, 2023; Masrichah, 2023; Serdianus, 2023). This phenomenon indicates a paradigm shift in education, from conventional methods to more technology-oriented approaches. However, behind these developments, there are crucial issues such as the inequality of access and the uneven quality of AI learning across different regions in Indonesia.

Several studies have been conducted on the application of AI in education in Indonesia. A study by Noah Yarrow and Riaz Bhardwaj highlighted the use of AI for learning personalization (Marienko et al., 2020). Meanwhile, some research revealed that AI has potential in increasing student engagement (Y. Chen et al., 2023; Juuti et al., 2021; Schiff, 2021). Another study by Dewi and Kurniawan (2021) explored the use of AI in automated assessments (Y. Chen et al., 2023; Juuti et al., 2021; Schiff, 2021).

Furthermore, some studies focused on the integration of AI in language teaching (Bakhodirov & Rahmanova, 2023; Liang et al., 2023; Lin, 2021; Pokrivcakova, 2019). Lastly, some research provided insights into the impact of AI on the effectiveness of online learning (Alhayani et al., 2021; L. Chen et al., 2020; Ouyang et al., 2022). These studies offer a deep understanding of various aspects of AI utilization in education in Indonesia.

Despite the extensive research conducted, there remains a gap in understanding the long-term impact of AI utilization in learning and how AI can be effectively integrated into the Indonesian education curriculum. This study aims to fill this gap by examining the long-term influence of AI in learning, particularly in the Indonesian context. A specific focus will be given to how AI can contribute to improving learning quality and reducing educational inequality. This research is expected to provide a significant contribution to the existing literature and practical recommendations for educational stakeholders in Indonesia to utilize AI more effectively and inclusively.

Research Method

This study adopts a quantitative research method with a survey design. The research population includes 250 educators from various educational levels in Indonesia, encompassing elementary, secondary, and higher education, from both public and private schools. The research instrument is a survey utilizing a Likert scale, directed towards educators and educational staff to assess various aspects of readiness in integrating Artificial Intelligence (AI) technology in the educational environment.

The research instrument consists of a series of questionnaires divided into four main sections: Respondent Profile, Educator Competencies, Learning Alignment, and Student Readiness. There are a total of 40 structured questions in the questionnaire, with each section using a four-point Likert scale to assess the level of agreement of the respondents, ranging from "Strongly Disagree" to "Strongly Agree". This questionnaire is designed to measure aspects such as infrastructure, institutional support, and individual competencies in the context of AI technology implementation.

Data collection was conducted through random sampling, involving 250 respondents from across Indonesia, along with a small number of respondents from countries like Taipei, Thailand, Malaysia, and Lao PDR. The distribution of respondents includes 55 from Vocational High Schools, 53 from Junior High Schools, and 46 from Higher Education Institutions, with the remainder spread across various other educational levels.

The collected data will be analyzed using descriptive statistics to outline the response characteristics of the respondents. This analysis aims to provide a comprehensive overview of the readiness of schools in Indonesia to implement AI technology. The focus of this research is to identify the factors influencing this readiness, including the utilization of AI technology in learning and educator competencies, as well as curriculum adaptation.

The results of this study are expected to contribute valuable insights for stakeholders in the education sector in Indonesia. The goal is to formulate effective strategies to facilitate the successful implementation of AI technology in the Indonesian educational environment.

Result and Discussion

The study results present the responses of 250 respondents regarding four key areas: Profile of Respondents, Competencies of Educators, Alignment in Learning, and Preparedness of Students.

Respondents Profile

The analysis of the respondents' profiles was structured around six key questions:

1. **Gender:** What is the gender distribution of the respondents?
2. **Age:** What are the age ranges of the respondents?
3. **Level of Educational Institution:** Which educational levels do the respondents teach at (e.g., primary, secondary, tertiary)?
4. **Teaching Area:** What are the main subjects or areas taught by the respondents?
5. **Teaching Experience:** How many years of teaching experience do the respondents have on average?
6. **Country:** Which countries are the respondents based in?

Findings:

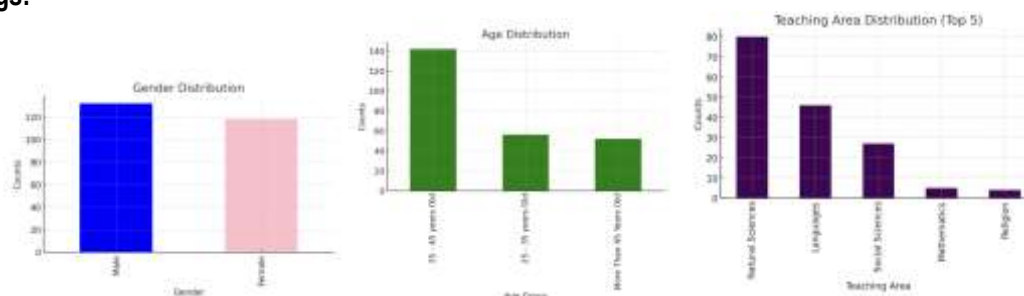


Image 1. Gender, age, and teaching area distribution

Based on picture 1, our findings are as follows:

1. **Gender:** The survey revealed a relatively balanced gender distribution among the respondents, with 132 males and 118 females.
2. **Age:** The dominant age group was 35-45 years, comprising 142 respondents. This was followed by the 25-35 age range with 56 respondents, and the over-45 group with 52 respondents.
3. **Level of Educational Institution:** A significant portion of the respondents, 55 in total, were from Vocational High Schools. This was closely followed by 53 respondents from Junior High Schools and 46 from Higher Education Institutions. Other respondents were spread across various other educational levels.
4. **Teaching Area:** In terms of teaching areas, Natural Sciences was the most represented with 80 respondents, followed by Languages with 46, and Social Sciences with 27. Other teaching areas had a smaller representation.
5. **Teaching Experience:** The majority of respondents, numbering 184, had over 10 years of teaching experience. Additionally, there were 46 respondents with over 5 years of experience and 18 with less than 5 years.
6. **Country:** The vast majority of respondents (233) were from Indonesia, with a small number from other countries such as Taipei, Thailand, Malaysia, and Lao PDR.

These findings provide a comprehensive demographic and professional background of the educators involved, crucial for understanding their perspectives and experiences in the context of integrating AI technology into education.

Educators Competencies

In exploring the competencies of educators in the realm of technology and Artificial Intelligence (AI), seven key questions guided our inquiry:

1. **Basic Computer Skills:** How proficient are educators in basic computer skills?
2. **Internet Access Skills:** What level of internet access skills do educators possess?
3. **Experience with AI-based Technologies:** Have educators used or interacted with AI technologies?
4. **Use of Specific AI Applications:** Which AI applications (e.g., Duolingo, Grammarly) are commonly used by educators?
5. **Utilization of AI in Learning:** How often do educators use AI-based technology in their teaching?
6. **AI Contribution to Teaching Quality:** Do educators believe AI can improve teaching quality?
7. **Training in AI-Based Learning Strategies:** Have educators received training for using AI technology in learning?

Our findings are as follows:

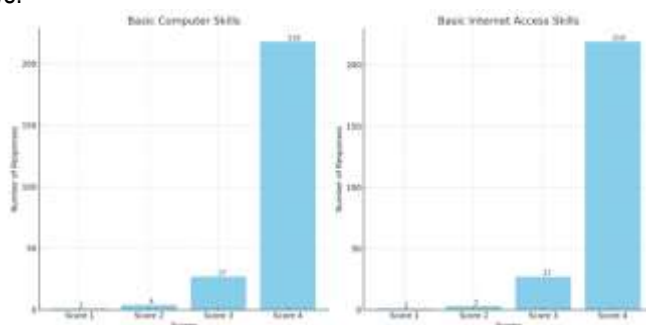


Image 2.. Basic computer and internet skill result

1. **Basic Computer Skills:** The average score was 3.848, indicating that most respondents feel moderately competent in basic computer skills. A high number of respondents, 218, rated their skills highly (score of 4) (Picture 2).
2. **Basic Internet Access Skills:** The average score was 3.856, similar to basic computer skills, suggesting a good level of expertise in internet access. The number of respondents giving a high rating (score of 4) was 219.

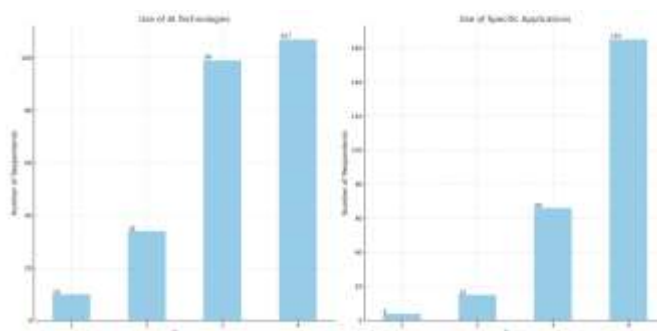


Image 3. Use of AI Technologies and Specific Application result

3. **Use of AI Technology:** An average score of 3.212 suggests that respondents have some experience with AI technology, though perhaps not as proficient as in other basic skills. The majority of respondents (107) gave a score of 4, indicating a positive perception of their AI competencies (Picture 3).
4. **Use of Specific Applications:** An average score of 3.568 indicates that many educators have used applications like Duolingo, Grammarly, Kahoot, Chat GPT, Canva, reflecting a moderately high engagement with these tools. A total of 165 respondents gave a score of 4.
5. **Utilization of AI in Learning:** The average score of 3.116 is slightly lower than other competencies, with 102 respondents giving the highest rating. This indicates a moderate level of utilization of AI in learning.
6. **AI's Contribution to Teaching Quality:** With an average score of 3.416, many educators believe that AI can positively contribute to teaching quality. A significant number, 133 respondents, rated this aspect highly (score of 4), reflecting a positive perception of AI's impact.
7. **Training in AI-Based Learning Strategies:** The lowest competency area, with an average score of 2.500, indicates a need for further training. More respondents (62) gave the lowest score (1) than the highest (4), highlighting the necessity for skill enhancement in this area.

Table 1. Competencies and Scores result

Competencies	Score 1	Score 2	Score 3	Score 4
Basic Computer Skills	1	4	27	218
Basic Internet Access Skills	1	3	27	219
Use of AI Technology	10	34	99	107
Use of Specific Applications	4	15	66	165
Utilization of AI in Learning	15	43	90	102
AI Contribution to Teaching Quality	4	21	92	133
Training in AI-Based Learning Strategies	62	56	77	55

Based on table 1, Educators generally have good basic technological capabilities, including computer skills and internet access. The majority of respondents feel very competent in these aspects, indicating their readiness to use basic technology in daily activities. However, there is greater variability in competencies related to AI technology. Although many educators have interacted with AI-based products or applications, the level of comfort and utilization of this technology in an educational context varies widely.

On the other hand, the area that requires more attention is training in AI-based learning strategies. Respondents indicated lower scores in training and mastery of AI-based learning strategies, signaling a need for further professional development in this area. Despite a general recognition of the positive potential of AI in improving teaching quality, gaps in training and practical experience with AI present barriers that need to be overcome. This suggests a significant opportunity for the development of more structured and comprehensive training programs to help educators maximize the potential of AI in education.

Learning Alignment

- Ease of AI Application Integration:** How easily can AI applications be integrated into current teaching methods?
- AI Support for Student Interaction and Creativity:** Does AI facilitate student collaboration and creativity?
- AI Enhancement of Student Skills:** Can AI applications enhance key skills like problem-solving and communication?
- Integration of Theory and Practice through AI:** Does AI help in bridging the gap between theory and practical application?
- AI's Impact on Creativity in Learning Tasks:** How does AI influence student creativity in learning tasks?
- Focus on Core Content:** Does AI technology maintain focus on core learning objectives?
- Reliability of AI Applications:** How reliable are AI applications in educational settings?
- Personalization of Learning Materials via AI:** Can AI technology adapt learning materials to individual student needs?
- Top 5 AI Applications for Learning:** What are the most preferred AI applications in education?

Findings:

- Integration and Ease of Operation of AI Applications:** An average score of 3.184 indicates that educators tend to find AI-based applications fairly straightforward to operate and that they can be integrated with their teaching methods. However, there is scope for improvement, particularly in the ease of integrating these applications with existing teaching strategies.
- Utilization of AI Applications for Collaborative Interaction:** With an average score of 2.948, it is evident that while some educators have adopted AI applications to support collaborative interaction, creativity, and student problem-solving skills, many have not fully utilized this potential.
- Development of Student Skills with AI:** Respondents tend to agree (average score of 3.324) that AI applications can enhance students' skills in creativity, collaboration, communication, and problem-solving. This reflects an acknowledgment of the potential of AI to develop 21st-century competencies in students.

4. **Accuracy and Reliability of AI Applications:** With an average score of 3.024, there is a moderate level of confidence in the accuracy and reliability of AI applications for learning. This suggests that there are some concerns or uncertainties among educators regarding the dependability of this technology.
5. **AI Adaptation to Individual Needs:** An average score of 3.292 indicates that many educators believe in AI's potential to facilitate the customization of learning materials to meet individual student needs.

Data analysis from the "Learning Alignment" section revealed that educators possess a generally positive, albeit varied, outlook on the integration and utilization of AI technology in education. They commonly agree that AI applications are user-friendly and can be assimilated into current teaching methodologies, albeit there is still potential for enhancement, particularly in integration aspects. AI's role in fostering collaborative interactions, creativity, and problem-solving among students is seen as moderate, with certain educators being more actively engaged in this application than others. This signifies that while AI's potential is acknowledged, its implementation in pedagogical practices continues to mature.

Respondents in this quantitative study fall within the AI user category. They are predominantly acquainted with applications like Canva, ChatGPT, Kahoot, Quizizz, and Mentimeter. The types of AI familiar to these teachers span three main categories: Generative AI, Educational AI, and Design and Creativity AI. Generative AI such as ChatGPT generates coherent and informative text based on given instructions using sophisticated predictive language models. Educational AI platforms like Kahoot and Quizizz leverage AI to provide an interactive learning experience and tailor questions to increase student engagement, with AI aiding in data analysis for instantaneous feedback and real-time difficulty adjustments. Mentimeter, an interactive presentation tool, employs AI to analyze real-time participant responses and visualize data in various formats to enhance participation and comprehension. For graphic design, Canva utilizes AI to suggest customizable designs, layouts, and imagery, enabling users to create attractive visual materials with greater efficiency.

The bar charts indicate that a majority of respondents highly rate statements concerning the enhancement of student skills through AI applications and the potential of AI to fortify the integration of theory and practice, denoting a broad recognition of the benefits of AI in education. Yet, lower scores in areas such as AI's reliability and training underscore the existence of apprehensions and the necessity for further advancements, both in the technological capabilities and in the provision of effective educator training. To sum up, while there is optimism about AI in the educational sector, there is an evident requirement for additional resources, training, and support to optimize the full potential of this technology.

Student Readiness

1. **Access to Technology:** Do students have access to necessary technological devices for AI learning?
2. **Basic Computer Skills Among Students:** How proficient are students in basic computer skills for using AI technology?
3. **Awareness of AI in Daily Life:** Can students identify examples of AI in everyday life?
4. **Digital Literacy:** Do students possess digital literacy skills, including critical assessment and privacy protection?
5. **Digital Ethics:** Are students aware of digital ethics when using AI technology and the internet?
6. **Initiative in Using AI for Learning:** Do students actively seek information and resources through AI applications for learning enhancement?

Findings:

Access to Technological Devices: An average score of 2.964 shows that students have moderate access to technological devices like computers or tablets, which are instrumental for incorporating AI technology in learning. Despite the widespread access, limitations exist for a certain group of students.

Basic Computer Skills: The average score of 2.820 points out that, in general, students have adequate basic computer skills necessary for AI technology usage, but there remains a scope for development.

Understanding of AI Use in Daily Life: With an average score of 2.720, students are seen to have a moderate grasp of how AI technology is utilized in everyday life.

Knowledge of Digital Literacy: Students exhibit an understanding of digital literacy, evidenced by an average score of 2.628, which includes the capability to critically evaluate information and safeguard their privacy while engaging with AI technology.

Knowledge of Digital Ethics: The average score of 2.580 for digital ethics knowledge suggests a need for improvement in students' comprehension of ethical conduct while using AI technology and the internet.

Initiative in Seeking Information and Learning Resources: An average score of 2.772 indicates that some students are proactive in searching for information and learning resources via AI applications, though this trait is not uniformly observed across the student population.

Within the realm of education, educators generally demonstrate sufficient basic technological skills, encompassing computer operation and internet access. Even with these foundational abilities, there is a notable variation in skills associated with AI. Some educators have experienced interaction with AI-based applications, but the level of comfort and its application in education varies. This situation highlights the need for more in-depth professional development, especially in learning strategies that incorporate AI. Overall, educators exhibit a positive outlook on integrating AI in education, yet there is a clear need for enhanced integration and practical application of AI.

Regarding student readiness for the era of AI technology, it appears they have a moderate level of preparedness. Differences in access and the ability to use AI technology point to the necessity for improvements in accessibility and digital literacy. The skills and knowledge of students about AI need further cultivation to better equip them for a world increasingly dominated by technology. Despite acknowledgment of the benefits of AI in education, there are still concerns about its reliability and the need for more thorough training for both educators and students. Consequently, it is advised that educational institutions provide more comprehensive and structured training tailored to AI-based learning strategies for educators, focus on improving digital literacy and AI skills in students, and develop cooperation among technology developers, educators, and stakeholders to ensure effective and pertinent AI implementation in education.

Moreover, while most educators have proficient basic digital skills, they require additional competencies to effectively integrate AI tools into their teaching. There is a limitation in educators' understanding of AI applications. Educators are poised to meet the demands of the digital era, provided there is sufficient connectivity and resources, along with training programs to enhance their personal development, particularly in AI-based learning strategies.

Conclusion and Suggestion

In the educational sphere, educators generally exhibit sufficient basic technological skills, including computer operation and internet access. Despite possessing these basic competencies, there is a significant variability in skills related to AI. While some educators have engaged with AI-based applications, the level of comfort and usage in education varies. This condition underscores the need for deeper professional development, particularly in learning strategies involving AI. Overall, educators have a positive attitude towards the incorporation of AI in education, but there is still a need for enhancement in the integration and practical application of AI. From the perspective of student readiness for the AI technology era, it appears they possess moderate preparedness. There are disparities in access and ability to use AI technology, indicating a need for improvement in accessibility and digital literacy. Students' skills and knowledge about AI require further development for better preparation in a technology-dominated world. Although the benefits of AI in education are recognized, there remain concerns regarding reliability and the need for more comprehensive training for both educators and students. Therefore, it is recommended for educational institutions to provide more complete and structured training for educators, prioritize the improvement of digital literacy and AI skills among students, and develop collaboration between technology developers, educators, and stakeholders to ensure the effective and relevant application of AI in education. This approach is expected to fully harness the potential of AI, preparing both educators and students for the challenges in an ever-evolving technological era.

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