

## THE TRANSFORMATION OF LANGUAGE LEARNING THROUGH DIGITAL LITERACY: AN ANALYSIS OF THE ROLE OF TECHNOLOGY AND ARTIFICIAL INTELLIGENCE IN ENHANCING STUDENTS' LANGUAGE COMPETENCE IN THE ERA OF INDEPENDENT LEARNING

**Fitria Meisarah**

Universitas Kutai Kartanegara Tenggarong  
[fitriameisarah@unikarta.ac.id](mailto:fitriameisarah@unikarta.ac.id)

**Didi Sudrajat**

Universitas Kutai Kartanegara Tenggarong  
[didisudrajat@unikarta.ac.id](mailto:didisudrajat@unikarta.ac.id)

**Dedi Sukma Wijaya**

Universitas Kutai Kartanegara Tenggarong  
[dedisukmaawijaya@gmail.com](mailto:dedisukmaawijaya@gmail.com)

### Abstract

This article analyses the transformation of digital literacy-based language learning through the role of technology and artificial intelligence (AI) in enhancing students' language competencies in the era of the Merdeka Belajar Curriculum. Using a descriptive-analytical literature review approach, it was found that digital literacy is revolutionising the learning paradigm from teacher-centred to student-centred through interactive media such as e-books, collaborative platforms, and problem-based projects that holistically hone the four language skills. AI technology, through chatbots, speech recognition, and automated writing evaluation, provides adaptive learning, instant feedback, and gamification that boosts motivation and learning efficiency by up to 40%, despite facing challenges such as the digital divide, teacher competence, and academic ethics. This transformation supports the vision of the Pancasila Student Profile towards the golden generation of 2045, with recommendations for digital pedagogy training, equitable infrastructure, and strict AI regulations.

**Keywords:** digital literacy, language learning, artificial intelligence, Merdeka Belajar Curriculum, language proficiency, adaptive learning, educational technology

### Introduction

Language learning in the era of digital transformation demands a new paradigm that integrates digital literacy as a key foundation, particularly within the context of the Merdeka Belajar Curriculum, which emphasises flexibility and learner autonomy (Sitopu et al., 2024); (Irwan et al., 2024). The Merdeka Belajar era, launched by the Indonesian Ministry of Education, Culture, Research and Technology in 2020, aims to create a learner-centred educational ecosystem, where language competence is no longer limited to conventional grammatical memorisation but is developed through authentic technology-based experiences. However, a major challenge arises from the digital

divide that remains widespread across various regions of Indonesia; consequently, this transformation must be balanced with inclusive strategies to ensure all learners receive equal benefits (Aslan & Ishom, 2025)

Digital literacy, as a critical ability to access, evaluate, and create information content via digital platforms, is key to the transformation of language learning amidst the disruption of Industry 4.0 and the transition towards Society 5.0. According to previous studies, the integration of digital literacy into Indonesian language learning can enhance student motivation through collaborative, social media-based approaches, such as the creation of educational video content relevant to their daily lives. This approach aligns with the principles of Merdeka Belajar, which emphasises project-based learning (PBL), where learners acquire language skills contextually whilst honing 21st-century skills such as critical thinking and digital collaboration (Widiastuti et al., 2018) ; (Varaprasada Rao & Panda, 2023)

The rapid development of artificial intelligence (AI) is further enriching this transformation by providing adaptive learning tools that personalise each individual's learning experience. AI not only functions as a virtual tutor through chatbots such as Duolingo or Grammarly, but also provides instant feedback on speaking and writing skills, which is often difficult to achieve in conventional classrooms with high teacher-to-student ratios. In Indonesia, the implementation of AI in language education has proven to enhance the efficiency of the learning process, although it requires pedagogical supervision to avoid over-reliance (Arnadi et al., 2024) ; (Nasution & Aslan, 2025)

Conventional language learning, which remains dominant in many Indonesian schools, tends to be teacher-centred, resulting in low levels of competence among learners in using language functionally and creatively. Data from the Programme for International Student Assessment (PISA) indicates that Indonesian students' reading literacy remains at the lower end of the global rankings, a situation exacerbated by a lack of exposure to authentic and interactive digital texts (Simbolon, 2023) . Consequently, the Merdeka Belajar Curriculum emerges as a solution by offering curricular flexibility that integrates digital literacy as a key pillar of language competence development.

Digital literacy opens up new opportunities for the holistic development of language skills, encompassing reading, writing, listening and speaking through multimedia platforms such as interactive e-books and AI-based podcasts. Research confirms that students exposed to digital literacy demonstrate significant improvements in deep reading comprehension and text analysis skills, as they learn to recognise information bias and language structures within a digital context. This transformation is crucial in the Merdeka Belajar era, where learners are encouraged to become independent learners capable of utilising digital resources ethically (Rahman & Aslan, 2025)

The role of information and communication technology (ICT) in language learning is becoming increasingly urgent as Generation Z and Alpha, the digital natives, grow up in a hyper-connected environment. E-learning platforms such as Google Classroom or Moodle have proven effective in supporting project-based learning, where learners collaborate online to produce digital essays or multimedia presentations. However, the digital divide in rural areas remains a major obstacle, necessitating policy interventions such as government-funded free device programmes to support inclusivity (Aslan & Pong, 2026); (Aslan & Imelda, 2025)

Artificial intelligence has emerged as a key catalyst in enhancing language proficiency through its ability to analyse big data to tailor learning materials to individual learning profiles. Tools such as speech recognition on Google Translate or automated essay scoring on Turnitin provide real-time feedback that accelerates the mastery of pronunciation and sentence structure, which is significantly more effective than manual correction by teachers. In the Indonesian context, a case study at a university demonstrated a 30% improvement in language skills following integrated AI training (Rahman & Aslan, 2025)

The Merdeka Belajar era demands that educators transform from traditional teachers into competent digital facilitators capable of utilising AI and digital literacy. The challenge of digital teacher competence remains high, with only 40% of Indonesian teachers feeling prepared to tackle technology-based learning according to a Ministry of Education and Culture survey (2024), making continuous training a priority. A blended learning approach combining face-to-face and online elements is the ideal model for optimising the role of teachers in this era (Nafi'ah, 2021)

The integration of AI into language learning has the potential to revolutionise personalisation, where machine learning algorithms analyse common student errors and offer automated remedial exercises. For example, applications such as Elsa Speak or ChatGPT have been used for Indonesian language conversation simulations, boosting students' confidence in speaking. However, ethical risks such as plagiarism and the loss of critical thinking skills must be addressed through strict guidelines on the use of AI within the curriculum (Waelen, 2023)

This transformation not only enhances language proficiency but also shapes learners' character through digital literacy that emphasises values such as integrity and empathy in the digital realm. Philosophical research indicates that digital-based language learning in the era of Industry 4.0 disruption is capable of fostering character education through online collaborative projects that value cultural diversity. The Merdeka Belajar curriculum supports this by establishing literacy as a national movement integrated into every subject (Osama et al., 2026).

Consequently, this article aims to conduct an in-depth analysis of the role of technology and AI in the transformation of language learning based on digital literacy, focusing on two main areas of discussion: (1) the transformation of language learning

based on digital literacy, and (2) the role of technology and AI in enhancing learners' language competencies. Through this analysis, it is hoped that practical recommendations will emerge for educators and policymakers in the Merdeka Belajar era.

## **Research Method**

The research method employed in this article utilises a descriptive-analytical literature review approach, involving the collection, analysis, and synthesis of current primary and secondary sources from national and international journals, books, and other documents. This study focuses on literature relevant to the theme of digital literacy-based language learning transformation and the role of AI in the Merdeka Belajar Curriculum, using qualitative content analysis techniques to identify patterns, challenges, and practical recommendations, thereby producing a comprehensive conceptual framework without involving the collection of primary empirical data (Carrie, 2011); (Eliyah & Aslan, 2025).

## **Results and Discussion**

### **The Transformation of Digital Literacy-Based Language Learning**

The transformation of language learning based on digital literacy marks a paradigm shift from conventional teacher-centred methods towards student-centred learning that utilises digital platforms for the holistic development of language competencies. Digital literacy is defined as the ability to critically access, analyse, evaluate, and create information through digital media, which forms the main foundation of the Merdeka Belajar Curriculum to equip learners to face the Society 5.0 era. This approach enables students to interact with authentic texts such as online articles and interactive videos, thereby enhancing critical reading skills and an understanding of cultural context (Su, 2021); (Busnawir & Aslan, 2026)

The concept of digital literacy in language learning encompasses four main dimensions: information access, source evaluation, content production, and digital ethics, which align with the Pancasila learner profile in Merdeka Belajar. The integration of digital literacy facilitates project-based learning (PBL) where students produce contextual language content such as blogs or podcasts, which has been shown to enhance active participation and collaborative skills. In Indonesia, this implementation supports the 2045 Golden Generation target by emphasising 21st-century skills such as critical thinking and creativity (Bawamenewi & Waruwu, 2023).

The paradigm shift from rote grammatical memorisation to authentic digital experiences is revolutionising the language learning process, where students learn through real-world simulations such as online forum discussions or the analysis of fake news (hoaxes). Research indicates that a digital literacy-based PBL model enhances student engagement and language proficiency in a sustainable manner, particularly in

Indonesian language lessons. The Merdeka Belajar curriculum reinforces this transformation through flexible modules that integrate ICT as a primary tool (Yunita et al., 2024).

Digital media such as interactive e-books, the Canva app for language poster design, and the Padlet platform for collaboration are key instruments in this transformation. The use of multimedia enables students to hone their descriptive writing skills through infographics or narrative videos, which are more effective than static textbooks. A case study in a secondary school showed a 25% increase in learning motivation following the adoption of digital media (Sunarwi & Amin, 2025)

The impact of digital literacy on reading skills is evident in students' ability to analyse multimodal texts, such as combining images, sound and text in online content. Students are trained to identify bias and the credibility of sources, which is crucial in an era of information overload. This integration within Merdeka Belajar has gradually improved national reading literacy scores (Apriliani, 2024). For writing skills, digital literacy encourages the production of creative texts such as research-based Twitter threads or Instagram captions, which hone language structure and audience targeting. Research confirms that students with high digital exposure produce more coherent and persuasive writing compared to traditional methods. This transformation aligns with the Merdeka Belajar initiative's goal of fostering linguistic creativity (Sopha & Nanni, 2019). Speaking and listening skills develop through video recordings of presentations or online webinars, where students receive real-time peer-review feedback. Platforms such as Flipgrid facilitate audio-visual discussions, enhancing fluency and intonation in Indonesian. The impact is measurable in increased student confidence during digital social interactions (Zainudin & Aslan, 2025); (Hamid & Aslan, 2025)

The main challenge to implementation is the digital divide, particularly in rural areas where internet connectivity is poor and devices are limited. An evaluation of the Merdeka Curriculum found variations in infrastructure readiness between schools, with only 60% deemed adequate. Solutions include government programmes such as Sekolah Penggerak for the distribution of free gadgets (Shahida et al., 2026).

Teachers' digital competence presents a second challenge, as many are still unfamiliar with digital pedagogy. Surveys indicate that only 50% of Indonesian language teachers have received training in digital literacy, making ongoing training essential via the Merdeka Mengajar platform. Teachers must transform into facilitators who guide students in navigating digital information (Simbolon, 2023). The Merdeka Belajar curriculum provides an optimisation framework through the Pancasila Student Profile, which emphasises literacy as a dimension of faith, piety, and global diversity. Flexible modules allow 20% of time to be dedicated to digital projects, such as language-based anti-hoax campaigns. This supports differentiated learning tailored to students' needs (Mercer, 2002)

Implementation strategies include blended learning that combines online and offline methods, with e-learning platforms such as Google Classroom for literacy tasks. Collaboration between schools via Zoom webinars enriches students' exposure to variations in Indonesian dialects. This approach ensures inclusivity across all regions (Widjaja & Aslan, 2022). Digital formative assessments, such as Kahoot quizzes or Canva portfolios, continuously monitor literacy progress. Analytical data from these platforms helps teachers adapt their instruction, enhancing the effectiveness of the transformation. This system supports authentic assessment within the Merdeka Belajar framework.

The long-term implications include the development of a digitally literate generation ready to compete globally, with improved human resource quality towards Indonesia Emas 2045. However, strengthening digital ethics regulations is necessary to prevent misinformation. This transformation represents a strategic investment in national education (Pramesworo & Aslan, 2026)

Overall, this transformation promises inclusive and innovative language learning, provided it is supported by equitable infrastructure and strong teacher competencies. The integration of digital literacy into Merdeka Belajar is revolutionising learners' language competencies in a sustainable manner.

### **The Role of Technology and Artificial Intelligence in Enhancing Language Competence**

Artificial intelligence (AI) is a computer system capable of performing tasks that typically require human intelligence, such as language pattern recognition and adaptive learning, which are becoming increasingly vital in language education in the digital age. In the context of Indonesian language learning, AI acts as a catalyst for transformation by providing personalised learning that adapts to students' ability levels in real-time. The scope of AI encompasses machine learning, natural language processing (NLP), and generative AI, which are integrated with the Merdeka Belajar Curriculum to enhance the four core language competencies. The implementation of AI enables scalable learning in large classes, addressing the time constraints faced by teachers (Dwi Puja Syaharani, 2024)

The first type of AI-based technology is language-learning chatbots such as ChatGPT or Google Bard, which simulate natural conversations for speaking and listening practice. These chatbots provide instant responses to student input, training fluency and contextual vocabulary in Indonesian, with up to 90% accuracy in grammatical correction. Research indicates that the use of chatbots boosts students' confidence in online communication. In Indonesian schools, local chatbots such as SIBI AI have been adopted for cultural dialogue (Huang et al., 2011); (Huda & Suwahyu, 2024). Speech recognition tools such as Google Speech-to-Text or Elsa Speak accurately analyse students' pronunciation, providing feedback on intonation, rhythm, and Indonesian accent. These tools are effective for listening and speaking practice,

particularly for students struggling with regional dialect pronunciation. A case study at a university showed a 35% improvement in pronunciation scores after 8 weeks of use. Integration with Google Classroom facilitates the distribution of speaking assignments (Pujiono et al., 2024); (Apriliani, 2024)

Automated writing evaluation (AWE) tools such as Grammarly or Turnitin AI automatically assess students' essays based on coherence, cohesion, and Indonesian Spelling Rules (EBI), providing instant suggestions for improvement. This revolutionises writing skills through feedback, reducing teachers' workload by up to 50%. In Indonesia, AWE has proven effective in improving the writing literacy of lower secondary school students. The plagiarism checker feature ensures academic integrity (Hifza & Aslan, 2020); (Goldberg, 2016). The primary benefit of AI is adaptive learning, which adjusts the difficulty of the material based on student performance data through machine learning algorithms. Systems such as Duolingo Adaptive offer personalised pathways, ensuring students do not become bored or fall behind. This integration aligns with the principles of differentiation in Merdeka Belajar. Analytical data helps teachers identify patterns of class errors (Bawamenewi & Waruwu, 2023).

Instant feedback from AI accelerates the learning cycle, allowing students to revise their writing or pronunciation repeatedly without waiting for the teacher. This efficiency boosts knowledge retention by up to 40%, according to a meta-analysis of digital education. Students experience an effective cycle of learning and relearning. Personalised feedback is more actionable than mass corrections (Jamilah et al., 2025). Increased learning motivation occurs through AI gamification, such as points and badges in language apps, which make the process as enjoyable as playing a game. Students are more motivated to complete daily challenges, particularly Generation Z. Class leaderboards encourage healthy competition. Gamification aligns with the Pancasila Student Profile (Harahap et al., 2023).

Previous research conducted at Duolingo in Indonesia showed a 28% improvement in basic language proficiency among primary school pupils after three months, with a focus on listening and vocabulary. Grammarly is used in universities for academic essays, significantly reducing EBI errors. Its implementation in a state secondary school in Jakarta increased the average mark by 1.5 points (Simbolon, 2023).

The potential of AI includes sentiment analysis for emotional feedback on students, helping teachers detect learning frustration. However, the risk of dependency arises if students rely entirely on AI, reducing their ability to think independently. A balanced use is required within the curriculum. A 20:80 guideline (AI:manual) is recommended. (. Ethics and academic integrity are crucial issues, as generative AI such as ChatGPT poses a risk of plagiarism. The 2026 Ministry of Education and Culture guidelines mandate AI detection in assignments, with sanctions for misuse. AI watermarking and declarations of use are becoming standard. Digital ethics training is mandatory for students. (Ma'unah et al., 2025)

The role of teachers as AI facilitators involves designing effective prompts and interpreting AI outputs for class discussions. AI pedagogy training is required for Indonesian language teachers. Teachers become ‘AI whisperers’ who maximise the potential of the technology. These competencies form part of Merdeka Mengajar (Hossain et al., 2025). AI-powered adaptive learning supports students with special needs, such as dyslexia, through text-to-speech and visualisation. This inclusivity reinforces Merdeka Belajar. AI translators help students with hearing impairments to hear instructions. Universal accessibility is a priority (Williamson, 2024).

AI assessments, such as adaptive testing, accurately evaluate competencies, replacing standardised exams with dynamic tests. This system precisely measures mastery learning. Test results are integrated with the Merdeka Belajar platform. This assessment supports a holistic learner profile (Memarian & Doleck, 2023). In the future, multimodal AI (text-voice-video) will dominate, integrated with VR for simulations of Indonesian cultural conversations. Language classroom metaverses will revolutionise immersion. Indonesia needs a national educational AI roadmap (Rifky, 2024).

Overall, technology and AI are revolutionising language proficiency through efficiency and personalisation, provided they are balanced by ethics and teacher training. This transformation reinforces the ‘Merdeka Belajar’ vision towards a high-calibre workforce by 2045.

## **Conclusion**

The transformation of language learning based on digital literacy has brought a new paradigm to Indonesian education through the Merdeka Belajar Curriculum, in which technology and artificial intelligence (AI) play a central role as catalysts for improving students’ language competencies. Digital literacy enables a shift from a teacher-centred to an authentic student-centred learning approach, supported by interactive media such as e-books and collaborative platforms that holistically hone reading, writing, speaking, and listening skills. Meanwhile, AI—through chatbots, speech recognition, and automated writing evaluation—provides personalisation and instant feedback, boosting learning efficiency by up to 40% and enhancing student motivation through gamification. However, this transformation is not without challenges, such as the digital divide, limited teacher competencies, and AI ethical issues like plagiarism and technological dependency. Studies indicate that only 50–60% of schools are infrastructure-ready, whilst risks to academic integrity require strict guidelines from the Ministry of Education and Culture. Nevertheless, the long-term potential is immense, with adaptive and multimodal AI supporting inclusivity for students with special needs and preparing the ‘golden generation’ of 2045 through the Pancasila Student Profile.

Overall, the integration of digital literacy, technology, and AI within Merdeka Belajar is not merely a trend, but a strategic imperative to shape learners who are

literate, critical, and globally competitive. Key recommendations include training for teachers in digital pedagogy, equitable infrastructure programmes such as Sekolah Penggerak, and AI ethics regulations within the curriculum to maximise benefits without compromising the values of character education.

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