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ENHANCING EFL STUDENTS' SPEAKING SKILLS THROUGH AI-INTEGRATED SHADOWING USING LOORA

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Abstract: The growing emphasis on technology-enhanced language learning has highlighted the need to better understand the integration of traditional speaking techniques with artificial intelligence in EFL contexts. This study investigates the implementation of the shadowing technique integrated with AI to enhance students' speaking skills using a mixed-method approach. Data were collected from 25 pre-service English teachers through speaking tests, Likert-scale questionnaires and interviews, and analyzed using descriptive statistics, paired sample t-test, and thematic analysis. The results reveal that students' speaking

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performance significantly improved, as indicated by higher post-test scores and statistically significant differences between pre-test and post-test results. In addition, students demonstrated positive perceptions across all indicators, particularly in speaking skill improvement, highlighting gains in fluency, pronunciation, and natural speaking ability. These findings indicate that the integration of shadowing with Loora provides both effective practice and meaningful learning experiences.

Keywords: *EFL learners, Loora, shadowing technique, speaking skills*

INTRODUCTION

The development of speaking skills remains one of the most essential yet challenging aspects of learning English as a Foreign Language (EFL). In the context of 21st-century education, students are expected not only to communicate effectively but also to demonstrate fluency, accuracy, and confidence in real-life communication. However, many EFL learners still encounter difficulties in expressing their ideas orally due to limited vocabulary, inaccurate pronunciation, lack of confidence, and insufficient opportunities for meaningful speaking practice (Alzubi, 2024; Islam & Stapa, 2021; Phoeun & Sengsri, 2021). These challenges indicate the need for more effective and engaging instructional strategies to support speaking development.

In this regard, the development of English-speaking skills becomes highly relevant, particularly for pre-service English teachers. English serves as a global means of communication and plays a crucial role in enabling future educators to actively participate in modern and multicultural educational contexts (Mavlonova & Morozova, 2025). Pre-service teachers are not only expected to achieve fluency and accuracy in speaking, but also to serve as effective language models who can demonstrate communicative competence in classroom settings (Triwibowo, 2023; Wijaya, 2021). However, despite these

expectations, many pre-service teachers still struggle to achieve the desired level of speaking proficiency, particularly in terms of fluency, pronunciation, and confidence.

One instructional strategy that has been widely recognized for improving speaking skills is the shadowing technique. Shadowing involves listening to spoken input and simultaneously repeating it, enabling learners to imitate pronunciation, intonation, rhythm, and speech rate (Barreto & Saltos, 2024). Previous studies have demonstrated that shadowing can significantly improve learners' fluency, pronunciation accuracy, and confidence in speaking (Hamada, 2021; Phuong & Ngoc, 2023; Rodríguez Viteri, 2023). Research conducted in various contexts, including Indonesia and other EFL settings, has consistently shown positive effects of shadowing on students' speaking performance and motivation (Rosyidi et al., 2022; Sari & Jaya, 2025; Tran, 2021; Yavari & Shafiee, 2019). Despite its effectiveness, the implementation of shadowing in classroom practice is often limited by the lack of immediate feedback and objective evaluation, which are essential for monitoring students' progress.

With the rapid development of digital technology, particularly artificial intelligence (AI), new opportunities have emerged to enhance language learning. AI-powered applications allow learners to engage in more interactive and personalized learning experiences by providing instant feedback and performance analysis. Previous studies have investigated the integration of technology in language learning, particularly in speaking development, from different perspectives. Kukulska-Hulme (2021) aimed to explore the development of research questions in Mobile Assisted Language Learning (MALL) through a conceptual review. The study analyzed major themes in MALL research and found that mobile technologies support flexible, contextual, and learner-centered language learning beyond classroom boundaries. Similarly, Warschauer (2011) investigated the transformative role of digital media in education using qualitative classroom observations and case study approaches in technology-enhanced learning environments. The findings revealed that digital

tools can enhance language learning when they are supported by appropriate pedagogical design and meaningful classroom integration.

More specifically, recent studies have focused on AI-assisted speaking practice and Automatic Speech Recognition (ASR) as emerging tools in second language learning. A meta-analysis by Ngo et al. (2024) aimed to examine the effectiveness of ASR in ESL/EFL pronunciation learning by synthesizing findings from multiple empirical studies. The study reported a medium overall effect size, indicating that ASR significantly improves learners' pronunciation performance, particularly when combined with explicit corrective feedback. In line with this, (McCrocklin, 2016) investigated the use of ASR in pronunciation learning and found that automated feedback systems can support learner autonomy by providing immediate and individualized corrective input, which contributes to improved pronunciation accuracy over time. Similarly, (Liakin et al., 2015) conducted an experimental study on mobile-assisted pronunciation learning and found that ASR-based feedback significantly improved learners' speaking fluency and pronunciation compared to traditional instruction. These studies commonly employed experimental or quasi-experimental designs involving pre-test and post-test measures to evaluate speaking performance outcomes.

In relation to shadowing, Hamada (2019) aimed to review the concept, pedagogical applications, and future directions of the shadowing technique in language learning. The study concluded that shadowing is an effective technique for improving listening comprehension, pronunciation accuracy, and speaking fluency through repetitive imitation and real-time processing of speech input. In addition, recent empirical studies have extended shadowing by integrating it with AI-based tools. For instance, Rahayu et al. (2025) investigated the integration of shadowing with an AI-powered application (ELSA Speak) using a quasi-experimental design. The study found that students in the experimental group showed greater improvement in pronunciation and speaking fluency compared to those in traditional learning settings. Similarly, (Hsu, 2025) examined

the combination of shadowing practice and ASR technology in an EFL classroom and reported significant improvements in learners' pronunciation accuracy and speaking fluency based on pre-test and post-test analysis.

Despite these advancements, existing studies tend to examine AI/ASR-based speaking practice and shadowing techniques separately. Studies on shadowing primarily focus on repetition-based practice and its impact on fluency, pronunciation, and listening-speaking coordination Hamada (2019). Meanwhile, research on AI-assisted speaking practice and Automatic Speech Recognition (ASR) emphasizes automated feedback systems that support pronunciation accuracy and fluency development through immediate and individualized corrective input (Liakin et al., 2015; McCrocklin, 2016). However, these two strands of research remain largely disconnected, as shadowing studies rarely incorporate adaptive AI feedback systems, while AI/ASR studies do not typically integrate structured shadowing techniques as part of speaking instruction.

Moreover, although some recent studies have begun to combine shadowing with AI-based tools, they tend to focus primarily on speaking performance outcomes, particularly pronunciation and fluency improvement (Hsu, 2025; Rahayu et al., 2025). Less attention has been given to the students' perception and experiences, such as confidence, motivation, perceived challenges, and overall learning experience. In addition, research involving pre-service English teachers in EFL contexts remains limited, despite their critical role as future educators who require strong speaking competence and pedagogical readiness.

Therefore, this study addresses these gaps by investigating the implementation of an AI-assisted shadowing technique in an EFL classroom using the Loora application. Unlike previous studies, this research integrates shadowing with AI-based ASR feedback, examines students' speaking performance through pre-test and post-test scores, and explores learners' perceptions across multiple dimensions, including general perception, speaking improvement, confidence,

motivation, AI integration, challenges, and overall evaluation. By focusing on pre-service English teachers, this study is expected to provide both empirical evidence and pedagogical insights into the effectiveness of integrating shadowing methods with emerging technologies in language learning. Ultimately, this study seeks to offer a more contextualized and innovative approach to improving speaking skills by combining the strengths of shadowing and AI technology. The findings are expected to contribute to the development of more effective, engaging, and technology-enhanced speaking instruction in EFL classrooms.

METHOD

Research Design

This study employs a mixed-method approach, combining quantitative and qualitative data to explore the students' perceptions of its use and its impact on enhancing speaking skills in the EFL classroom. This approach is considered appropriate as it provides a comprehensive understanding of both students' perceptions and their actual speaking development. The use of mixed methods allows researchers to integrate numerical data with in-depth insights, thereby strengthening the interpretation of findings, as suggested by John W. Creswell (Creswell & Creswell, 2017). The quantitative data are obtained from Likert-scale questionnaire responses and students' speaking performance scores, while the qualitative data are derived from semi-structured interview sessions.

Participants and Sampling

The participants of this study are pre-service English teachers enrolled in an English Education program. Specifically, the study involves a total of 25 fourth-semester students who have experienced speaking instruction using the shadowing technique supported by an AI-based application, namely Loora. A purposive sampling technique is employed to select participants who meet the criteria of having actively engaged in shadowing activities during the course. This

sampling technique is appropriate as it enables the researcher to select information-rich participants who have relevant experience with the phenomenon under investigation (Creswell & Creswell, 2017; Patton, 2022). The number of participants is considered adequate for this study, as sample sizes of 25 or more are generally sufficient for descriptive quantitative analysis while still allowing meaningful qualitative exploration (Creswell & Creswell, 2017).

Data Collection Instruments

This study utilizes two main instruments. The first instrument is a questionnaire designed to measure students' perceptions of using the shadowing technique integrated with AI to enhance their speaking skills. The questionnaire was formulated in a Likert-scale format comprising 20 items that assess students' perceptions across several dimensions. The instrument was developed based on several theoretical frameworks, including perceived usefulness and ease of use proposed by Fred D. Davis (Davis, 1989), speaking skill components from Jack C. Richards (Richards, 2008) and H. Douglas Brown (Brown, 2010), as well as self-efficacy and motivation theories from Albert Bandura (Bandura, 1997) and Zoltán Dörnyei (Dörnyei, 2001). The following table illustrates the indicators associated with each item in the questionnaire.

Table 1.
Questionnaire indicator

No	Indicator	Theories	Item
1	General Perception	Fred D. Davis (1989): Perceived Usefulness of shadowing	1-3
2	Speaking Skill Improvement	Jack C. Richards (2008); H. Douglas Brown (2010): Speaking components (fluency, pronunciation, intonation)	4-7
3	Confidence and Motivation	Albert Bandura (1997); Zoltán Dörnyei (2001)	8-10
4	AI Integration	Fred D. Davis (1989): Perceived Ease of Use & Usefulness on Loora	11-14

5	Challenges	H. Douglas Brown (2010): Learning difficulties in language acquisition	15-17
6	Overall Evaluation	Fred D. Davis (1989); Zoltán Dörnyei (2001): Attitude & behavioral intention	18-20

To ensure the validity of the instrument, item validity was analyzed using item-total correlation, and all items met the minimum requirement with correlation coefficients above 0.30, indicating that the questionnaire items were valid and appropriate for measuring the intended constructs. Furthermore, the reliability of the questionnaire was measured using Cronbach's Alpha to assess the internal consistency of the instrument. According to Joseph F. Hair Jr. et al. (Hair et al., 2021), a Cronbach's Alpha coefficient above 0.70 indicates an acceptable level of reliability. The analysis revealed that the instrument achieved a Cronbach's Alpha coefficient of 0.848 across 20 items, which falls into the "good" category, indicating a high level of internal consistency.

The second instrument is students' speaking performance scores obtained from Loora. The evaluation focuses on several key dimensions, including fluency, pronunciation, and overall speaking performance. Fluency is assessed based on the smoothness, speech rate, and continuity of students' speech, while pronunciation is evaluated in terms of accuracy, clarity, and similarity to native-like articulation. The overall performance score represents a composite evaluation derived from these aspects.

The scoring process is automatically conducted by the AI system embedded in Loora, which analyzes learners' speech input and provides immediate feedback. In this study, no human raters were involved in the scoring process, as all evaluations were generated consistently by the system to ensure objectivity and reduce potential rater bias. The scores were collected at two different stages, namely pre-test and post-test, to measure students' speaking improvement after the implementation of the AI-assisted shadowing technique.

Regarding validity and reliability, Loora employs ASR-based algorithms that have been widely used in language learning

applications to provide consistent and real-time feedback on learners' speaking performance. The use of automated scoring ensures standardized evaluation across all participants. However, to strengthen the interpretation of the results, the scores are analyzed alongside students' perceptions obtained from questionnaires, allowing for methodological triangulation. This combination of quantitative performance data and qualitative perception data enhances the overall reliability and credibility of the findings.

Data Collection Procedures

The data collection was conducted in three stages. In the **pre-implementation stage**, students' initial speaking performance was recorded using Loora to obtain baseline (pre-test) scores. During the **implementation stage**, students participated in 13 sessions of speaking instruction using the shadowing technique integrated with AI. It is visualized in the following figure.

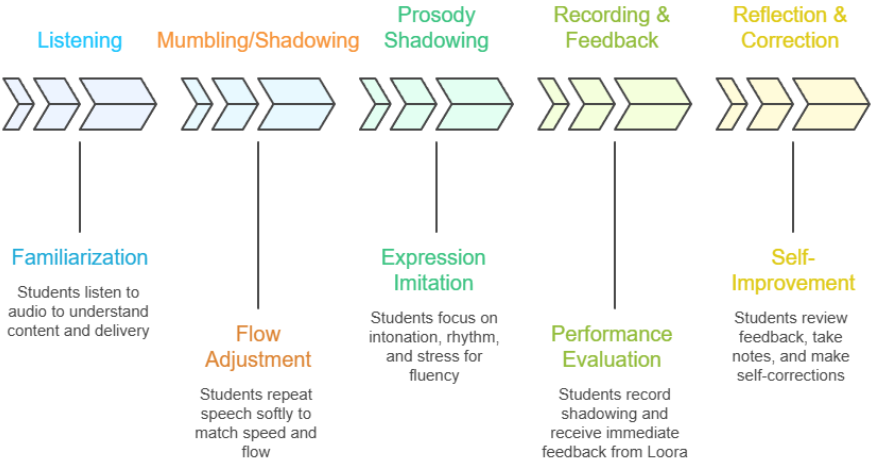


Figure 1. The process of shadowing implementation

The process began with the listening step, in which students carefully listened to the audio or model speech provided in order to familiarize themselves with the content, pronunciation, and overall delivery. This initial step is essential as it allows learners to build auditory recognition and prepare for accurate repetition (Hamada,

2019). The next step involved mumbling or shadowing in a low voice, where students attempted to repeat the speech softly while following the audio. This step helped students adjust to the speed and flow of the spoken input. It was followed by the prosody shadowing step, in which students focused more on imitating intonation, rhythm, stress, and natural speech patterns to produce more fluent and expressive utterances. These steps are consistent with the progressive nature of shadowing practice, which supports the development of phonological processing and speaking fluency (Kadota, 2019). After becoming more confident, students proceeded to record their shadowing performance using Loora. At this step, the application provided immediate feedback on their speaking performance, including aspects such as fluency, pronunciation, and overall delivery. This feedback allowed students to identify specific areas that needed improvement. The final step involved reflection, where students reviewed the feedback, took notes on their mistakes, and made self-corrections. This reflective process encouraged students to become more aware of their speaking performance and supported continuous improvement through repeated practice.

The last main stage in data collection procedure is **the post-implementation stage**. Students completed the same speaking tasks to obtain post-test scores. Subsequently, they were asked to complete the Likert-scale questionnaire. To gain deeper insights into their experiences, 5 participants were also involved in semi-structured interviews, which are commonly used to explore participants' perspectives in greater depth (Creswell & Creswell, 2017).

Data Analysis

To enhance the credibility and validity of the findings, this study applies data triangulation by integrating multiple data sources, including questionnaire results, speaking performance scores, and interview data. Triangulation allows the researcher to cross-validate findings and ensure consistency across different types of data, thereby strengthening the overall trustworthiness of the study (Creswell & Creswell, 2017).

The data were analyzed using both quantitative and qualitative techniques. The quantitative data from the questionnaire were analyzed using descriptive statistics, particularly mean scores, to determine students' perceptions in each indicator, and the results were interpreted based on Likert scale categories. In addition, students' speaking performance scores obtained from Loora were analyzed to determine the extent of improvement by comparing pre-test and post-test results using descriptive statistics (mean scores and percentage of improvement) and inferential statistics (paired sample t-test). Meanwhile, the qualitative data from interviews were analyzed using thematic analysis, which involves coding the data, categorizing similar responses, and identifying emerging themes, as outlined by Virginia Braun and Victoria Clarke (Braun & Clarke, 2006).

FINDINGS AND DISCUSSIONS

Students' Perceptions of Shadowing with AI

The results of the questionnaire analysis present students' perceptions of using the shadowing technique integrated with AI in enhancing their speaking skills. The data were analyzed using mean scores and interpreted based on the Likert scale categories.

Table 2.
Mean Score of Each Indicator

Indicator	Item	Mean Score	Interpretation
General Perception	1-3	3.76	Positive
Speaking Skill Improvement	4-7	3.99	Positive
Confidence and Motivation	8-10	3.48	Positive
AI Integration	11-14	3.77	Positive
Challenges	15-17	3.18	Neutral
Overall Evaluation	18-20	3.69	Positive

General Perception

Based on Table 2, the mean score for **general perception**, as the first indicator, is 3.76, which falls into the positive category. This result indicates that students generally perceive the shadowing technique as a helpful and effective strategy in the speaking class. The finding suggests that shadowing is well accepted by students as an engaging learning activity that encourages active participation in speaking practice. The interview data further support these findings.

Excerpt 1

"Shadowing is good for speaking class, it is really effective for me." (P2)

This statement indicates that students not only recognize the usefulness of the method but also personally experience its effectiveness. Such responses reflect students' positive attitudes toward the use of shadowing, particularly in enhancing their speaking practice.

Speaking Skill Improvement

The second indicator is speaking skill improvement, which shows the highest mean score ($M = 3.99$), indicating a strong positive perception. This result suggests that students believe the shadowing technique significantly contributes to improving their speaking skills, particularly in terms of fluency, pronunciation, and natural speaking ability. This finding is also aligned with the main objective of the study, which aims to enhance students' speaking performance through the integration of shadowing and AI. The interview data further support these findings. Several students mentioned that shadowing helped them speak more smoothly and pronounce words more accurately.

Excerpt 2

"Shadowing helps me speak more fluently and I can follow how native speakers pronounce words..." (P1)

This statement shows that shadowing technique provides a practical model for speaking improvement.

Confidence And Motivation

The third indicator is confidence and motivation, which has a mean score of 3.48 and is categorized as positive, although it is lower compared to other indicators. This finding suggests that while the shadowing technique contributes to increasing students' confidence and motivation in speaking, its impact is not as strong as its effect on speaking skill improvement. This may indicate that some students still experience anxiety or hesitation during speaking practice, despite engaging in shadowing activities. The interview data further support these findings. Some students reported that shadowing helped them feel more prepared before speaking, which gradually increased their confidence.

Excerpt 3

"Shadowing helps me practice before coming to speaking class, so I feel more ready and not too afraid to speak in class." (P3)

Excerpt 4

"After shadowing practice, I feel more confident because I already know how to say the words and even the sentences too." (P4)

However, a few students also expressed that they still experienced nervousness when speaking.

Excerpt 5

"I still feel nervous sometimes, especially when I am not sure about the pronunciation." (P4)

Excerpt 6

"I am still afraid of making mistakes, especially when I don't know the vocabulary." (P5)

This suggests that while shadowing provides support, affective factors such as anxiety may not be fully eliminated.

AI Integration

The fourth indicator is AI integration, which obtained a mean score of 3.77, indicating a positive perception. This finding shows that students perceive the integration of AI as helpful, engaging, and supportive for independent learning. It also highlights the added value of combining technology with traditional methods, where AI enhances shadowing practice by providing immediate feedback and greater flexibility in learning. This is supported by the data from interview, several students reported that the use of AI made their learning experience more flexible, as they could practice speaking anytime without relying on the teacher.

Excerpt 7

"Using the AI app makes it easier for me to practice speaking anytime, even outside the classroom." (P3)

Excerpt 8

"I don't have to wait for the lecturer I can practice by myself whenever I want." (P5)

Some participants also highlighted the benefit of immediate feedback.

Excerpt 9

"The feedback from the AI helps me know my mistakes directly, especially in pronunciation." (P4)

This indicates that AI not only facilitates practice but also promotes greater learner autonomy.

Challenges

The fifth indicator is challenges, which obtained a mean score of 3.18 and falls into the neutral category. This finding indicates that students experience some difficulties during shadowing practice, such as fast audio speed, unfamiliar vocabulary, and cognitive load.

However, since the overall mean score is not high, these challenges are not considered major obstacles in the learning process. This is supported by data obtained from interview. Some students reported that they found it difficult to follow the speed of the audio, especially when the speech was too fast.

Except 10

"Sometimes the audio is too fast, so I cannot follow all the words clearly."
(P2)

Others also highlighted vocabulary limitations as a challenge.

Except 11

"I don't understand some words, so it makes shadowing more difficult for me." (P1)

However, several students also noted that these difficulties gradually decreased over time.

Except 12

"At first it was difficult, but after practicing several times, I can follow the audio better." (P5)

Overall Evaluation

The final indicator is overall evaluation, which obtained a mean score of 3.69 and is categorized as positive. This result indicates that students are generally satisfied with the implementation of the shadowing technique and consider it suitable for improving speaking skills, particularly for pre-service English teachers. This finding reflects a comprehensive evaluation, integrating students' experiences across all previous aspects, including perception, skill improvement, motivation, AI integration, and challenges. The interview data further support these findings. Several students expressed overall satisfaction with the learning experience and stated that shadowing helped them improve their speaking ability in a structured and practical way. Some

participants also mentioned that they would recommend this method to other students, as it provides clear guidance and consistent practice.

Excerpt 13

“Shadowing helps me practice, so I think now my speaking becomes better.” (P3)

Excerpt 14

“This method is good for students who want to improve speaking because it is easy to follow and effective.” (P4)

This suggests that students not only accept the method but also recognize its value for broader instructional use.

Students' Speaking Performance Improvement

The second finding is related to the students' improvement in speaking skills. It was obtained from pretest and post test scores which is tabulated below.

Table 3.

Descriptive Statistics of Students' Pre-test and Post-test

Test	N	Mean	Standard Deviation
Pre-test	25	81.16	4.39
Post-test	25	88.72	4.06

Table 3 presents the descriptive statistics of students' speaking scores before and after the implementation of the shadowing technique integrated with AI using Loora. The results show that the mean score increased from 81.16 in the pre-test to 88.72 in the post-test. This indicates that students experienced an improvement in their speaking performance after participating in shadowing activities supported by AI.

Table 4.
Shadowing Paired Sample T-test

Variable	Mean Difference	Std. Deviation	t-value	Df	Sig. (p-value)
Pre-test – Post-test	-7.56	4.57	-8.27	24	0.000

Table 4 shows the results of the paired sample t-test conducted to determine whether the difference between pre-test and post-test scores is statistically significant. The results indicate a mean difference of -7.56 with a t-value of -8.27 and a significance level of 0.000 ($p < 0.05$). This means that the improvement in students' speaking scores is statistically significant. Therefore, it can be concluded that the use of the shadowing technique integrated with AI using Loora has a significant effect on enhancing students' speaking skills.

DISCUSSION

The findings of this study indicate that the integration of the shadowing technique with AI provides both measurable and perceived benefits for students' speaking development. The significant improvement in students' speaking scores confirms that shadowing, when supported by AI, is effective in enhancing speaking performance. This finding is in line with recent studies showing that shadowing facilitates the development of fluency and pronunciation through repeated exposure and imitation of authentic language input (Efeoğlu, 2023; Hamada, 2021; Hsu, 2025; Phuong & Ngoc, 2023; Podder et al., 2025). In the Indonesian context, some studies also report similar results, indicating that shadowing significantly improves students' oral fluency and pronunciation accuracy (Rosyidi et al., 2022; Sari & Jaya, 2025). These findings reinforce the view that structured repetition and auditory imitation play a crucial role in developing speaking competence in EFL learners.

The positive perceptions across all indicators further strengthen these findings. In particular, the highest mean score in speaking skill improvement suggests that students experienced direct benefits in key

speaking components such as fluency, pronunciation, and natural speech production. This aligns with recent research highlighting that shadowing helps learners internalize phonological patterns and improve speaking automatization (Hamada, 2021). In addition, a study by Barreto & Saltos (2024) found that shadowing significantly enhances learners' pronunciation and speaking confidence through consistent practice. Similar findings are also reported that students perceived shadowing as an effective and engaging strategy to improve speaking skills (Duong, 2025; P GA & Lamanilao-Agdana, 2025). This indicates that students not only show measurable improvement but also recognize the value of the method in their learning process.

Although the results related to confidence and motivation were relatively lower ($M = 3.48$) compared to other indicators, particularly in speaking skill improvement ($M = 3.99$) and AI integration ($M = 3.77$), they are still categorized as positive but require further consideration. Previous research supports this finding, showing that while shadowing improves linguistic aspects relatively quickly, changes in affective variables such as confidence and anxiety tend to occur more gradually (Phuong & Ngoc, 2023). Moreover, Dörnyei's motivation theory (Dörnyei, 2001) explains that sustained engagement and positive learning experiences are necessary to build long-term motivation. In line with this, Indonesian studies have reported that students' confidence in speaking improves over time as they become more familiar with the learning method and gain repeated successful experiences (Amalist et al., 2025; Sari & Jaya, 2025).

This result may indicate that improvements in technical speaking aspects, such as fluency and pronunciation, do not automatically translate into higher confidence and motivation. According to Albert Bandura (Bandura, 1997), self-efficacy is not solely determined by actual performance but also by individuals' self-perceptions and expectations. In this case, students, as pre-service teachers, may have higher self-expectations, leading them to remain critical of their own performance despite measurable improvement. Similarly, Dörnyei (2001) argues that motivation and confidence are

influenced by complex psychological factors and may not immediately improve alongside skill development.

Additionally, the use of AI-based applications that provide immediate and detailed feedback may increase learners' awareness of their errors. While such feedback is beneficial for improvement, it can also heighten self-monitoring and reduce confidence, particularly among learners who are sensitive to correction (Liakin et al., 2015; McCrocklin, 2016). Another possible factor is the adaptation process to a new learning method. As AI-assisted shadowing is relatively unfamiliar, students may require time to adjust before feeling fully comfortable and motivated. This aligns with Brown (2010), who suggests that learners often experience initial difficulties when exposed to new learning approaches. This is further supported by the neutral response in the challenges indicator ($M = 3.18$), indicating that some students still encountered difficulties during the learning process, particularly related to fast audio input and unfamiliar vocabulary.

These difficulties reflect the cognitive demands of shadowing, especially for learners with developing proficiency levels. According to cognitive load theory, tasks that require simultaneous listening and speaking can impose a high processing burden on learners (Sweller, 2011). However, similar challenges have also been reported in recent studies, which found that initial difficulty is a natural part of the shadowing process and gradually decreases as learners adapt to the task (Nguyễn & Phương, 2024; Phuong & Ngoc, 2023). In the Indonesian context, learners also reported similar difficulties but considered them manageable and beneficial for improving listening and speaking coordination (Rosyidi et al., 2022). This suggests that challenges in shadowing should not be viewed as barriers but rather as part of the learning process.

Importantly, the integration of AI played a crucial role in supporting the effectiveness of shadowing. The use of AI, particularly through Loora, enabled students to receive immediate feedback, practice flexibly, and engage in more autonomous learning. This supports recent findings that AI-based language learning tools can

enhance speaking performance by providing personalized feedback and adaptive learning environments (Betaubun et al., 2023; Qin & Zhong, 2024). In other studies, the use of digital tools in language learning has also been shown to increase student engagement, interest, autonomy, self-efficacy and motivation (Ambarita & Susyla, 2026; Dong, 2025; Li & Alharbi, 2025). Furthermore, AI integration addresses one of the major limitations of traditional shadowing, namely the lack of objective and immediate feedback, thereby making the learning process more effective and data-driven.

From a pedagogical perspective, these findings suggest that combining shadowing with AI is an effective approach for teaching speaking in EFL contexts. This approach not only improves linguistic competence but also promotes learner autonomy, self-regulation, and reflective learning. Previous research has emphasized the importance of integrating technology into language teaching to create more interactive and learner-centered environments (Wahyuni & Ariyanto, 2024; Zhang, 2025). For pre-service English teachers, this is particularly important, as they are expected to develop both language proficiency and digital pedagogical competence. Studies in Indonesia also highlight the need for future teachers to be equipped with innovative teaching strategies that integrate technology effectively (Luckyardi et al., 2024; Machmud & Fakhri, 2021; Nurhidayat et al., 2024).

Overall, the integration of shadowing and AI represents an innovative and practical strategy for enhancing speaking skills in contemporary language learning environments. The combination of structured practice and technological support creates a more engaging, flexible, and effective learning experience. These findings contribute to the growing body of research on technology-enhanced language learning and provide empirical evidence that integrating traditional methods with emerging technologies can significantly improve students' speaking skills. Therefore, while the findings confirm the effectiveness of AI-assisted shadowing in improving speaking performance, they also highlight the importance of providing pedagogical support to enhance students' confidence and motivation.

This includes gradual familiarization with the technology, guided practice, and positive reinforcement to ensure that cognitive improvement is accompanied by affective development.

CONCLUSION

This study aimed to explore the implementation of the shadowing technique integrated with AI, students' perceptions of its use in enhancing speaking skills, and the measurable improvement in students' speaking performance. The findings reveal that the integration of shadowing with Loora was implemented through structured stages, including listening, low-voice shadowing, prosody shadowing, recording, and reflection, which facilitated systematic speaking practice.

The results of the study indicate that students demonstrated significant improvement in their speaking performance, as evidenced by the increase in mean scores from the pre-test to the post-test and supported by the statistically significant results of the paired sample t-test. In addition, students showed positive perceptions across all measured indicators, particularly in speaking skill improvement, which obtained the highest mean score. This suggests that shadowing, when integrated with AI, effectively enhances key speaking components such as fluency, pronunciation, and natural speech production.

The qualitative findings further support the quantitative results, showing that students found the method engaging, helpful, and supportive for independent learning. Although some challenges were identified, such as difficulties in following fast audio and understanding unfamiliar vocabulary, these did not significantly hinder the learning process. Instead, the use of AI helped students overcome these challenges by providing immediate feedback and flexible learning opportunities.

In conclusion, the integration of shadowing and AI can be considered an effective and innovative approach to improving students' speaking skills in the EFL classroom. This approach not only

enhances students' linguistic competence but also promotes learner autonomy, confidence, and reflective learning. Therefore, it is recommended that educators, particularly in teacher education programs, consider incorporating AI-supported shadowing into speaking instruction to create more interactive, adaptive, and learner-centered learning environments.

DECLARATION OF AI AND AI-ASSISTED TECHNOLOGIES

During the preparation of this manuscript, the author used several digital tools to support the writing process. Zotero was used for managing and organizing references, while Grammarly was utilized to check grammar and improve language clarity. In addition, Napkin AI was used to create figures, and SciSpace was employed to identify relevant academic articles. The author has carefully reviewed and edited all outputs generated by these tools and takes full responsibility for the accuracy and integrity of the content of this publication.

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