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ARTIFICIAL INTELLIGENCE-ASSISTED LANGUAGE LEARNING: EXPLORING ITS EFFECTIVENESS IN EFL CLASSROOMS

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ABSTRACT

This study investigates the effectiveness of Artificial Intelligence (AI)-assisted language learning in English as a Foreign Language (EFL) classrooms. The study employed a quantitative quasi-experimental design involving 120 eleventh-grade students from several public and private senior high schools in Makassar, Indonesia. The participants were divided into an experimental group, which received AI-assisted learning through chatbots, automated writing feedback systems, and adaptive learning platforms, and a control group, which received conventional instruction. Data were collected through pre-tests, post-tests, questionnaires, and classroom observations over an eight-week treatment period. The findings showed that the experimental group achieved a 25% improvement in English proficiency, while the control group showed only a 10% improvement. The t-test result confirmed that the difference between the two groups was statistically significant at **$p < 0.05$**. AI-assisted learning also supported students' reading, writing, and speaking skills by providing adaptive reading support, immediate writing feedback, and opportunities for speaking practice through AI-based interaction. In addition, 85% of students in the experimental group reported higher motivation when learning with AI tools. Classroom observations also showed increased engagement, participation, and learner autonomy. However, challenges such as unstable internet connections, limited teacher competence in using AI tools, and varied levels of students' digital literacy were identified. The study concludes that AI-assisted language learning can significantly improve students' English proficiency, motivation, and engagement when supported by adequate infrastructure, teacher training, and responsible technology integration.

Keywords: AI-assisted language learning, EFL, english proficiency, motivation, engagement, digital learning.

INTRODUCTION

The rapid development of digital technology has transformed educational practices worldwide, including the teaching and learning of English as a Foreign Language (EFL). One of the most significant innovations in this transformation is the integration of Artificial Intelligence (AI) into language learning. AI-assisted language learning offers opportunities for more personalized, adaptive, and interactive instruction because it can respond to students' individual needs, learning pace, and performance patterns (Holmes et al., 2019). In EFL classrooms, where students often require continuous practice, feedback, and exposure to meaningful language use, AI has the potential to support more effective learning experiences.

AI has been increasingly recognized for its ability to improve language learning through real-time feedback, adaptive learning pathways, and interactive learning

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environments. Luckin et al. (2017) explain that AI can support personalized learning by providing learning materials and feedback based on students' needs. Similarly, Chen et al. (2020) argue that AI can enhance language acquisition because it offers immediate correction and encourages active learner participation. In practical terms, AI-assisted language learning includes tools such as chatbots, speech recognition systems, automated writing evaluation platforms, and adaptive reading or vocabulary applications (Li, 2021). These tools enable students to practice language skills independently while receiving instant feedback, which is essential for improving accuracy, fluency, and confidence (Wang & Young, 2020).

Empirical studies have also shown that AI and technology-enhanced learning can support various aspects of EFL development. Automated writing evaluation tools have been reported to help improve students' writing accuracy and grammatical awareness (Ranalli, 2018). AI-based vocabulary and reading tools can provide contextual explanations and adaptive exercises that help students understand language forms and meanings more effectively (Zhang & Pérez-Paredes, 2021). In speaking instruction, AI-based chatbots and speech recognition tools can create simulated conversations that allow students to practice communication in a low-pressure environment (Fryer & Carpenter, 2019). These findings suggest that AI is not only useful as a technological tool but also as a pedagogical support system that can enhance language achievement, motivation, and learner autonomy.

In addition to improving language performance, AI can increase students' motivation and engagement. Hwang and Tu (2021) state that AI-based learning environments can create more dynamic and responsive learning experiences. Huang et al. (2021) further explain that adaptive and interactive features can make students more willing to participate in learning activities. This is important in EFL classrooms because students' motivation often influences their willingness to practice and use English. AI can also support autonomous learning by allowing students to access materials anytime, revisit difficult topics, and learn at their own pace (Alam, 2021). Therefore, AI integration is closely related to the shift from teacher-centered instruction to learner-centered language learning.

Despite these potential benefits, the implementation of AI in education still faces several challenges. Zawacki-Richter et al. (2019) highlight that limited infrastructure, lack of teacher training, and institutional readiness can hinder the effective use of AI in classrooms. Bond et al. (2021) also emphasize that teachers' digital competence is a key factor in successful technology integration. In addition, ethical issues such as data privacy, algorithmic bias, and excessive dependence on technology remain important concerns in AI-assisted learning (Tsai et al., 2021). Holmes et al. (2022) warn that AI should be used to support, not replace, meaningful teacher-student interaction.

These challenges are particularly relevant in developing countries such as Indonesia. Although AI has gained increasing attention in global education, its integration in Indonesian

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EFL classrooms remains uneven. Many schools still face technological limitations, and teachers may not have sufficient training to design AI-supported learning activities effectively (Rahman, 2022). In addition, students' access to digital devices and internet connectivity varies, which may influence the effectiveness of AI-based learning (Sari & Putra, 2023). These contextual issues suggest that findings from studies conducted in developed countries may not be fully applicable to Indonesian classrooms. Although previous studies have examined AI-assisted language learning in relation to writing, vocabulary, reading, speaking practice, and motivation, there is still limited empirical evidence on how AI works in real EFL classroom settings in Indonesia, especially at the senior high school level in Makassar. Most studies have focused on general technology-enhanced learning or have been conducted in contexts with better digital infrastructure. As a result, there is still a gap in understanding how AI-assisted language learning affects students' language achievement, motivation, and perceptions in local Indonesian EFL contexts.

The novelty of this study lies in its focus on AI-assisted language learning in senior high schools in Makassar. Unlike previous studies that mainly discuss AI from a general or theoretical perspective, this study investigates its practical effectiveness in a specific local classroom context. It examines not only students' language achievement but also their motivation and perceptions of AI integration. By focusing on these three aspects, this study provides a more comprehensive understanding of how AI can support EFL learning and what challenges may emerge during implementation. Therefore, this study aims to explore the effectiveness of AI-assisted language learning in senior high schools in Makassar. Specifically, it investigates students' language achievement, motivation, and perceptions toward the use of AI in EFL learning. The findings are expected to provide empirical evidence for the development of technology-enhanced language learning and offer practical implications for teachers, schools, and policymakers in optimizing AI integration in Indonesian EFL classrooms.

METHOD

1. Research Design

This study employed a quantitative quasi-experimental design to examine the effectiveness of AI-assisted language learning in improving students' English proficiency, motivation, perceptions, and classroom engagement. The study was conducted in several public and private senior high schools in Makassar City, South Sulawesi, Indonesia. The experimental group received AI-assisted learning using chatbots, automated writing tools, and adaptive learning platforms, while the control group received conventional instruction through teacher explanation, textbook-based exercises, and classroom discussion.

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2. Participants / Subjects

The participants were 120 eleventh-grade students selected through stratified random sampling. This technique was used to ensure that students from different school types and learning backgrounds were represented. The participants were divided into an experimental group and a control group.

Table 1. Research Design and Participants

Aspect	Description
Research design	Quantitative quasi-experimental design
Location	Public and private senior high schools in Makassar City
Participants	120 eleventh-grade students
Sampling technique	Stratified random sampling
Experimental group	AI-assisted learning
Control group	Conventional instruction
Treatment duration	Eight weeks

3. Instruments

The instruments consisted of an English proficiency test, a questionnaire, and an observation sheet. The pre-test and post-test were used to measure students' English proficiency before and after treatment. The questionnaire was used to assess students' motivation and perceptions of AI-assisted learning. The observation sheet was used to evaluate classroom engagement during the learning process.

Table 2. Research Instruments

Instrument	Purpose	Main Indicators
Pre-test and post-test	Measuring English proficiency	Vocabulary, grammar, reading, writing, communication
Questionnaire	Assessing motivation and perceptions	Motivation, usefulness, ease of use, autonomy, confidence
Observation sheet	Evaluating classroom engagement	Participation, attention, interaction, task completion

4. Data Collection Procedure

The data collection was conducted over eight weeks. At the beginning of the study, both groups completed a pre-test to identify their initial English proficiency. During the treatment phase, the experimental group used AI tools, including chatbots for communication practice, automated writing tools for feedback, and adaptive platforms for personalized exercises. Meanwhile, the control group was taught using conventional methods. Classroom observations were conducted throughout the treatment. At the end of the study, both groups completed a post-test, and the experimental group filled out the questionnaire.

Table 3. Data Collection Procedure

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Stage	Activity
Preparation	School coordination and instrument preparation
Pre-test	Measuring students' initial English proficiency
Treatment	AI-assisted learning for the experimental group and conventional instruction for the control group
Observation	Recording students' classroom engagement
Post-test	Measuring students' English proficiency after treatment
Questionnaire	Collecting students' motivation and perception data

5. Data Analysis

The data were analyzed using descriptive and inferential statistics. Descriptive statistics were used to calculate mean scores, standard deviations, percentages, and score improvements. A paired-sample t-test was used to compare pre-test and post-test scores within each group, while an independent-sample t-test was used to compare the results between the experimental and control groups. Questionnaire data were analyzed using mean scores and percentages, while observation data were analyzed descriptively to support the interpretation of classroom engagement.

Table 4. Data Analysis Techniques

Data Source	Analysis Technique	Purpose
Pre-test and post-test	Descriptive statistics	Describing students' proficiency
Pre-test and post-test	Paired-sample t-test	Measuring improvement within groups
Group scores	Independent-sample t-test	Comparing experimental and control groups
Questionnaire	Mean and percentage	Describing motivation and perceptions
Observation sheet	Descriptive analysis	Describing classroom engagement

RESULTS AND DISCUSSION

Result

The findings of this study show that the implementation of Artificial Intelligence (AI)-assisted language learning had a positive impact on students' English proficiency, motivation, engagement, and classroom participation. The data were obtained from pre-tests, post-tests, questionnaires, and classroom observations conducted during an eight-week treatment period. The experimental group received AI-assisted learning through chatbots, automated writing tools, and adaptive learning platforms, while the control group was taught using conventional teaching methods. The results indicate that the experimental group achieved greater improvement than the control group. Students who learned through AI-

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assisted tools showed a mean score increase of **25%** from pre-test to post-test. In contrast, students in the control group showed only a **10%** improvement. The t-test result confirmed that the difference between the two groups was statistically significant at **$p < 0.05$**. This finding suggests that AI-assisted learning provided measurable benefits in improving students' overall English proficiency.

Table 5. Overall Improvement in English Proficiency

Group	Learning Method	Score Improvement	Statistical Result
Experimental Group	AI-assisted language learning	25%	Significant difference, $p < 0.05$
Control Group	Conventional teaching methods	10%	Lower improvement than experimental group

The improvement in the experimental group was found across several language skills. In reading, students showed better comprehension ability after using adaptive reading platforms and vocabulary support systems. These tools helped students understand texts more effectively by providing real-time explanations of unfamiliar words and phrases. Students also demonstrated better performance in identifying main ideas, supporting details, and making inferences. In writing, the use of automated writing evaluation systems helped students improve grammar, sentence structure, vocabulary use, coherence, and organization of ideas. The immediate feedback provided by AI tools enabled students to identify and revise their errors independently. This made the writing process more interactive and reflective compared to conventional instruction, where feedback was usually delayed. In speaking, students benefited from AI chatbots and speech recognition tools. These tools gave students opportunities to practice speaking in a low-anxiety environment. As a result, students showed improvement in fluency, pronunciation, and confidence in expressing ideas.

Table 6. Improvement across Language Skills

Language Skill	AI Tool Used	Main Improvement Observed
Reading	Adaptive reading platforms and vocabulary support systems	Better comprehension, vocabulary understanding, identification of main ideas, details, and inferences
Writing	Automated writing evaluation systems	Improved grammar, sentence structure, vocabulary use, coherence, and organization
Speaking	AI chatbots and speech recognition tools	Increased fluency, better pronunciation, and improved speaking confidence

The questionnaire results showed that AI-assisted learning also influenced students' motivation. A total of **85%** of students in the experimental group reported higher motivation when learning with AI tools. Students perceived AI-assisted learning as more engaging,

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interactive, and enjoyable than traditional classroom instruction. Classroom observations also supported this finding. Students in the experimental group were more active during lessons, frequently interacted with AI applications, asked questions, and participated in learning activities.

Table 7. Students' Motivation and Engagement

Aspect	Result	Interpretation
Motivation	85% positive response	Most students reported higher motivation when learning with AI tools
Engagement	Positive observation result	Students were more active, interactive, and involved in classroom activities
Participation	Positive observation result	Students showed greater willingness to explore learning materials and complete tasks

The observation data further revealed that AI-assisted learning encouraged learner autonomy and classroom participation. Students in the experimental group were more willing to explore learning materials independently and take responsibility for their own learning. In contrast, students in the control group tended to be more passive and relied more heavily on teacher instruction. This finding indicates that AI tools supported a more learner-centered classroom environment.

Despite these positive outcomes, several challenges were identified during the implementation. Unstable internet connections occasionally disrupted the learning process. In addition, some teachers lacked sufficient knowledge and skills to integrate AI tools effectively into classroom instruction. Students' digital literacy also varied, and some students needed additional guidance to use AI applications properly.

Table 8. Challenges in Implementing AI-Assisted Learning

Challenge	Description	Implication
Internet instability	Unstable connections disrupted learning activities	Schools need better technological infrastructure
Teacher readiness	Some teachers lacked skills in using AI tools	Teacher training is needed
Students' digital literacy	Some students needed guidance in using AI applications	Digital literacy support should be provided

Overall, the findings demonstrate that AI-assisted language learning significantly enhanced students' English proficiency, motivation, engagement, and classroom participation. The experimental group consistently outperformed the control group, with a **25%** improvement compared to **10%** in the control group. The use of AI tools also supported students' reading, writing, and speaking development by providing immediate feedback, adaptive learning support, and opportunities for independent practice. However, the

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effectiveness of AI-assisted learning depends on technological readiness, teacher competence, and students' digital literacy.

Discussion

The findings of this study provide strong empirical evidence that Artificial Intelligence (AI)-assisted language learning significantly enhances students' English proficiency, motivation, and engagement in EFL classrooms. These results reinforce the growing body of literature that positions AI as a transformative tool in language education, particularly in facilitating personalized and adaptive learning environments (Holmes et al., 2019; Zawacki-Richter et al., 2019). The improvement in students' language proficiency indicates that AI can support more interactive, individualized, and responsive English learning experiences.

From a theoretical perspective, the improvement in students' language proficiency can be explained through constructivist learning theory, which emphasizes active learner engagement and knowledge construction. AI tools, such as adaptive learning platforms and automated feedback systems, allow learners to interact with content dynamically and receive immediate feedback, thereby supporting deeper cognitive processing (Chen et al., 2020). This aligns with the concept of scaffolding, where AI functions as a digital tutor that provides support based on learners' individual needs (Hwang & Tu, 2021). The significant improvement in reading skills can be linked to the affordances of AI in facilitating comprehensible input, as proposed in Krashen's Input Hypothesis. AI-based systems provide contextualized vocabulary support and adaptive text difficulty, enabling learners to access input slightly above their current proficiency level (Zhang & Pérez-Paredes, 2021). This adaptive mechanism helps students process linguistic input more efficiently and improves reading comprehension. Similarly, the enhancement of writing skills can be interpreted through form-focused instruction. Automated writing evaluation systems provide immediate corrective feedback, allowing learners to notice errors and improve grammar, sentence structure, and vocabulary use (Ranalli, 2018).

The improvement in speaking skills also highlights the role of AI in reducing affective barriers. AI chatbots create a low-anxiety environment where learners can practice speaking without fear of negative evaluation (Fryer & Carpenter, 2019). This finding is consistent with Huang et al. (2021), who argue that AI-mediated interaction promotes learner confidence and willingness to communicate. In terms of motivation, AI-assisted learning supports autonomy by allowing students to control their learning pace, enhances competence through immediate feedback, and increases engagement through interactive features (Hwang & Tu, 2021; Alam, 2021). However, the implementation of AI-assisted learning also presents several barriers. The first major barrier is limited technological infrastructure, particularly unstable internet access and unequal availability of digital devices. This issue

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reflects broader digital inequality in developing educational contexts and may reduce the effectiveness of AI integration (Zawacki-Richter et al., 2019). The second barrier is teachers' limited digital competence. As Bond et al. (2021) argue, teachers are not replaced by AI but are required to take new roles as facilitators, designers, and evaluators of AI-supported learning. Without sufficient training, teachers may find it difficult to select suitable AI tools, design appropriate tasks, and guide students in using AI responsibly.

Another important barrier is students' varied levels of digital literacy. Although AI promotes independent learning, not all students are equally capable of using AI tools effectively. Some students may require additional guidance to understand instructions, interpret feedback, and avoid overdependence on automated responses. This supports Xu and Ouyang's (2022) argument that the success of AI in fostering self-regulated learning depends on learners' ability to use digital tools strategically. Ethical issues also remain a concern. Data privacy, algorithmic bias, and excessive reliance on AI must be addressed carefully (Tsai et al., 2021). Overdependence on AI may reduce opportunities for meaningful human interaction, which remains essential for developing communicative competence.

For sustainable implementation, AI-assisted language learning should not be treated as a temporary innovation or a replacement for teachers. Instead, it should be integrated into a blended learning model that combines AI-based support with teacher guidance, peer interaction, and classroom discussion. Sustainability requires adequate infrastructure, continuous teacher professional development, clear school policies, and ethical guidelines for AI use. Schools should provide stable internet access, digital devices, and technical support to ensure that all students can benefit equally from AI-assisted learning. Teachers also need regular training to improve their ability to design AI-supported activities, interpret AI-generated feedback, and monitor students' learning progress. In addition, sustainable AI integration requires careful pedagogical planning. AI tools should be aligned with curriculum goals, students' proficiency levels, and learning outcomes. The use of AI should focus on strengthening students' language skills, motivation, and learner autonomy rather than simply introducing technology into the classroom. AI can also support inclusive education by addressing diverse learner needs through adaptive learning systems that accommodate different proficiency levels, learning styles, and learning paces (Holmes et al., 2022). Therefore, the sustainability of AI-assisted learning depends on how well technology, pedagogy, ethics, and institutional support are integrated.

Despite its contributions, this study has several limitations. The research was conducted in a specific context, namely senior high schools in Makassar, which may limit the generalizability of the findings. In addition, the duration of the study was relatively short, so the long-term effects of AI-assisted language learning were not examined. Future research should explore the longitudinal impact of AI integration and investigate how AI-assisted learning can be applied across different educational levels, regions, and EFL learning

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contexts. In conclusion, this study demonstrates that AI-assisted language learning offers significant pedagogical benefits, including improved language proficiency, enhanced motivation, increased engagement, and stronger learner autonomy. However, its successful and sustainable implementation requires attention to technological readiness, teacher competence, students' digital literacy, ethical considerations, and institutional support. AI should therefore be used as a complementary pedagogical tool that strengthens, rather than replaces, human-centered language instruction.

CONCLUSION

This study concludes that AI-assisted language learning is effective in improving students' English proficiency, motivation, engagement, and learner autonomy in EFL classrooms. The findings show that the experimental group, which learned through AI-assisted tools, achieved a 25% improvement from pre-test to post-test, while the control group, which received conventional instruction, improved by only 10%**.** This indicates that AI tools such as chatbots, automated writing evaluation systems, and adaptive learning platforms can provide meaningful support for English language learning. AI-assisted learning contributed to the development of reading, writing, and speaking skills. Adaptive reading platforms helped students understand texts and vocabulary more effectively. Automated writing tools provided immediate feedback on grammar, sentence structure, and vocabulary use, allowing students to revise their work independently. AI chatbots and speech recognition tools also created a low-anxiety environment for speaking practice, helping students improve fluency, pronunciation, and confidence. The study also found that AI increased students' motivation and engagement. The questionnaire results showed that **85%** of students reported higher motivation when learning with AI tools. Classroom observations further indicated that students became more active, independent, and involved in learning activities. However, several challenges were identified, including unstable internet connections, limited digital devices, teachers' digital competence, students' varied digital literacy, and ethical concerns such as data privacy and over-reliance on AI. Therefore, AI should be implemented as a complementary tool, not as a replacement for teachers. Sustainable implementation requires adequate infrastructure, teacher training, clear guidelines, and institutional support. Future research should examine the long-term effects of AI-assisted learning in broader educational contexts.

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