SCIENTIFIC CULTURE
www.sci-cult.com

SCIENTIFIC CULTURE, Vol. 12, No. 2.1, (2026), pp. 6195-6204
Open Access. Online & Print

DOI: 10.5281/zenodo.19410837

EMPOWERING LANGUAGE LEARNING THROUGH ARTIFICIAL INTELLIGENCE INNOVATIONS

Jack Ng Kok Wah[1*]

[1]Multimedia University, Cyberjaya, Malaysia. Persiaran Multimedia, 63100 Cyberjaya, Selangor
ngkokwah@mmu.edu.my, https://orcid.org/0000-0002-3055-953X

Received: 20/02/2026
Accepted: 30/03/2026

Corresponding Author: Jack Ng Kok Wah (ngkokwah@mmu.edu.my)

ABSTRACT

AI in language learning assists by adapting, personalizing, and enhancing technology. It combines both traditional teaching pedagogy with technological innovation. Although used extensively, there is disagreement in studies about how well AI influences cognitive skills, motivations, and development of social-emotional intelligence in relation to different languages, ages, and educational settings. Thus, this review synthesizes recent studies of AI-assisted language learning to identify key trends, difficulties, and opportunities through both quantitative and qualitative findings. The pedagogical, technological, and learner-centered perspectives are all examined by applying a systematic and bibliometric analysis to recent studies. This review encompasses empirical studies, case studies, and theoretical discussions. As a result, this study shows how AI technology can be used to develop personalized learning, improve vocabulary acquisition, increase learner engagement, and practice speech exercises. However, some learners report higher anxiety level and others use excessively. Educators also feel thrilled and concerned about how to integrate technology in teaching as well as ethical considerations related to its usage in education. Thus, this review recommends a balance between AI-assisted teaching and human support to increase digital literacy and facilitate greater access to education. Future studies should focus on long-term studies and examine different cultures in a more in-depth analysis of how generative AI technology is altering its role in education.

KEYWORDS: AI; Language Learning; Personalized Learning; Vocabulary Acquisition; Language Acquisition Technology; Educational Technology.

1. INTRODUCTION

AI is gaining popularity in the area of language learning due to its ability to provide personalized, interactive, and efficient language learning experience. This assists language learners in terms of their vocabulary acquisition and skill development despite different linguistic settings (Arbi, 2024; Chen, 2024). For instance, generative AI like mobile applications and intelligent tutoring systems allow dynamic learner–digital content interaction and provide instant personalized feedback towards the learner's interaction (Vo & Nguyen, 2024; Wan & Moorhouse, 2024). This indicates that in language classrooms, those personalized feedback could help teachers by supplementing instructions outside class time, which would expand access to learning opportunities to more globally accessible contexts. (Yuan and Schlote, 2024).

1.1. Issues and Gaps

Despite the rapid growth of AI along with the benefits that come with using AI-based tools, there appears to be a number of limitations surrounding integration of AI in teaching language. One of the major gaps is that the majority of studies on usage of AI in language teaching benefiting language learning focus on Arabic and English language only, while other languages are under-researched (Fitrianto, Setyawan, & Saleh, 2024; Javaid, 2024). Although AI tools can boost student motivation and engagement in classes while learning language, their effectiveness is constrained by how much preparation the teacher has in integrating their pedagogical tools with AI. The constraints from low technological literacy of teacher and student, and a lack of adaptation to local instructional contexts of the learned language could also negatively impact the students' learning outcome (Novawan, Walker, & Ikeda, 2024; Patty, 2024).

Besides, a number of studies report mixed results on learners' anxiety levels when learning language, spoken language proficiency after using AI-based tools, and students' self-regulation while attending lessons integrated with AI. This would suggest that there should be certain variables that influence the AI's effectiveness on producing a beneficial outcome for students who integrate AI in language learning classes, which would explain why not all learners will benefit from AI-based interventions (Hsu, Chang, & Jen, 2024; Kutsyk & Nykyporets, 2024). Bibliometric analyses also show that the literature on motivational and cognitive aspects of students is overemphasized, while other areas like ethical handling of students' data privacy in AI-based platforms, socio-cultural effects of using AI-based tools that provide cultural context on the country of the language the students are learning on students themselves, and pedagogical perspectives of teachers integrating AI-based tools in their classes are still under-researched (Lubis et al., 2024; Rahman et al., 2024).

1.2. Scope and Objectives

The purpose of the research aims to examine how AI supports various teaching approaches to language acquisition of students, which includes immersive speaking exercises given to students and customized learning pathways based on students' needs that was analyzed through the use of AI-based tools (Fitrianto, Setyawan, & Saleh, 2024; Wan & Moorhouse, 2024). This study also aims to create a thorough understanding of the advantages and difficulties of AI-assisted language instruction on students' learning progress by combining insights from teacher experiences when using the AI-based tools, learner perceptions of the instructions generated by AI-based tools, and the functional efficacy of AI-supported learning tools in guiding the students' language learning progress (Novawan, Walker, & Ikeda, 2024; Vo & Nguyen, 2024).

1.3. Novelty Contributions

Integrative framework used in this study connects notion of learner-centered teachings in classrooms, AI integration in pedagogy, and challenges faced in terms of technology. It also examines how AI supports language learning by focusing on cross-linguistic applicability, learner experience, usability, and teacher adoption (Arbi, 2024; Lubis et al., 2024) instead of just cognitive or motivational outcomes, which are already heavily emphasized in earlier reviews (Javaid, 2024; Kutsyk & Nykyporets, 2024). Hence, this study provides new perspectives on the useful application of AI technologies in classroom and remote learning settings by concentrating on the development of generative AI tools in the most recent educational contexts (Vo & Nguyen, 2024; Wan & Moorhouse, 2024).

In order to create a more inclusive and flexible language learning environment, this research also aims to inform policymakers, educators, and technology developers about both practical ways to maximize AI's potential and its limitations.

2. METHODS

2.1. Eligibility Criteria

The narrative review of this study is based on several criteria that ensure the selection of studies

that are relevant, credible, and methodologically rigorous. For example, when examining utility of AI in language learning, most of the chosen literature are empirical research with systematic reviews and theoretical discussions that were published after 2024 and are in line with current pedagogical practices and technological advancements (Rahman et al., 2024; Lubis et al., 2024).

This review includes research conducted in a variety of educational contexts, including traditional classrooms, online learning environments, and mobile-assisted learning environments, to represent the various ways on how AI is applied into language acquisition (Vo & Nguyen, 2024; Yuen & Schlote, 2024). The majority of research focuses on behavioural, cognitive, or motivational learner outcomes, all of which are important factors for this study to assess the educational implications of integrating AI (Javaid, 2024; Hsu et al., 2024). On the other hand, studies that have unrelated technological interventions, lack methodological clarity, or are not peer reviewed are not included.

2.2. Review Selection

In search of relevant articles, specific keywords related to AI in language learning like "technology-enhanced learning," "language learning," "artificial intelligence," and "AI-assisted pedagogy" were used. Search was conducted across major academic databases such as Web of Science, Scopus, and Google Scholar (Arbi, 2024; Chen, 2024). After identifying potential sources, abstracts and full-text articles were screened based on the relevance of the articles to AI use in language teaching. Articles that were chosen were articles that emphasize teacher perspectives, learner experiences, and reported challenges related to AI implementation. Both concept papers and empirical research articles were included in the search of articles, ensuring representation of both theoretical and practical aspects (Novawan et al., 2024; Patty, 2024). To broaden the coverage of articles, the reference lists of the selected articles were examined repeatedly to find more relevant studies that did not appear during the database search, following the procedure in the established narrative review method (Kutsyk & Nykyporets, 2024). Since only one author conducted the review, both screening and selection of the articles happened independently without third-party checking. This meant that inter-rater reliability was not assessed for the articles reviewed in this paper. However, the author carefully screened and selected the articles to maintain consistency in the quality of articles and accuracy of the articles in relation to AI in language learning.

Figure 1 shows the initial database searches which retrieved 69 studies. After removing duplicates, 31 records were left. After screening 31 records, 10 studies were excluded while the remaining 21 articles were thoroughly examined again. After the last screening, another 8 studies were excluded as they did not meet the eligibility criteria. The number of articles included in the final analysis was 13, and all 13 articles were analysed through in-depth qualitative and quantitative analysis. This systematic selection process is to ensure the relevance and quality of the analysis while trying to source for articles related to learner experiences, AI applications, and teaching implications.

Identification
Records identified through database searching (n = 64)
Additional records identified through other sources (n = 5)

Screening
Records after duplicates removed (n = 31)
Records screened (n = 31)
Records excluded (n = 10)
Eligibility
Full-text articles assessed for eligibility (n = 21)
Full-text articles excluded, with reasons (n = 8)
Included
Studies included in qualitative and quantitative synthesis (n = 13)

Figure 1: PRISMA Flow Diagram: Study Selection for Reviewing the Impact of Artificial Intelligence on Language Learning.

2.3. Data Extraction

During this process, the relevant variables such as

participant profiles like age, the research objectives of each articles, types of AI technologies used (e.g. generative AI, mobile applications, self-regulation strategies), instructional methods used with integration of AI, and effects on learner motivation, cognition, and engagement were variables that were being searched (Fitrianto et al., 2024; Wan & Moorhouse, 2024). To provide rich and descriptive context for the findings mentioned, qualitative findings focusing on learners' perceptions of AI-supported interactions and teachers' reflections on challenges were also extracted for analysis (Novawan et al., 2024; Vo & Nguyen, 2024). This is to ensure reliability and consistency for this study while minimizing potential bias.

2.4. Data Synthesis

Thematic analysis approach was used to identify patterns for gains in vocabulary acquisition of students after using AI-based tools, increased learner engagement as a result of AI-based tools, and reduction in learning anxiety in terms of speaking the learned language. Special emphasis was put when AI was used alongside adaptive or personalized teaching methods towards students' needs in the sourced articles (Hsu et al., 2024; Fitrianto et al., 2024). The review also outlines trends in technology use in language learning settings, in which the analysis suggests an increase in usage of generative AI, mobile-assisted learning, and self-regulated AI systems in language learning context (Rahman et al., 2024; Arbi, 2024). Moreover, the synthesis also reveals potential benefits of using AI-based tools in language learning classes that were suggested in the sourced articles, such as improved learner autonomy in classes and motivation in language learning after using AI-based tools, and challenges of using AI-based tools, like gaps in digital skills of students and teachers and the need for teaching adjustments by teachers who do not have prior experience in integrating AI-based tools in their teachings (Chen, 2024; Yuen & Schlote, 2024). Such usage of qualitative insights by the experience of teachers and students using AI-based tools in language learning classes to explain the context of quantitative finding is to provide a clearer and deeper understanding of AI's role in language learning.

3. RESULTS AND FINDINGS

3.1. Trends in AI-Enhanced Language Learning

According to Fitrianto and his team (2024) and Arbi (2024), AI was found to facilitate personalized and adaptive learning experiences among students who used AI in class. This suggests that AI can accommodate learners' proficiency level, learning styles, and goals while providing personalized feedback towards their progress and scaffolded practice opportunities based on students' knowledge. For instance, generative AI like ChatGPT has been found to be effective in offering interactive dialogue experiences that provide immediate feedback, simulating human tutoring experiences (Vo & Nguyen, 2024; Wan & Moorhouse, 2024). Similarly, mobile and cloud-based AI platforms can enhance accessibility to learning materials, allowing learners to engage with resources flexibly which would support learner-centered and anytime-anywhere education (Yuen & Schlote, 2024).

As shown in Table 1, AI can facilitate customized instruction in classes, strengthen vocabulary and speaking skills, assist teachers in pedagogical teaching, as well as motivate learners in language learning. For instance, technologies such as chatbots and mobile applications can enhance engagement of learners, reduce anxiety, and promote self-regulated learning. All these could foster a more effective, interactive, and confident language acquisition experience for learners with different backgrounds.

Table 1: Comparative Analysis of AI-Enhanced Language Learning: Applications and Outcomes.

AI Application	Description	Learning Outcomes	References
Personalized Learning Systems	AI-powered learning tools can tailor lessons based on learners' profiles, proficiency levels, and learning pace, offering personalized feedback and practice to help students based on their personal needs.	Stronger engagement from students, improved knowledge retention on language, reduced learning anxiety while speaking learned language, and more individualized progress monitoring based on their needs.	Fitrianto et al. (2024); Arbi (2024); Javaid (2024)

AI-Powered Vocabulary & Language Practice	Technologies such as image recognition, chatbots, and generative AI support learners' vocabulary acquisition and language use through interactive activities that could allow students to practice.	Improved vocabulary acquisition for learners, more opportunities for practice to train their speech, better self-regulation during speaking, and lower anxiety levels when speaking.	Hsu et al. (2024); Vo & Nguyen (2024); Wan & Moorhouse (2024)
Generative AI & Conversational Agents	AI-based speaking partners and writing assistants (e.g., ChatGPT) can simulate authentic communication scenarios, creating scenarios close to real life for students to simulate.	Better speaking confidence, improved fluency for speaking and interactional skills, and more positive attitudes toward language learning.	Vo & Nguyen (2024); Wan & Moorhouse (2024); Patty (2024)
Teacher Support & Intelligent Tutoring	AI tools can support teachers with lesson planning to improve the lesson quality, student progress tracking so that teachers know how students progress, and differentiated instruction for students with diverse needs.	Teachers can better understand learners' needs, manage classroom more efficiently, and implement targeted interventions to enhance learning outcomes of students.	Novawan et al. (2024); Kutsyk & Nykyporets (2024)
Mobile and App-Based AI Learning	Mobile applications offer language practices, reminders, and gamified experiences for students to learn and practice language.	Increased learner motivation on learning language, flexible learning opportunities for students, and sustainable engagement to sustain students' attention.	Yuen & Schlote (2024); Chen (2024)
AI Analytics & Progress Tracking	AI systems that analyze learner performance can generate feedback based on what students need and identify potential learning difficulties early to resolve issues.	Foster self-regulated learning guided by AI-based tools, guide remedial instruction that fits the learners' needs, and improve learners' overall language proficiency.	Lubis et al. (2024); Rahman et al. (2024)
Cognitive and Motivational Enhancement	AI-supported interventions focusing on developing students' cognitive, motivational, and metacognitive strategies can enhance language learning quality of students.	Greater learning motivation, train learners to develop stronger problem-solving and critical thinking skills and enhance learning autonomy of students when using AI.	Javaid (2024); Arbi (2024)

3.2. Cognitive, Motivational, and Behavioral Insights

Javaid (2024) and Hsu et al. (2024) report that AI-supported learning can improve learner's reading comprehension, language retention of the language they are learning, and vocabulary acquisition on words that they are unfamiliar with. It can also alleviate learners' anxiety level when they are given a chance to speak. Besides, AI can provide immediate feedback on students' progress and gamified learning experience to support self-regulated learning, which can foster learners' engagement towards educational materials. However, poorly aligned AI tools or excessive automation may lead to cognitive overload and reduce opportunities for critical thinking (Kutsyk & Nykyporets, 2024). Despite these risks, the findings extracted suggest that thoughtfully integrated AI within curriculum design can still enhance learners' motivation and self-efficacy in language learning.

3.3. Contradictions and Conflicting Evidence

Novawan et al. (2024) found that many educators expressed their concern on AI potentially decreasing their authority and create dependency on technology among the students. Furthermore, Patty (2024) found that different schools vary in their speed of adopting AI based on a variety of institutional barriers. Besides, the author also found that different schools

differ in the digital literacy of educators and the confidence of educators in the effectiveness of AI. These findings suggest that AI in language learning will only work if educators were more prepared given that the schools support them. Also, the findings suggest that learner receptivity is crucial for AI to work.

3.4. Quantitative and Qualitative Insights

Rahman et al. (2024) and Lubis et al.'s (2024) work show that AI-related language learning research was being increasingly studied. The authors found that these studies were more frequent in 2024. Besides, bibliometric mapping also shows evidence suggesting an increasing emphasis on personalized learning, generative AI usage and the use of mobile platforms for teaching language learning. The mapping also reveals that these studies have increased focus on cross-linguistic education.

The qualitative research into the benefits of the aforementioned research areas provide valuable insights into this topic. Previous studies collecting data on learner interviews and case studies in this area found a range of benefits like greater learner confidence when practicing their speech in the language they are learning, having more opportunities for low-stakes practice outside of scheduled class time, and enhanced access to authentic language contexts through real-time feedback (Chen, 2024; Yuen & Schlote, 2024). Moreover, learners also mentioned that they felt more autonomy and agency when using AI-based learning tools when doing self-directed language practice, which supports the view that the growing shift toward learner-centred pedagogical practices in language education may better align with learners' needs and learning preferences.

3.5. Comparative Analysis and Case Studies

Comparative analysis shows that AI-supported Arabic learning plans that are personalized to students who learn it for the first time would result in better language retention of Arabic language as compared to traditional instruction (Fitrianto et al., 2024). Additionally, EFL learners found generative AI to be a more effective way to improve their oral speaking fluency as compared to static language learning applications (Vo & Nguyen, 2024). Case study on the "Call Annie as an AI speaking partner" (Wan & Moorhouse, 2024) demonstrates AI's ability to generate authentic conversational speech, providing a scalable approach to speaking practice that creates a low-pressure participation environment for learners to build confidence gradually over time. These demonstrate AI's potential to resolve teacher shortages and enhance access to opportunities for learners to practice speaking in educational environments that lack resources for them.

3.6. Gaps in Literature

Most studies put their focus on short-term outcomes, which meant that the literature lacks longitudinal evidence about long-term effects of using AI on practical language proficiency in real-world communication (Arbi, 2024; Chen, 2024). Besides, the socio-emotional effects of AI like development of cultural awareness during AI-mediated interactions, the formation of learner identity through sustained engagement with AI tools, and the honing of collaborative skills in learning environments that integrate AI remain underexplored. Ethical issues like the privacy of learner's personal data while using the AI-based platform are also insufficiently addressed. This calls for a need for frameworks that can guide technological innovation in improving ethical AI practices on handling the learners' data to protect learners from technological harm (Lubis et al., 2024). Moreover, most research was done using qualitative methods, which meant that there is a lack of quantitative data in literature of the integration of AI in pedagogical materials. Therefore, there is a demand for mixed-methods studies to examine measurable learning outcomes and quantify learner experience to gain a structured understanding and evidence on the benefits of using AI in language learning.

Synthesis of Real-World Applications: Most studies mentioned that AI has potential to transform language learning to practical applications to support diverse learning needs from students. For instance, support from AI tutors, generative chatbots, and mobile applications can create support for personalized learning and reduce language learner's anxiety in classes. Furthermore, these could complement traditional teaching to enhance both accessibility to learning materials and instructional quality that is tailored to students' needs. As a result, this could provide learners with more engaging lessons, flexible learning progress and timing, and responsive learning opportunities that allow students to better learn the languages they learn. Nevertheless, effective integration requires a strategic combination of AI with human guidance on language teaching rather than simply replacing educators with full AI lessons. This could potentially maximize learning benefits for learners while

minimizing potential harm to the privacy of learners.

3.7. Ethical Considerations

As AI is increasingly on demand for language learning globally, concerns around learner data privacy, technological bias when using AI, and equitable access to AI-based tools become more pronounced. Since collection, analysis, and storage of students' learning behaviors, sensitive personal information, and performance records on assessments are often done, there is a need for strict compliance with data protection regulations, following both the General Data Protection Regulation (GDPR) and the Family Educational Rights and Privacy Act (FERPA). Educators and researchers must be transparent in how they are using the information collected through AI-based platforms and obtain informed consent from the students so that it would prevent the misuse of data and protect the students from potential misuse of their information. They should also implement safeguards to prevent unauthorized access to sensitive information from other unauthorized third-party that could use students' information for personal gain. Ethical deployment such as minimizing technological biases when using AI, respecting learner autonomy in AI-based platforms, and fostering trust of personal data in digital learning environments would protect learners' rights and dignity while improving pedagogical innovation (Arbi, 2024; Chen, 2024; Fitrianto et al., 2024; Hsu et al., 2024; Javaid, 2024; Kutsyk & Nykyporets, 2024; Lubis et al., 2024; Novawan et al., 2024; Patty, 2024; Rahman et al., 2024; Vo & Nguyen, 2024; Wan & Moorhouse, 2024; Yuen & Schlote, 2024). Moreover, while EFL learners gain benefit from tools integrated with AI like ChatGPT and mobile AI applications (Vo & Nguyen, 2024; Yuen & Schlote, 2024), learners trying to gain proficiency in non-English contexts, including Arabic or multilingual environments may encounter technical constraints or cultural misrepresentations from using AI-based platforms to learn (Fitrianto et al., 2024). Table 2 summarizes key studies on AI in language learning, such as personalizing instruction based on learners' needs, enhancing vocabulary retention of learners, and reducing learner anxiety when practicing speaking the learned language. Although the evidence demonstrates AI's growing potential in language learning area, potentially helping students learn languages easier, it also points to the need for further research to improve technological infrastructure, teacher training, and implementation strategies.

Table 2: Comparative Analysis of AI's Impact on Language Learning Across Various Studies.

Reference	Key Findings	Methodology	Impact on Language Learning	Technological Focus	Challenges Identified
Arbi, A. P. (2024)	AI improves English language learning through personalized support.	Literature review	Enhanced vocabulary acquisition, reduced anxiety.	AI-powered learning tools	Lack of trained educators, limited access to technology
Chen, Y. (2024)	AI facilitates effective language acquisition by offering adaptive learning environments.	Conference paper, conceptual analysis	Adaptive learning paths, faster language skill acquisition.	AI in language acquisition	Insufficient research on long-term effects
Fitrianto, I., et al. (2024)	AI enables personalized Arabic learning by adjusting to individual learner needs.	Case study, survey	Customized learning plans improve engagement and proficiency.	Personalized AI learning tools	Technical limitations in AI tools
Hsu, T. C., et al. (2024)	AI's image recognition aids vocabulary acquisition and reduces anxiety.	Experimental study	Improvement in vocabulary retention and emotional engagement.	AI and self-regulation strategies	Teacher support and integration issues
Javaid, Z. K. (2024)	Cognitive and motivational impacts of AI on English language learners are significant.	Systematic review	Enhanced motivation, better retention of vocabulary.	AI tools for cognitive and motivational enhancement	Ethical concerns regarding data usage
Kutsyk, B. M., & Nykyporets, S. S. (2024)	AI offers significant potential in transforming language learning strategies.	Doctoral dissertation	Personalized feedback, improved student engagement.	AI-based learning systems	Issues with data privacy and security
Lubis, A. H., et al. (2024)	AI applications are growing in language learning, but further study is needed on their effectiveness.	Bibliometric analysis	Significant increase in AI-related language learning publications.	AI research and development	Need for standardized evaluation criteria
Novawan, A., et al. (2024)	Teachers face challenges in integrating AI due to lack of training.	Qualitative study	Increased teacher engagement in tech-enhanced learning.	AI tools in language teaching	Teacher resistance, lack of AI literacy
Patty, J. (2024)	AI-based tools are essential for personalized and scalable language learning.	Literature review	Personalized learning experiences improve learner outcomes.	AI-driven language apps	Resistance from traditional educators, ethical issues
Rahman, A., et al. (2024)	Comprehensive analysis of AI's role in language learning reveals significant positive effects.	Bibliometric and content analysis	Increased learner engagement, better content delivery.	Various AI technologies	Lack of long-term impact studies
Vo, A., & Nguyen, H. (2024)	EFL students perceive AI-based language tools positively but face technology acceptance issues.	Survey	Positive impact on language skills and confidence.	AI in EFL education	Technology acceptance barriers
Wan, Y., & Moorhouse, B. L. (2024)	AI speaking partners like Call Annie offer learners real-time conversational practice.	Experimental study	Enhanced speaking skills and confidence in real conversations.	AI speaking partners	Lack of AI conversational context adaptation
Yuen, C. L., & Schlote, N. (2024)	Mobile apps and AI enhance additional language learning, fostering flexibility and convenience.	Case study	Improved language learning outcomes with mobile AI integration.	Mobile AI learning apps	Infrastructure issues in developing regions

4. DISCUSSION AND CONCLUSION

Recent research demonstrates that AI could support individualized progress by optimizing

learning experiences which are done through the provision of tailored instructional materials that adapt to learners' differing proficiency levels and interests (Arbi, 2024). For instance, Fitrianto, Setyawan, and Saleh (2024) found that personalization of Arabic learning plans could be done through AI-driven systems, which would allow learners to target specific skills to train, monitor their language learning progress more effectively, and receive immediate feedback to guide further improvement on their proficiency in the language they are learning. Moreover, Hsu, Chang, and Jen (2024) found that self-regulated strategies integrated with AI's image recognition technology could potentially enhance vocabulary acquisition by providing contextualized visual input and reduce learning anxiety through more learner-controlled practice. In Javaid's (2024) study, interactive and gamified learning experiences were found to promote intrinsic motivation and maintain learner engagement when AI was used to support adaptive feedback throughout the language learning process. Kutsyk and Nykyporets (2024) also observed that the development of cognitive skills, such as problem-solving and memory retention could be enhanced by AI applications delivering customized challenges with immediate corrective feedback. Lubis et al. (2024) and Rahman et al. (2024) found that scholarly interest in AI applications in language learning, namely technology-enhanced language learning (TELL) is growing, as well as generative AI tools for language acquisition. Lastly, Novawan, Walker, and Ikeda (2024) inform that AI's potential to enhance language teaching was receiving the recognition of educators. However, more research on challenges on professional development, ethics, and alignment with curricular objectives should be done.

4.1. Recommendations

Based on the findings above, stakeholders should emphasize training for teachers to integrate AI into lessons effectively, ensuring that they would be able to effectively align AI-based technological tools with pedagogical objectives that they plan on delivering. Furthermore, collaboration between AI developers and educators in developing the AI-based platforms can help ensure that learning materials are developed to be culturally and contextually appropriate for diverse learning needs. Moreover, educational institutions should also consider implementing policies that maintain a balance between AI-supported instruction and human interaction to reduce overreliance on automated systems which might limit social and communication development. Last but not least, metacognitive reflection on learning materials generated by AI during the use of AI tools should be taught to students to strengthen learner motivation and self-regulated learning on the teaching materials (Hsu et al., 2024).

Implications

One of the implications include customizing AI support for learners to resolve educational inequities to allow learners to receive the same education despite being limited by geographical location in which accessing the learning materials is troublesome or resource constraints where it is inefficient to obtain the learning material. Another implication includes assessments integrated with AI which could provide timely feedback on learner progress that ease the reflection of learners, allowing teachers to support the learners in terms of curriculum development and instructional decision-making that fits the needs of students. Moreover, to address the limitations in writing and speaking practice usually faced by students, teachers could use generative AI tools to generate audio of people from native language speakers to replace cases where there are limited opportunities to interact with native speakers.

4.2. Limitations

One of the limitations in this area includes the tendency of some studies to overgeneralize positive findings in their studies despite only having small sample sizes which limit generalizability and short-term interventions that do not provide information on its long-term effects (Patty, 2024; Chen, 2024). In addition, the inaccuracies of AI in speech recognition when receiving spoken audio from students and natural language processing could potentially affect learning experiences negatively as the students might be misled without them noticing. Also, the use of AI in teaching and learning faces significant challenges like the issues on learners' personal data privacy, technological bias when using AI, and potential learner dependency on AI due to its ease of use. This is especially salient in the context of generative AI tools where large amount of learning materials could be generated in an instant (Vo & Nguyen, 2024).

4.3. Future Research

Future research should consider employing longitudinal studies to study the impact of AI-supported language learning on different aspects of the learner like motivation of learning, proficiency of

spoken language over time, and cognitive development in language acquisition. Besides, to better explain the insights of quantitative findings which are generalizable, comparative investigations should be done in different profiles (languages learned, culture of the learner, and age groups of the learner) to provide more variables to research on when performing quantitative analysis. Crucially, evaluation of ethical guidelines when using AI-based platforms and the best implementation of AI in educational contexts are essential to create a safe environment for students to use AI, which would make adopting AI in pedagogy sustainable. Therefore, further studies should also explore the effectiveness of hybrid instructional models that integrate AI with traditional teaching approaches and the ways to improve the application of AI into teaching to achieve an optimal balance between technological support and human interaction.

5. CONCLUSION

In short, personalized, engaging, and flexible educational experiences in language learning were made possible by integrating AI into the materials used. Even though AI is beneficial in cognition, motivation, and practicality, effective implementation of AI still depends on the careful alignment of AI tools with certain framework as guidelines for considerations, including pedagogical practices, ethical standards, and teacher support to protect the learners while using AI tools. Through future rigorous research on AI, AI could allow language learners to learn more effectively in a more engaging and inclusive environment.

Availability of data and materials: The study is a narrative review and does not involve the collection or analysis of original data from participants.

Competing interests: I, as the sole author and the corresponding author of the article, declare that I have no competing financial or personal interests that could have influenced the work reported.

Funding: The author declares that no funding was received for the preparation or publication of the manuscript.

Generative AI Use: Generative AI was used to enhance the structure and language of the manuscript.

REFERENCES

Arbi, A. P. (2024). Optimizing the Use of Artificial Intelligence in English Language Learning: A Literature Review. Gudang Jurnal Multidisiplin Ilmu, 2(2), 25-30.

Chen, Y. (2024, May). Enhancing Language Acquisition: The Role of AI in Facilitating Effective Language Learning. In 2024 3rd International Conference on Humanities, Wisdom Education and Service Management (HWESM 2024) (pp. 593-600). Atlantis Press.

Fitrianto, I., Setyawan, C. E., & Saleh, M. (2024). Utilizing Artificial Intelligence for Personalized Arabic Language Learning Plans. International Journal of Post Axial: Futuristic Teaching and Learning, 132-142.

Hsu, T. C., Chang, C., & Jen, T. H. (2024). Artificial intelligence image recognition using self-regulation learning strategies: effects on vocabulary acquisition, learning anxiety, and learning behaviours of English language learners. Interactive Learning Environments, 32(6), 3060-3078.

Javaid, Z. K. (2024). A systematic review on cognitive and motivational impact on English language learning through artificial intelligence. International Journal of Literature, Linguistics and Translation Studies, 4(1).

Kutsyk, B. M., & Nykyporets, S. S. (2024). The impact of artificial intelligence (AI) on language learning (Doctoral dissertation, ВНТУ).

Lubis, A. H., Samsudin, D., Triarisanti, R., Jerusalem, M. I., & Hwang, Y. (2024). A bibliometric mapping analysis of publications on the utilization of artificial intelligence technology in language learning. Journal of Advanced Research in Applied Sciences and Engineering Technology, 38(1), 156-176.

Novawan, A., Walker, S. A., & Ikeda, O. (2024). The new face of technology-enhanced language learning (TELL) with artificial intelligence (AI): Teacher perspectives, practices, and challenges. Journal of English in Academic and Professional Communication, 10(1), 1-18.

Patty, J. (2024). The use of AI in language learning: what you need to know. Jurnal Review Pendidikan dan Pengajaran (JRPP), 7(1), 642-654.

Rahman, A., Raj, A., Tomy, P., & Hameed, M. S. (2024). A comprehensive bibliometric and content analysis of artificial intelligence in language learning: tracing between the years 2017 and 2023. Artificial Intelligence Review, 57(4), 107.

Vo, A., & Nguyen, H. (2024). Generative artificial intelligence and ChatGPT in language learning: EFL students' perceptions of technology acceptance. Journal of University Teaching and Learning Practice, 21(6), 199-218.

Wan, Y., & Moorhouse, B. L. (2024). Using Call Annie as a generative artificial intelligence speaking partner for language learners. RELC Journal, 00336882231224813.

Yuen, C. L., & Schlote, N. (2024). Learner Experiences of Mobile Apps and Artificial Intelligence to Support Additional Language Learning in Education. Journal of Educational Technology Systems, 00472395241238693.