

# TRANSFORMATIONAL LANGUAGE, LITERATURE, AND TECHNOLOGY OVERVIEW IN LEARNING (TRANSTOOL)

## CHALLENGES AND OPPORTUNITIES OF IMPLEMENTING AI IN LANGUAGE LEARNING IN INDONESIA

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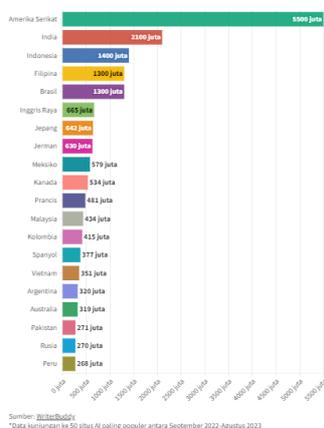
### Abstract

Advances in artificial intelligence (AI) technology have had a significant impact across various sectors, including language education. In Indonesia, the implementation of AI in language learning presents substantial opportunities, such as personalized learning and innovative assessment methods. However, there are significant challenges, including infrastructure limitations, technology access gaps, and a lack of teacher training. This research aims to analyze the challenges and opportunities of implementing AI in language learning in Indonesia. The study uses a descriptive qualitative method that combines in-depth interviews with education practitioners, language teachers, and technology experts, as well as document analysis from related literature. The results show that while AI can enhance the quality of learning through adaptive and interactive experiences, its implementation is still hindered by uneven infrastructure, especially in remote areas, and the need for more inclusive language processing models. In conclusion, collaboration among the government, educational institutions, and technology developers is crucial to addressing these challenges and maximizing the potential of AI in language education in Indonesia.

**Keywords:** Challenges, Opportunities, Language Learning, Education

## 1. INTRODUCTION

The trend of using Generative AI technology in education is not limited to Indonesia. Research conducted by Tyton Partners in the fall of 2023 shows that 49% of students from 600 higher education institutions in the United States, out of a total of 1,600 respondents, have adopted GenAI technology in their learning processes. Similar findings were obtained from a BestColleges survey in 2023, which indicated that approximately 56% of 1,000 students in the United States have used AI assistance to complete their academic assignments.



**Figure 1. Countries with the Highest AI Usage**

Figure 1 shows the number of visits to the 50 most popular AI sites across various countries from September 2022 to August 2023. The horizontal bar chart reveals that the United States has the highest number of visits, with 5.5 billion visits, significantly surpassing other countries. India ranks second with 2.1 billion visits, while Indonesia is in third place with 1.4 billion visits. Countries such as the Philippines and Brazil each recorded approximately 1.3 billion visits, placing them next in line. The United Kingdom (665 million), Japan (642 million), and Germany (630 million) also made significant contributions to AI site traffic. Latin American countries like Mexico and Colombia, as well as Southeast Asian countries such as Malaysia and Vietnam, are also on the list, though with lower visit numbers compared to the larger countries. This illustrates that the penetration and use of AI technology in developing countries are starting to rise, with Indonesia and India being key examples. The United States remains the leader in AI technology adoption, possibly due to more advanced technological infrastructure and broader access to the technology.

The development of information and communication technology (ICT) in Indonesia has seen significant progress in recent years, particularly in internet accessibility. By 2024, 79.5% of Indonesia's population accessed the internet, up from 64.8% in 2018 and surpassing 77% in 2022. The high number of internet users, exceeding 210 million in 2023, makes Indonesia one of the countries with the largest number of internet users in the world. This increase aligns with the rapid growth of mobile phones, with 90.54% of households in Indonesia having at least one mobile phone number in 2021, up from 88.46% in 2018. The high internet penetration and rapid development of mobile phones highlight the significant potential for technology implementation in various sectors, including education. The varying internet penetration across provinces, with Banten, DKI Jakarta, and West Java having the highest penetration rates, reflects disparities that may affect the gap in technology-based educational access (Hartanto & Rohmah, 2024).

The use of artificial intelligence (AI) in the context of education has become common and widely accepted. In schools and universities, the use of AI, especially Generative AI tools like ChatGPT, as an aid for completing academic tasks has become a regular practice. A survey of 1,501 students aged 15-21, including high school and college students, reveals that 86.21% of them use AI assistance at least once a month for their assignments. Only 13.79% reported never using AI in their academic activities. Among the respondents, 44.04% are high school students, while nearly 56% are college students, with a nearly balanced ratio of males and females at 46.77% and 53.23%, respectively. Respondents come from all 34 provinces in Indonesia, although the majority are from Java Island (68.09%). Indonesia itself is one of the countries with high levels of AI technology usage globally, as demonstrated by the WriterBuddy study, which reported 1.4 billion visits to AI sites from Indonesia between September 2022 and August 2023, making it the third-largest contributor to global AI device visits (Hartanto & Rohmah, 2024).

Advancements in information and communication technology in Artificial Intelligence (AI) have had a significant impact on various sectors, including education. One of the most significant areas of transformation is in language learning, where AI has the potential to enhance personalized educational experiences and facilitate innovative assessment methods. However, the integration of AI in language education also presents several challenges, including issues related to data privacy, the need for adequate teacher

training, and the accessibility of technology for all students in Indonesia (Saputra et al., 2023). Additionally, the growing reliance on AI tools in language learning necessitates a comprehensive understanding of the opportunities provided by this technology and the potential obstacles that educators and institutions may face during the integration process, especially in rapidly developing educational environments like Indonesia (Dr. Rashmi, 2023).

One of the main benefits of integrating AI into language learning is the potential for personalized and adaptive instruction. This approach allows for a learning experience tailored to the needs and pace of each student, ultimately fostering greater engagement and proficiency in the target language (Dr. Rashmi, 2023). In addition, when educators utilize AI tools to create customized learning paths, they can significantly enhance students' language mastery by providing immediate feedback and tailoring content based on student progress. This approach has been shown to improve overall educational outcomes and increase motivation in diverse classrooms. Given this context, the aim of this research is to analyze the challenges and opportunities of implementing AI technology in language learning in Indonesia.

## **2. RESEARCH METHODS**

This research employs a descriptive qualitative method aimed at identifying and describing phenomena related to the application of AI in language learning. Secondary data sources are obtained from literature and documents related to the use of AI in education. Data collection techniques include in-depth interviews, participant observations at institutions that have implemented AI, and document studies from journal articles and research reports. Data analysis is conducted through thematic analysis to identify themes related to challenges and opportunities, followed by data triangulation to enhance the validity of the research findings. This method is expected to provide a deep and comprehensive understanding of the challenges and opportunities of implementing AI in language learning in Indonesia.

## **3. RESULTS AND DISCUSSION**

### **3.1. Challenges of Implementing AI in Language Learning in Indonesia**

Indonesia, with its remarkable linguistic diversity of over 700 languages, faces unique challenges in implementing Artificial Intelligence (AI) technology for language learning (Aji et al., 2022). Additionally, the lack of adequate natural language processing models tailored to these less-represented languages significantly hinders the effectiveness of AI solutions, as many existing systems do not accommodate the complexities and variations inherent in Indonesia's linguistic landscape (Aji et al., 2022). Furthermore, gaps in technological infrastructure and educational resources across different regions contribute to uneven AI implementation, limiting access for schools and students in rural and underserved areas where investment and skill development are particularly constrained. Moreover, the need for specialized training programs for educators on how to effectively integrate AI into language learning curricula remains a significant barrier, as many teachers are not equipped with the skills needed to effectively utilize this

technology in their classrooms (Aji et al., 2022). Additionally, bureaucratic challenges and regulatory frameworks surrounding AI technology also pose additional obstacles, as the government must navigate complex policies while fostering an environment conducive to innovation and investment in this rapidly evolving sector, requiring a concerted effort to align regulations with the fast-changing technological landscape.

The rapid development of AI has brought both opportunities and challenges to the education sector in Indonesia. Implementing AI in language education requires a comprehensive understanding of these challenges to create effective solutions that address existing technological and socio-economic barriers in the region. Furthermore, ethical and social issues surrounding AI, such as bias and job displacement, must also be carefully addressed to ensure that the integration of this technology does not exacerbate existing inequalities within the education system and society at large, particularly in the context of language learning where cultural and linguistic sensitivity is paramount. Additionally, the integration of AI into language learning must consider privacy issues related to the collection and use of student data, which can pose significant risks if not managed properly, highlighting the urgent need for comprehensive privacy policies and informed consent practices to foster trust and transparency among educators, learners, and the public (Rusmiyanto et al., 2023).

There are significant concerns about over-reliance on AI tools, such as machine translation, which could hinder independent language learning and critical thinking skills among students (Laksana & Komara, 2024). Additionally, a lack of motivation among students during online learning, exacerbated by unengaging content, poses challenges for educators in effectively integrating AI technology (Setyowati, 2021). Furthermore, while AI tools can assist with academic writing, they often lack crucial features for editing Indonesian text, limiting their effectiveness and utility (Utami & Winarni, 2023). Teachers also struggle to keep up with the rapid advancements in AI, leading to gaps in their ability to effectively utilize this technology in the classroom (Fatimah & Octaviani, 2023). Collectively, these factors highlight the need for targeted strategies to enhance AI literacy among educators and students, ensuring that AI tools are used to complement rather than replace traditional learning methods.

Below is a table of the main challenges and hindering factors in the implementation of AI for language learning in Indonesia:

**Table 1. Challenges and Hindering Factors in the Implementation of AI Technology in Language Learning in Indonesia**

<b>Main Challenge</b>	<b>Hindering Factors</b>
Linguistic Diversity	The diversity of languages and local dialects creates difficulties in developing AI models that can process and generate accurate content for less-represented languages.
Lack of Natural Language Processing Models	Many AI models are not tailored to handle the complexity and variation of languages in Indonesia, especially local and less-represented languages.
Technological Infrastructure Gaps	Uneven access to technology and infrastructure, particularly in rural and remote areas, hampers the equitable implementation of AI in language education.

<b>Main Challenge</b>	<b>Hindering Factors</b>
Lack of Educational Resources	Insufficient infrastructure and budget constraints prevent schools from effectively adopting AI technology.
Need for Educator Training	Many teachers lack the skills and knowledge needed to integrate AI into language learning, and adequate training programs are still lacking.
Regulatory and Bureaucratic Framework	Complexity of policies and bureaucracy slows down the adoption and development of AI in education, requiring alignment with rapidly evolving technology.
Ethical and Social Issues	Concerns about data privacy, algorithmic bias, and over-reliance on AI technology raise worries about negative impacts on educational equity.
Availability of Local Content	A lack of relevant AI content in Indonesian and regional dialects reduces accessibility and relevance of learning materials for students.
Student Motivation and Engagement	Low student motivation during online learning and less engaging content makes AI integration less effective in language education.
Resistance to Change by Educators	Some teachers may resist using AI and prefer traditional methods, hindering the adoption of new technologies in the classroom.

Challenges in implementing AI in language learning include inadequate infrastructure, a lack of skilled educators proficient in AI technology, and concerns about data privacy and algorithmic bias, which can hinder equitable access to learning opportunities for all students in Indonesia (Dr. Rashmi, 2023; Rusmiyanto et al., 2023). Furthermore, the success of AI implementation in an educational context will heavily depend on how effectively teachers can utilize these tools, necessitating comprehensive training programs focused on both the technological aspects and pedagogical implications of AI in language learning environments (Dr. Rashmi, 2023; Rusmiyanto et al., 2023; Woo & Choi, 2021).

Indonesia's education system has historically struggled with infrastructure deficiencies, particularly in terms of access to reliable internet connectivity and computational resources (Saputra et al., 2023). The widespread deployment of AI-supported language learning tools will require a robust technological backbone capable of supporting the data-intensive nature of these applications (Dr. Rashmi, 2023). Additionally, ongoing professional development for educators is crucial, as many teachers may lack the understanding and skills necessary to effectively implement AI-based tools; thus, substantial investment in teacher training programs focusing on technological proficiency and the pedagogical benefits of these tools is essential (Saputra et al., 2023).

Limited access to the internet and necessary hardware creates disparities in learning opportunities among students in different regions, ultimately hindering the effective implementation of AI tools in educational settings (Aji et al., 2022; Saputra et al., 2023).

Furthermore, many educational institutions grapple with inadequate infrastructure and budget constraints, making the integration of AI into language learning a significant challenge and highlighting the need for substantial investments in technology and training to address these barriers (Aji et al., 2022; Saputra et al., 2023). Additionally, the readiness of educators to embrace AI technology is critical, as lack of training and resistance to change can significantly impede the adoption of innovative teaching methods that could enhance language learning outcomes (Saputra et al., 2023). Moreover, there is a pressing need for the development of local content in Indonesian and regional dialects to ensure relevance and accessibility for all learners, as the current landscape is largely dominated by resources available in English, which may not sufficiently address the unique linguistic diversity in Indonesia (Saputra et al., 2023; Taufik et al., 2023; Woo & Choi, 2021).

Limited access to technology and infrastructure in Indonesia, particularly in remote and underserved areas, poses a significant barrier to the effective implementation of AI-supported language learning. This lack of access not only impacts students' ability to learn but also restricts teachers' opportunities to integrate AI tools into their instructional methods, perpetuating existing inequalities in educational outcomes across Indonesia (Saputra et al., 2023). Furthermore, without adequate investment in infrastructure and supporting resources, the long-term sustainability of AI integration in language education remains uncertain, highlighting the need for collaborative efforts from both the public and private sectors to bridge this gap and ensure equitable access to transformative educational technology (Makeleni et al., 2023; Taufik et al., 2023).

The readiness of educators to adapt to the changing landscape of language learning is another critical challenge. Many teachers lack sufficient training in using AI tools, which hinders their ability to effectively implement this technology in the classroom; therefore, enhancing professional development opportunities is crucial to empower educators to employ innovative teaching methodologies and improve students' language acquisition experiences (Dr. Rashmi, 2023). Additionally, some teachers may resist AI integration, preferring traditional teaching methods, which can impede the widespread adoption of this technology. Moreover, the absence of comprehensive reviews on the effectiveness and pedagogical implications of existing AI-based language learning tools further complicates the situation, preventing educators from making informed decisions about technology integration and its potential impact on student engagement and learning outcomes, underscoring the need for more research in this domain (Woo & Choi, 2021).

Another pressing concern is data privacy and algorithmic bias, which can pose significant challenges in the context of AI-supported language learning. The collection and use of student data by AI systems raise ethical questions and necessitate the establishment of robust data protection policies and appropriate consent practices (Woo & Choi, 2021). Additionally, the potential for bias in AI algorithms can perpetuate existing inequalities in the education system, making it crucial for developers and educators to collaborate closely to ensure fairness and inclusivity in the use of this technology. This collaboration should also foster an environment that encourages human-AI interaction and emphasizes the importance of teacher-student engagement.

The linguistic diversity and dialects in Indonesia present further challenges in implementing AI-supported language learning. This diversity complicates the design of AI systems capable of accurately processing and generating content for various local languages, which are often underrepresented in existing AI resources. Therefore, there is

an urgent need to develop language learning AI tools that not only serve the national languages but also include regional dialects to provide an inclusive learning environment that reflects Indonesia's rich linguistic heritage. This approach would ensure that all students can engage with language instruction enhanced by technology in a way that aligns with their cultural and linguistic identities.

### **3.2. Opportunities for Implementing AI in Language Learning in Indonesia**

The diverse linguistic landscape of Indonesia presents both challenges and opportunities for language education in the country. AI technology can offer personalized learning experiences by recognizing individual student needs and adapting curricula accordingly, thereby addressing the barriers posed by language diversity and enhancing overall educational outcomes. Additionally, the implementation of AI tools, such as adaptive learning platforms, can facilitate immersive and engaging language experiences, allowing students to interact with culturally relevant content while receiving real-time feedback on their progress and performance (Nanduri & Bonsignore, 2023).

AI systems are becoming increasingly capable of analyzing student data, offering insights into student progress and helping to identify areas needing improvement. This allows educators to tailor their instruction more effectively and ensures that all students receive the support they need to thrive in their language learning journey (Nanduri & Bonsignore, 2023; Woo & Choi, 2021).

AI can also play a crucial role in revitalizing endangered languages by creating engaging and interactive learning experiences that not only captivate students but also enhance their appreciation of the cultural heritage associated with these languages. This fosters a deeper connection and commitment to language preservation efforts in Indonesia. By leveraging AI's capacity for real-time content adaptation and personalized feedback, educators can create a more inclusive learning environment that aligns with students' unique linguistic backgrounds, ultimately leading to improved language proficiency and engagement across various educational contexts.

**Table 2. Summary of Opportunities for AI Implementation in Language Learning in Indonesia**

<b>Aspects</b>	<b>AI Implementation Chances</b>
Personalized Learning	AI can provide learning experiences tailored to individual student needs, enhancing the effectiveness of language acquisition processes.
Real-Time Feedback and Assessment	AI facilitates real-time feedback and assessment, allowing students to identify areas for improvement and adjust their learning strategies accordingly.
Language Preservation	AI can help revitalize endangered languages through interactive and contextual learning experiences, boosting appreciation for cultural heritage.
Gamification	Integrating gamification strategies into AI platforms can increase student motivation and engagement by making learning enjoyable.

<b>Aspects</b>	<b>AI Implementation Chances</b>
Cultural Relevance	AI enables the inclusion of culturally relevant content in language learning, creating a more inclusive and contextual learning environment.
Project-Based Learning	AI can optimize project-based learning by creating dynamic and relevant multimedia content.
Support for Special Needs Students	AI assists in developing specialized tools, such as Braille for visually impaired students, and audio-visual media tailored to the needs of students with special requirements.
Adaptive Learning Paths	AI can create adaptive learning pathways that align with students' cultural backgrounds and preferences, supporting inclusivity in language education.
Enhanced Student Engagement	AI can boost student engagement through interactive and personalized content, improving motivation and learning effectiveness.
AI-Driven Language Analysis	AI can analyze student interactions and performance data, offering more effective and relevant learning recommendations.
Innovative Teaching Methods	AI supports innovative teaching methods, such as interactive and student-centered approaches, enhancing language proficiency and communication skills.
Content Development and Instructional Design	AI helps educators develop dynamic content and instructional strategies, increasing student engagement and learning outcomes.
Educational Equity	AI can mitigate challenges posed by language diversity, providing more equitable access to quality language education across Indonesia.
Language Immersion and Interaction	AI can create immersive virtual environments for practice and interaction, enhancing motivation and effectiveness in language learning.

Integrating AI-powered language learning tools can significantly enhance student motivation and engagement by providing interactive and personalized content that aligns with students' interests and cultural backgrounds. This, in turn, fosters a more enjoyable and effective language acquisition process. Additionally, incorporating gamification strategies into AI-supported platforms can further boost student engagement by transforming language learning into an enjoyable experience where students learn through games and competitions, thereby reinforcing their motivation to practice and master the language consistently (Nanduri & Bonsignore, 2023; Woo & Choi, 2021).

The potential of AI in language learning is highlighted by its ability to deliver personalized learning experiences that adapt to individual student needs, thereby enhancing the effectiveness of language acquisition. AI-powered tools can also facilitate real-time feedback and assessment, allowing students to identify areas for improvement and adjust their learning strategies, which significantly contributes to linguistic proficiency and overall educational experience (Dr. Rashmi, 2023). Additionally, AI

technology can streamline language learning by incorporating immersive experiences, such as virtual environments for practice and interaction, which can increase engagement and motivation among learners, ultimately leading to a more effective and enjoyable language learning journey (Dr. Rashmi, 2023).

The use of AI can help revitalize endangered languages by offering innovative language learning methods that engage students through various media, fostering a deeper appreciation and understanding of the cultural context associated with these languages (Nanduri & Bonsignore, 2023). In this regard, AI integration not only supports personalized learning but also enables the incorporation of diverse educational resources, such as interactive simulations and multimedia content, which can significantly enrich students' learning experiences and cultural understanding of the languages being studied (Dr. Rashmi, 2023; Nanduri & Bonsignore, 2023; Saputra et al., 2023). In summary, the opportunities for applying AI in language learning in Indonesia include enhancing educational practices and preserving cultural heritage, making it essential for educators and policymakers to actively seek ways to integrate this advanced technology into language curricula for a more comprehensive learning experience (Chen et al., 2021; Dr. Rashmi, 2023; Nanduri & Bonsignore, 2023).

When educators explore the application of AI in language curricula, they can leverage intelligent tutoring systems and natural language processing to create advanced learning environments that cater to diverse student needs, ultimately supporting better language outcomes and an engaging learning atmosphere (Chen et al., 2021). Additionally, this technology can play a crucial role in developing adaptive learning pathways tailored to Indonesia's varied cultural backgrounds and student preferences, promoting inclusivity and relevance in language education (Woo & Choi, 2021). Furthermore, AI's ability to analyze student interactions and performance data allows for continuous refinement of content and teaching methodologies, ensuring that the learning experience is not only personalized but also aligned with evolving pedagogical trends and linguistic demands in the region.

The application of AI in language learning in Indonesia offers significant and diverse opportunities. One potential application is the use of chatbots as learning assistants capable of providing real-time responses, helping students practice speaking and writing in Indonesian (Dewi & Sukraningsih, 2023). Additionally, AI can be used for language analysis, offering more accurate feedback on students' speaking or writing errors (Juanda & Afandi, 2024). In the educational context, AI can support the development of contextual teaching models by analyzing student data and providing relevant context for the material being studied (Widiastini et al., 2023). AI can also optimize project-based learning by creating more interactive and dynamic multimedia content that can be used in educational projects.

For students with special needs, AI can play a crucial role in developing more effective Braille tools for visually impaired students, enabling them to learn Indonesian more easily (Altyna, 2022). Additionally, AI can assist in creating more interactive audio-visual media, such as customized educational videos that cater to the abilities and needs of individual students. Finally, AI can optimize the overall learning process by analyzing student data and providing more effective learning recommendations, including identifying areas that need reinforcement and better learning strategies (Azizah et al.,

2017). This potential indicates that AI can be a valuable tool in enhancing language education quality in Indonesia.

Research by Susanto et al. (2024) shows that tools like ChatGPT can enhance teaching by aiding in the design of innovative materials, facilitating assessment, and promoting active learning through interactive methods. Additionally, machine translation tools like DeepL have been positively received by students for their accuracy and efficiency, although concerns about over-reliance persist (Laksana & Komara, 2024). Furthermore, studies indicate that AI integration can lead to improved academic outcomes, as evidenced by enhanced learning experiences in scientific Indonesian language courses (Sugianti & Rosidah, 2024).

However, there is a noted gap between students' text comprehension skills and AI capabilities, highlighting the need for curriculum revisions to better integrate AI tools (Juanda & Afandi, 2024). AI can personalize the learning experience, adapting to individual student needs and learning paces, which has been shown to improve academic performance and engagement in various studies (Sayfullayeva, 2024; Sugianti & Rosidah, 2024). For instance, AI-based learning has led to significant improvements in student performance in scientific Indonesian language courses, demonstrating its potential across different educational levels (Sugianti & Rosidah, 2024). Additionally, AI facilitates innovative teaching methods, such as interactive and student-centered approaches, which enhance language proficiency and communication skills (Sayfullayeva, 2024). Integrating AI tools in content development allows educators to create dynamic instructional strategies, fostering a more engaging learning environment. Moreover, AI's role in providing timely feedback can significantly improve writing skills, as evidenced by its positive impact on student attitudes and learning outcomes (Ahmad et al., 2024). Overall, the collaboration between educators and AI in content development fosters a dynamic learning environment, enhancing pedagogical practices and student engagement.

#### **4. CONCLUSION**

The application of AI in language learning in Indonesia shows that AI technology offers significant opportunities to enhance personalized, adaptive, and more interactive learning experiences. However, AI implementation also faces challenges, particularly related to technological infrastructure limitations, access gaps in remote areas, and a lack of training for educators. Additionally, Indonesia's linguistic diversity requires more inclusive language processing models to accommodate underrepresented local languages. Other constraints include resistance to changes from traditional teaching methods and ethical and data privacy issues. To maximize AI's potential in language learning, collaborative efforts between the government, educational institutions, and technology developers are needed to address these challenges and ensure fair and effective AI integration across Indonesia.

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