Attitudes and Challenges of Pre-University Students in Kota Samarahan towards AI-Assisted Pronunciation Learning

Abg. Ashmirul Abg. Abu Nawas[1], Nur Syafiqah Yaacob[2*], Haida Umiera Hashim[3], Saule Yeszhanova[4], Joseph Ramanair[5]

[1,5] *Faculty of Education, Language and Communication, University Malaysia Sarawak*
[2] *Faculty of Education, National University of Malaysia*
[3] *Academy of Language Studies, University Technology MARA, Shah Alam, Malaysia*
[4] *School of Education, Nazarbayev University*

Corresponding Author: nursyafiqahyaccob@ukm.edu.my

ABSTRACT

With the rapid integration of artificial intelligence (AI) in language education, understanding students' perceptions of AI-assisted pronunciation tools has become increasingly important. This study examines pre-university students' attitudes and challenges regarding AI-assisted English pronunciation learning in Kota Samarahan, Sarawak, Malaysia. Through a quantitative research design, a survey was employed with 120 pre-university students participated. The research found predominantly positive attitudes of which participants viewed AI tools as engaging, effective for improving pronunciation accuracy, and motivating for regular practice. They found the feedback clear and were willing to recommend these tools. Apart from that, several key challenges were identified. The most obvious issue was AI's lack of personalised guidance compared to teachers. Other significant obstacles included unreliable internet connectivity, AI systems' inaccuracies in recognising diverse accents, and the demotivating effect of repetitive feedback during extended use. The findings suggest AI tools are valuable for supplementary pronunciation practice. However, effective integration requires improved technological infrastructure, more accent-inclusive AI design, and a blended approach that combines automated feedback with teacher support to address pedagogical and motivational gaps.

Keywords: AI-powered tool, attitudes, challenges, pre-university students, pronunciation learning

INTRODUCTION

Artificial intelligence (AI) has rapidly transformed the landscape of education, introducing innovative methods that enhance teaching, learning, and assessment. One area that has particularly benefited from AI integration is language learning, where intelligent systems provide learners with personalized feedback, adaptive practice, and independent learning opportunities (Wah, 2025; Mohebbi, 2025). Among the various applications of AI in language education, pronunciation learning has emerged as a key focus. Through AI-assisted tools such as ELSA Speak, YouGlish, and Speechling, learners can receive immediate evaluation and correction of their speech, improving their pronunciation accuracy and confidence in communication.

Nevertheless, the advancement of artificial intelligence (AI) in education has introduced new opportunities for improving learning outcomes through personalized, data-driven instruction. Within the field of English language learning, AI technologies have shown potential to support learners in developing pronunciation accuracy and fluency, an important skill to ensure effective communication and global participation (Fathi et al., 2024; Dennis,

2024; Gottardi et al., 2022). However, despite the growing availability of AI-assisted pronunciation tools, there remains a gap in understanding how pre-university students perceive and experience these technologies, particularly in the Malaysian educational context. Previous research on pre-university students has highlighted the importance of understanding learners' attitudes toward online learning in general, as these perceptions significantly influence engagement, motivation, and learning outcomes (Nawas et al., 2025). The extent to which AI effectively supports pronunciation learning depends not only on the technology itself but also on students' attitudes, engagement, and ability to overcome associated challenges.

The integration of AI into language learning aligns with the United Nations Sustainable Development Goals (SDGs), notably SDG 4: Quality Education and SDG 9: Industry, Innovation, and Infrastructure. SDG 4 emphasizes inclusive and equitable education and the promotion of lifelong learning, while SDG 9 focuses on technological innovation as a driver of development. By leveraging AI technologies in education, institutions contribute to both goals by enhancing learning accessibility and quality while preparing students to thrive in a technology-driven world. For pre-university students, who are in a crucial transitional stage before tertiary education, exposure to AI-assisted learning supports both linguistic competence and digital readiness (May et al., 2024).

Pronunciation is a fundamental aspect of language proficiency that directly influences intelligibility, confidence, and communicative competence (Tsang, 2025; Pudin et al., 2021). However, many learners, especially non-native speakers, struggle to master pronunciation due to factors such as limited classroom time, large class sizes, and lack of individualized feedback (Couper, 2021). In Malaysia, while students often perform well in grammar and reading, pronunciation remains a persistent challenge (Pudin et al., 2021). For example, teachers in Malaysia may not be able to provide personalized correction for every learner due to time constraint and resources. Consequently, many students continue to speak English with pronunciation errors that affect clarity and confidence.

AI-assisted pronunciation tools address these limitations by providing learners with real-time, data-driven feedback on their speech (Jingjing & Andi, 2025). For example, by using automatic speech recognition (ASR) and machine learning algorithms, these tools identify mispronunciations, suggest corrections, and allow students to monitor their progress over time. This self-directed approach promotes learner autonomy and continuous practice beyond the classroom. Research has shown that AI-based pronunciation practice can enhance motivation, awareness of pronunciation features, and learning outcomes when used consistently and effectively. For example, a research conducted by Assal and Hosen (2025) emphasize AI technologies can deliver personalized and visually engaging feedback through interactive interfaces, such as animated models or graphical progress indicators, which support learners' understanding and retention of pronunciation patterns. By combining immediate corrective feedback with visually dynamic representations of speech, AI tools can make the learning experience more engaging, intuitive, and motivating for students.

Despite their potential, AI-assisted pronunciation tools present several challenges. The accuracy of feedback may vary according to accent, speech rate, or environmental noise, leading to occasional inconsistencies (Mohammadkarimi, 2024). Moreover, many AI systems are trained on native-speaker accents, which may disadvantage learners with local or regional varieties of English (Farooq & Hussain, 2025). Apart from that, technical limitations such as unstable internet connections, lack of suitable devices leads to unfamiliarity with AI interfaces which also reduce effective use (Kaushik, Barcellona, Mandyam, Tan, & Tromp, 2025). Additionally, without teacher mediation, some learners may find it difficult to interpret automated feedback, reducing the effectiveness of independent practice (Li & Kim, 2024).

Learners' attitudes toward AI-assisted tools play a crucial role in determining the success of their adoption (Yıldız, 2023). Positive attitudes encourage engagement, experimentation, and persistence, while negative perceptions may result in limited use or rejection of technology. Apart from that, several factors such as practicality, perceived usefulness, and confidence in using technology affect how students respond to AI in learning contexts (Hamadneh, 2024). For pre-university students, understanding these attitudes and the challenges they face provides valuable insight into how technology can best support pronunciation learning and overall language proficiency (Pudin et al., 2021).

In Malaysia's context, the integration of AI technologies into English education supports national aspirations to enhance both communicative competence and digital literacy. By promoting equitable access to advanced learning tools, AI contributes to the broader goals of SDG 4, ensuring that all students have the opportunity to develop essential skills for the 21st century. At the same time, it reflects SDG 9's call for innovative and sustainable technological solutions that empower learners and educators alike. Investigating pre-university students' attitudes and challenges toward AI-assisted pronunciation learning is thus both timely and significant. It provides a deeper understanding of how emerging technologies influence learners' experiences and offers insights for educators seeking to design inclusive, effective, and sustainable approaches to English language teaching in the digital era.

LITERATURE REVIEW

Pronunciation has long been recognized as a difficult component of second language acquisition. While many learners can acquire grammatical and lexical competence through exposure and practice (Matiso, 2023; Ping & Tao, 2025; Li & Lian, 2022), traditional classrooms often fail to provide individualized pronunciation instruction due to large class sizes, limited teaching hours, and curriculum constraints (Couper, 2021). As a result, many learners receive minimal corrective feedback and have few opportunities to practice speaking in authentic contexts. This situation is particularly evident among pre-university students, who must develop strong communicative competence in English to succeed in higher education but often enter tertiary studies with persistent pronunciation difficulties.

AI-assisted pronunciation tools promise to fill this instructional gap. By employing automatic speech recognition (ASR) and machine learning algorithms, these tools can detect errors, compare learner speech to native models, and deliver instant feedback (Bashori et al., 2024). In conjunction with this, students can practice pronunciation autonomously, at their own pace, and receive immediate evaluation of their progress (Ardini, 2023). This flexibility aligns with the principles of Sustainable Development Goal 4 (Quality Education), which promotes equitable access to effective learning opportunities, and SDG 9 (Industry, Innovation, and Infrastructure), which highlights innovation as a pathway to sustainable development. However, the effective use of AI in education depends not fully on access to technology but on how learners perceive, adapt to, and engage with it.

Despite the theoretical advantages of AI-assisted pronunciation learning, several practical and pedagogical issues persist. One primary concern is the accuracy and reliability of AI feedback. Most pronunciation applications are designed using datasets based on native English accents, typically American or British (Hassan et al., 2022). Learners whose pronunciation reflects local varieties of English, such as Malaysian English, may find that AI tools incorrectly classify their speech as erroneous, even when it is intelligible in real communication (O'Neill & Carson-Berndsen, 2023). This misrecognition can lead to frustration, demotivation, or a loss of confidence in the learning tool. Moreover, learners may not fully understand the feedback provided by AI systems, particularly if it relies on phonetic symbols or technical linguistic terminology, thereby limiting its educational value.

Another issue concerns digital literacy and accessibility. While many higher institution students are familiar with mobile devices and online applications, not all possess the same level of technological competence or access to reliable internet connections (Bell et al., 2022). Technical challenges, such as poor connectivity or outdated devices, can interrupt learning and discourage consistent use of AI tools (Narayan & Jauhari, 2025). Students in rural or economically disadvantaged areas may be further marginalized if AI-assisted learning requires high-speed internet or subscription fees. These disparities challenge the SDG 4 principle of "inclusive and equitable education" and highlight the need to understand how technological inequalities affect learners' ability to benefit from AI-enhanced instruction, as also noted in studies of pre-university learners' perceptions toward online mathematics learning.

In addition to technical issues, attitudinal and motivational factors significantly influence the effectiveness of AI-assisted pronunciation learning. Students' perceptions of usefulness, ease of use, and trust in AI determine how willingly they adopt and continue using such tools (Pan et al., 2024). Some learners may view AI feedback as more objective and reliable than human evaluation, while others may prefer teacher guidance that provides emotional support and contextual understanding. Cultural attitudes toward technology, prior experiences with digital learning, and self-efficacy beliefs can all shape how students engage with AI systems (Chen et al., 2024). For pre-university students, whose academic and cognitive maturity is still developing, maintaining motivation and confidence is essential to successful learning outcomes. Hence, understanding their attitudes toward AI is thus critical for ensuring that technology supports, rather than discourages, their language development.

The role of teachers influences the integration of AI-assisted pronunciation learning. While AI can supplement instruction by providing automated feedback, it cannot fully replace the nuanced guidance of human educators (Jose & Jose, 2024). Teachers interpret learner errors, provide encouragement, and adapt explanations to students' individual needs, functions that AI cannot yet replicate. However, in some educational settings, the introduction of AI tools has led to reduced teacher involvement or overreliance on technology. Without proper guidance, students may misinterpret AI feedback or use the tools inconsistently, reducing their learning effectiveness. The challenge lies in balancing AI-driven learning with human pedagogical support to create a complementary and sustainable learning environment. Since, Bashori et al. (2024) and Sridharan and Sequeira (2024) have found that AI-asssisted tools promote continuous pronunciation practice by offering instant feedback that enhances learning experience.

Furthermore, the global push toward digital education, accelerated by the COVID-19 pandemic, has made technology integration an essential rather than optional component of modern teaching. As schools and institutions adopt more digital tools, evaluating students' readiness and attitudes toward these technologies becomes increasingly important (Oyetade et al., 2024). Pre-university programs in Malaysia are expected to equip

students with the skills and competencies needed for higher education and future careers (Yee & Seman, 2025), including communication, collaboration, and technological proficiency (Pudin et al., 2021). If students struggle to engage with AI-assisted learning due to negative attitudes or unresolved technical challenges, the intended educational benefits may not be fully realized. Therefore, research that explores students' perceptions and challenges is vital for ensuring that digital transformation in education supports inclusive, effective, and sustainable learning (Nawas et al., 2025).

From a broader perspective, this issue reflects the global tension between technological advancement and educational equity. While AI promises to make learning more accessible and efficient, it may inadvertently widen the gap between students who can effectively use technology and those who cannot (Narayan & Jauhari, 2025). Addressing this imbalance is central to achieving SDG 4, which emphasizes inclusive education that benefits all learners, regardless of background or socioeconomic status. By identifying the challenges faced by pre-university students in using AI-assisted pronunciation tools, educators and policymakers can develop strategies to promote equitable access, effective training, and supportive learning environments.

In summary, the growing presence of AI-assisted pronunciation tools offers both opportunities and challenges for pre-university students. While these tools can enhance learning autonomy, pronunciation accuracy, and engagement, their effectiveness is shaped by factors such as learners' attitudes, technological accessibility, and feedback quality. There remains a pressing need to investigate how students perceive and experience AI in pronunciation learning, particularly in the Malaysian context, where English proficiency and digital literacy are key educational priorities. Understanding these factors will not only inform pedagogical practices but also contribute to the global agenda of advancing sustainable, technology-driven education that supports quality learning for all.

RESEARCH METHOD

Research Design

This study adopted a quantitative descriptive survey design to explore pre-university students' attitudes and challenges toward the use of artificial intelligence (AI) tools in learning English pronunciation. The quantitative approach was chosen to collect numerical data that reflect general trends and perceptions among a large group of respondents. A descriptive design was deemed appropriate as it allows the researcher to capture participants' views and experiences at a specific point in time without manipulating any variables.

Participants and Sampling

The study involved pre-university students enrolled in Kota Samarahan, a province in Sarawak as these students are required to use English for academic communication and often engage with digital learning platforms. A purposive sampling technique was used to select participants who had prior experience using AI-assisted pronunciation tools such as Elsa Speak, Duolingo, or Google Pronunciation.

A total of 120 students participated in the study. This sample size was adequate for descriptive statistical analysis and aligned with similar studies in technology-assisted language learning. Participants were informed of the study's purpose and assured of confidentiality before completing the survey.

Research Instrument

Data were collected using a structured questionnaire developed by the researcher, comprising three sections:

Section A of the questionnaire focuses on collecting demographic information from the participants. This section is designed to gather basic background data, such as gender, age, type of institution attended, and the frequency of AI usage. Collecting demographic information is essential for several reasons. First, it provides a profile of the participants, which helps contextualize the study findings and allows for a better understanding of the population under investigation. For example, patterns in responses may differ according to age groups, gender, or institutional contexts, offering insights into how these factors may influence students' attitudes and experiences with AI-assisted pronunciation learning. Additionally, information about the frequency of AI use helps determine participants' familiarity and comfort level with technology, which can be a critical variable affecting their perceptions, engagement, and challenges when using AI tools. By including Section A, researchers can analyze whether demographic characteristics are associated with differences in attitudes, experiences, or challenges, thereby providing a more nuanced interpretation of the data.

Section B of the questionnaire is designed to assess students' attitudes toward AI-assisted pronunciation learning. It consists of seven Likert-scale items, with responses ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). This section aims to capture participants' perceptions of the usefulness, effectiveness, and motivational aspects of AI pronunciation tools. Example items include statements such as "AI pronunciation tools make learning English pronunciation more interesting," "AI feedback helps me improve my pronunciation accuracy,"

and "Using AI pronunciation tools enhances my speaking confidence." By analyzing responses to these items, researchers can gauge the degree to which students perceive AI as beneficial for pronunciation learning and identify specific areas where AI contributes to engagement, skill improvement, and confidence building. The data from this section help in understanding learners' readiness to adopt AI technology and their overall satisfaction with AI-supported language learning experiences.

Section C focuses on the challenges students face when using AI-assisted pronunciation tools and also includes seven Likert-scale items. This section is intended to identify potential obstacles that may affect the effectiveness of AI learning, such as technical issues, feedback comprehension, and system limitations. Sample items include "I find it difficult to understand AI pronunciation feedback," "AI tools sometimes misjudge my pronunciation," and "Internet or device issues limit my ability to use AI tools effectively." Collecting this information enables researchers to pinpoint common difficulties that learners encounter, which can inform improvements in AI tool design, instructional support, and strategies for integrating technology into language learning. Understanding these challenges also allows educators to anticipate barriers and provide guidance that enhances the overall learning experience.

Validity and Reliability

To ensure content validity, the questionnaire was reviewed by three experts in applied linguistics and educational technology. Minor revisions were made to enhance item clarity and relevance. A pilot test involving 30 students was conducted to identify potential ambiguities. The reliability of the reading section was assessed using Cronbach's alpha, a commonly used statistical measure to evaluate the internal consistency of a set of items in a questionnaire or test. The Cronbach's alpha value obtained for the reading section was 0.900, indicating a high level of reliability. In general, a Cronbach's alpha coefficient above 0.70 is considered acceptable, while values above 0.90 reflect excellent internal consistency (Edelsbrunner & Simonsmeier, 2025). This suggests that the items in the reading section consistently measure the same underlying construct, ensuring that the responses are stable and dependable for research purposes. High reliability is essential for drawing valid conclusions from the data, as it indicates that the instrument produces consistent results across different respondents and situations.

Data Collection Procedure

Data were collected through an online survey distributed via institutional email and messaging applications. Participation was voluntary, and respondents provided informed consent before accessing the questionnaire. The survey remained open for two weeks, during which 120 complete responses were received. To ensure ethical compliance, no personally identifiable information was collected, and all data were reported anonymously. The study was conducted in accordance with institutional ethical guidelines.

Data Analysis

Quantitative data were analyzed using Statistical Package for the Social Sciences (SPSS) version 29. Descriptive statistics including mean, standard deviation, and percentage, were used to summarize students' attitudes and challenges. Reliability testing using Cronbach's Alpha confirmed internal consistency, while independent samples t-tests and ANOVA were conducted (where applicable) to examine variations based on demographic factors such as gender and institution type. The findings were presented in tabular and graphical formats for ease of interpretation and comparison with previous research.

Ethical Considerations

The study strictly followed research ethics protocols. Participants were informed of their rights, including voluntary participation and withdrawal at any stage. Data confidentiality was maintained throughout the research process. The study adhered to the principles of the Declaration of Helsinki (2013) and received approval from the relevant institutional ethics committee.

RESULTS

Demographic Information

The study involved a total of 100 student respondents. In terms of gender distribution, female students constituted the majority at 61%, while male students accounted for 39%. Regarding academic programmes, more than half of the respondents were enrolled in Life Science (51%), followed by a substantial proportion from Physical Science (33%). A smaller group of students came from Computer Science (13%), with the remaining respondents classified under other programmes.

Tools Popularity and Usage

The findings show that students commonly rely on multiple AI-assisted pronunciation tools. Google Pronunciation emerged as the most widely used tool, followed closely by Duolingo, which is often paired with Google Pronunciation for enhanced practice. Other tools such as Speechling, YouGlish, ChatGPT, ELSA Speak, and Grammarly were mentioned but by comparatively fewer students. Notably, the majority of respondents reported using more than one tool, with the combination of Google Pronunciation and Duolingo being the most frequent. Only a small group of students (three in total) indicated that they did not use any of the listed pronunciation tools.

Analysis of Attitudes (Positive Statements)

The following statements were rated on a Likert scale (1=Strongly Disagree, 5=Strongly Agree). The table below shows the average score for each positive attitude statement.

Table 1. Attitudes towards AI-Assisted Pronunciation Learning

No.	Items	Mean	Standard Deviation
1.	I enjoy learning pronunciation through AI tools.	3.96	0.909
2.	AI pronunciation tools make my learning more engaging and interactive.	4.08	0.918
3.	I believe AI tools help me improve my pronunciation accuracy.	4.05	0.925
4.	The feedback provided by AI pronunciation tools is useful and easy to understand.	4.06	0.908
5.	I feel more confident speaking English after using AI pronunciation tools.	3.8	0.899
6.	AI tools motivate me to practice pronunciation more regularly.	3.85	0.968
7.	I would recommend AI pronunciation tools to other students.	4.08	0.884

Attitudes

The findings indicate that students hold positive attitudes toward AI-assisted pronunciation learning, beginning with their enjoyment of using AI tools (mean = 3.96, SD = 0.909) and the perception that these tools make learning more engaging and interactive (mean = 4.08, SD = 0.918). They also believed that AI helps improve their pronunciation accuracy (mean = 4.05, SD = 0.925), and they found the feedback provided by AI tools to be useful and easy to understand (mean = 4.06, SD = 0.908). Although the confidence gained after using AI tools received a slightly lower score (mean = 3.8, SD = 0.899), it still reflects a generally positive effect on students' speaking confidence. Students also felt motivated to practise pronunciation more regularly (mean = 3.85, SD = 0.968), and their strong willingness to recommend AI pronunciation tools to others (mean = 4.08, SD = 0.884) further reinforces the overall positive acceptance of AI in their pronunciation learning.

Analysis of Challenges (Negative Statements)

A higher score reflects a greater level of challenge experienced by the students, with responses rated on a scale from 1 (Strongly Disagree) to 5 (Strongly Agree).

Table 2. Challenges in Using AI-Assisted Pronunciation Tools

No.	Items	Mean	Standard Deviation
1.	I find it difficult to understand the pronunciation feedback provided by AI tools.	2.58	0.855

2.	AI pronunciation tools do not always recognize my accent accurately.	2.97	0.904
3.	Poor internet connection affects my ability to use AI pronunciation tools effectively.	3.18	0.989
4.	I face technical issues (e.g., app crashes, audio errors) when using AI pronunciation tools.	2.49	0.98
5.	I feel that AI pronunciation tools lack personalized guidance compared to teachers.	3.3	0.858
6.	I sometimes feel demotivated when the AI feedback is too repetitive or unclear.	3.12	0.891
7.	Using AI pronunciation tools for long periods feels tiring or uninteresting.	2.9	0.893

Despite these positive attitudes, students also experienced several challenges with AI pronunciation tools. They generally disagreed that AI feedback was difficult to understand (mean = 2.58, SD = 0.855), though some reported issues with accent recognition (mean = 2.97, SD = 0.904), showing that AI systems may not always accurately assess diverse accents. Internet connection problems were identified as a notable barrier (mean = 3.18, SD = 0.989), while technical issues such as app crashes or audio errors were less frequently experienced (mean = 2.49, SD = 0.98). The most prominent challenge was the perception that AI tools lack personalised guidance compared to teachers (mean = 3.3, SD = 0.858), highlighting limitations in adaptive feedback. Additionally, students sometimes felt demotivated when AI feedback became repetitive or unclear (mean = 3.12, SD = 0.891), and prolonged use of AI tools was viewed as tiring or uninteresting (mean = 2.9, SD = 0.893), indicating that engagement may decrease during extended practice sessions.

DISCUSSION

The findings of this study reveal that pre-university students generally hold positive attitudes toward AI-assisted pronunciation learning, and these attitudes strongly align with the existing literature on AI in language education (Hamadneh, 2024; Oyetade et al., 2024). The literature review indicated that AI has increasingly transformed language learning through its ability to simulate human feedback, personalise learning, and promote learner autonomy, features that are consistent with the favourable perceptions expressed by the students. Mohebbi (2025) highlighted that AI tools support learner independence and self-regulation, and this is reflected in the students' agreement that AI applications make pronunciation learning more engaging and enjoyable. The strong mean scores for engagement and positive learning experiences correspond with studies such as Ardini (2023), Bashori et al. (2024), Jingjing and Andi (2025), and Mohammadkarimi (2024), all of which found that AI-assisted pronunciation systems enhance learner motivation through interactive features and immediate corrective feedback. This adds to the novelty of the present study by demonstrating that pre-university students, a group less frequently examined in prior research, share similar positive perceptions of AI tools as reported in higher education contexts.

Students' perception that AI tools help them improve pronunciation accuracy is directly supported by empirical research. Dennis (2024) reported that AI-powered speech recognition significantly improves learners' pronunciation and speaking skills. Similar evidence appears in the work of Bashori et al. (2024), who demonstrated improvement in both segmental and suprasegmental features, and in the findings of Li and Lian (2022), who showed the importance of corrective feedback in supporting learners' development of English intonation. The students' belief that feedback produced by AI tools is easy to understand is also consistent with findings by Li and Kim (2024), who observed that higher education learners often describe automated feedback as supportive and comprehensible in self-regulated learning contexts. These perceptions further align with Wah (2025) and Mohebbi (2025), who found that personalization and clear feedback contribute significantly to learner engagement with AI tools. This study adds novelty by extending these findings to the pre-university level, highlighting that even learners at a preparatory stage benefit from the immediacy and clarity of AI feedback.

Although students somewhat agreed that AI tools increase their confidence in speaking English, this moderate response is in line with broader research on anxiety and oral proficiency. Tsang (2025) found that learners' confidence in speaking is influenced by both self-perceived pronunciation ability and their prior anxiety levels during oral tasks. AI tools can help reduce anxiety through repeated practice, but they may not fully recreate the social or interpersonal aspects of confidence building that occur in human-mediated interactions. This adds to the

novelty of the study by emphasising that confidence enhancement among pre-university students may require complementary strategies beyond AI assistance.

The willingness of students to recommend AI pronunciation tools to others reflects strong acceptance of technology, which is supported by multiple studies on students' readiness and adoption of AI. Chen et al. (2024) demonstrated that positive attitudes and self-efficacy predict students' intention to use AI for language learning. Similar findings were reported by Hamadneh (2024) and Oyetade et al. (2024), who found that students are generally willing to use digital technologies when they perceive them as beneficial and convenient. In Malaysia, May et al. (2024) highlighted that learners recognise the value of AI in developing oral proficiency, suggesting that the positive attitudes documented in this study are consistent with trends in Malaysian higher education. The current study adds novelty by confirming that pre-university students are equally receptive to AI pronunciation tools, indicating readiness for earlier interventions in the educational pipeline.

Despite the generally favourable responses, students also reported several challenges that influence their engagement with AI pronunciation tools. The highest challenge mean score reflected concerns regarding the lack of personalised guidance when compared with human teachers. This issue is widely acknowledged in the literature. Jose and Jose (2024) pointed out that AI systems often lack the emotional and contextual sensitivity required for personalised instruction, while Narayan and Jauhari (2025) emphasised that AI integration in education still struggles to match the adaptive qualities of human educators. Li and Kim (2024) also noted that learners may struggle when automated feedback does not fully address their unique learning needs, which corresponds with students' comments on repetitive or unclear feedback that can reduce motivation over time. This adds novelty by highlighting that pre-university learners, despite being digital natives, still perceive a critical gap in AI's adaptive and human-like guidance.

Students additionally highlighted technical barriers, especially problems with internet connectivity. This challenge mirrors findings from Bell et al. (2022), who reported that the digital divide continues to affect students in technology-enhanced learning environments. Poor connectivity can significantly disrupt AI functionality and limit access to high-quality speech recognition, particularly in resource-restricted settings that must still strive to meet the inclusivity goals of SDG 4. Accent recognition issues emerged as another notable challenge in the findings. Students expressed concerns about AI systems misinterpreting or inaccurately evaluating their speech due to accent differences. This issue is well-documented in research on ASR performance. Farooq and Hussain (2025) explained that AI speech systems often struggle with the phonetic variation present in diverse accents and dialects. Similar limitations have been highlighted by Hassan et al. (2022), who attempted to improve ASR accuracy for South Asian English through transfer learning, and by O'Neill and Carson-Berndsen (2023), who demonstrated the sensitivity of ASR systems to phonetic variation among L2 English speakers. These studies confirm that accent bias remains a major obstacle for learners using pronunciation apps, particularly in multilingual contexts such as Malaysia. This study adds novelty by contextualising these accent-related challenges specifically within pre-university Malaysian learners, a group that has been underrepresented in previous research.

Some students also felt that prolonged use of AI tools could become tiring or monotonous. Although less frequently discussed in existing literature, this finding aligns with concerns reported by Ping and Tao (2025), who noted that AI-driven pronunciation systems must integrate multisensory and varied feedback strategies to sustain learner interest. Without such variation, AI tools risk reducing engagement despite their initial appeal. This adds novelty by emphasising the need for AI systems to incorporate more diverse and interactive features to maintain motivation in early-stage learners.

Overall, the findings align well with current research on AI-assisted pronunciation learning. Students appreciate AI tools for their immediacy, clarity, and capacity to improve pronunciation, sentiments that echo the broader literature on the benefits of AI in developing spoken proficiency. At the same time, the challenges they report also reflect well-established limitations in AI systems, including issues of personalization, accent sensitivity, and technological barriers. These findings suggest that while AI holds significant promise for supporting pronunciation learning among pre-university students, its success depends on addressing technological constraints, enhancing system sensitivity to diverse learner backgrounds, and integrating teacher support to balance automated feedback with human judgment and pedagogy. This adds to the novelty of the study by providing empirical evidence on pre-university students, demonstrating how AI-assisted pronunciation tools function in the formative stage of English learning, and highlighting specific considerations for implementation in Malaysian educational contexts.

CONCLUSION

Implications of the Study

The findings of this study carry important implications for educators, curriculum designers, and policymakers involved in language education at the pre-university level. First, the generally positive attitudes toward AI-assisted pronunciation tools suggest that integrating these technologies into classroom instruction or self-directed learning can effectively enhance learner engagement, motivation, and autonomy. Educators can leverage AI to provide immediate, clear, and individualized feedback, complementing traditional teaching methods and allowing learners to practice pronunciation at their own pace, which may contribute to improved oral proficiency.

Additionally, the study highlights the importance of considering learners' psychological and motivational factors when implementing AI tools, ensuring that technology adoption aligns with learners' confidence levels and self-efficacy. For curriculum designers, the results indicate that structured incorporation of AI-assisted learning within English courses can enrich the learning environment while addressing time constraints and large class sizes. From a broader perspective, this research adds to the novelty by demonstrating that AI tools are not only effective in higher education contexts but also applicable and impactful for pre-university students in Malaysia, thus informing scalable and contextually relevant strategies for technology-enhanced language learning (Ardini, 2023; Bashori et al., 2024; Dennis, 2024; May et al., 2024).

LIMITATIONS OF THE STUDY

Despite the valuable insights provided, this study has several limitations that should be acknowledged. The sample was limited to pre-university students from a single institution in Malaysia, which may restrict the generalizability of the findings to other educational levels or cultural contexts. In addition, the study focused primarily on students' experiences with AI-assisted pronunciation tools without directly measuring actual improvements in pronunciation performance, which limits the ability to draw causal conclusions regarding learning outcomes.

Furthermore, technological constraints, such as the quality of internet connectivity and device availability, were reported by participants but not systematically controlled or analysed, potentially influencing engagement with the AI tools. Acknowledging these limitations provides a clearer understanding of the scope and applicability of the study's findings and suggests caution in overgeneralizing results (Bell et al., 2022; Farooq & Hussain, 2025; Jose & Jose, 2024; Ping & Tao, 2025).

Research Gaps

The study also identifies notable gaps in the existing literature that warrant further investigation. While previous research has examined AI-assisted language learning at the tertiary level, there is limited empirical evidence regarding pre-university learners, a group that is critical for bridging secondary education and tertiary readiness. Additionally, most studies have focused on learners' attitudes or the technical affordances of AI systems separately, with less attention given to the interplay between learner perceptions, engagement, and actual learning outcomes.

Another gap is on the accent sensitivity and personalization in AI pronunciation systems, particularly for multilingual contexts such as Malaysia, where learners' linguistic backgrounds differ significantly from native English norms (Mohebbi, 2025). Finally, few studies have explored how to integrate teacher support effectively with AI tools to maximize learning while mitigating challenges related to motivation, monotony, or misinterpretation of automated feedback. Addressing these gaps can inform the design of more inclusive, adaptive, and pedagogically robust AI-assisted learning environments (Ardini, 2023; Bashori et al., 2024; Li & Kim, 2024; O'Neill & Carson-Berndsen, 2023).

In summary, pre-university students generally hold highly positive perceptions of AI-assisted pronunciation tools. They find these tools engaging, useful, and motivating, and believe that AI significantly supports the improvement of their pronunciation skills and confidence. Nevertheless, several challenges remain, including limited personalised guidance, inaccuracies in accent recognition, and technical or connectivity issues, which need to be addressed to maximise the effectiveness of AI-assisted language learning.

ACKNOWLEDGEMENTS

REFERENCES

Ardini, S. N. (2023). The use of artificial intelligence to promote autonomous pronunciation learning: segmental and suprasegmental features perspective. *Indonesian Journal of English Language Teaching and Applied Linguistics, 8(2)*, 133-147. https://doi.org/10.21093/ijeltal.v8i2.1452.

Asri, D. P., Thaher, I., & Widayanti, R. (2025). Artificial intelligence, legal culture, and the indonesian formal legal system: negotiating norms in the regulation of emerging technologies. *Journal of Cultural Analysis and Social Change, 10(3)*, 457–468. https://doi.org/10.64753/jcasc.v10i3.2439.

Assal, M. E., & Hosen, R. M. (2025). The impact of artificial intelligence on graphic design from the perspective of motion design and animated characters in universities as a model. *Journal of Cultural Analysis and Social Change, 10(4)*, 190–204. https://doi.org/10.64753/jcasc.v10i4.2794.

Bashori, M., van Hout, R., Strik, H., & Cucchiarini, C. (2024). I can speak: Improving English pronunciation through automatic speech recognition-based language learning systems. *Innovation in Language Learning and Teaching, 18(5)*, 443-461. https://doi.org/10.1080/17501229.2024.2315101.

Bell, T., Aubele, J. W., & Perruso, C. (2022). Digital divide issues affecting undergraduates at a Hispanic-serving institution during the pandemic: A mixed-methods approach. *Education Sciences, 12(2)*, 115. https://doi.org/10.3390/educsci12020115.

Chen, D., Liu, W., & Liu, X. (2024). What drives college students to use AI for L2 learning? modeling the roles of self-efficacy, anxiety, and attitude based on an extended technology acceptance model. *Acta Psychologica, 249*, 104442. https://doi.org/10.1016/j.actpsy.2024.104442.

Couper, G. (2021). Pronunciation teaching issues: Answering teachers' questions. *RELC Journal, 52(1)*, 128-143. https://doi.org/10.1177/0033688220964041.

Dennis, N. K. (2024). Using AI-powered speech recognition technology to improve English pronunciation and speaking skills. *IAFOR Journal of Education, 12(2)*, 107-126. https://doi.org/10.22492/ije.12.2.05.

Edelsbrunner, P. A., & Simonsmeier, B. A. (2025). The cronbach's alpha of domain-specific knowledge tests before and after learning: A meta-analysis of published studies. *Educational Psychology Review, 37(4)*, 1-43. https://doi.org/10.1007/s10648-024-09982-y.

Farooq, M. A., & Hussain, M. A. (2025). Speech recognition and phonetic variation:Understanding the impact of accents and dialects on AI-based speech systems. *Qualitative Research Journal for Social Studies, 2(3)*, 296-311. https://doi.org/10.63878/qrjs295.

Fathi, J., Rahimi, M., & Derakhshan, A. (2024). Improving EFL learners' speaking skills and willingness to communicate via artificial intelligence-mediated interactions. *System, 121*, 103254. https://doi.org/10.1016/j.system.2024.103254.

Gottardi, W., Almeida, J. F., & Tumolo, C. H. (2022). Automatic speech recognition and text-to-speech technologies for L2 pronunciation improvement: Reflections on their affordances. *Texto livre, 15*, e36736. https://doi.org/10.35699/1983-3652.2022.36736.

Hamadneh, B. (2024). Factors affecting students' willingness to use artificial intelligence in university settings. *International Journal of Information and Education Technology, 14(12)*, 1763-1769. https://doi.org/10.18178/ijiet.2024.14.12.2207.

Hassan, M. A., Rehmat, A., Ghani, K. M., & Yousaf, M. H. (2022). Improvement in automatic speech recognition of South Asian accent using transfer learning of Deepspeech2. *Mathematical Problems in Engineering, 2022(1)*, 6825555. https://doi.org/10.1155/2022/6825555.

Jingjing, L. Y., & Andi, H. K. (2025). Effectiveness of AI-driven tools in improving English pronunciation training. *Educational Research and Reviews, 7(1)*, 56-58. https://doi.org/10.32629/rerr.v7i1.3523.

Jose, J., & Jose, B. J. (2024). Educators' academic insights on artificial intelligence: challenges and opportunities. *Electronic Journal of e-Learning, 22(2)*, 59-77. https://doi.org/10.34190/ejel.21.5.3272.

Kaushik, A., Barcellona, C., Mandyam, N. K., Tan, S. Y., & Tromp, J. (2025). Challenges and opportunities for data sharing related to artificial intelligence tools in health care in low-and middle-income countries: Systematic review and case study from Thailand. *Journal of Medical Internet Research, 27*, e58338. https://doi.org/10.2196/58338.

Li, L., & Kim, M. (2024). It is like a friend to me: Critical usage of automated feedback systems by self-regulating English learners in higher education. *Australasian Journal of Educational Technology, 40(1)*, 1-18. https://doi.org/10.14742/ajet.8821.

Li, Z., & Lian, A. P. (2022). Achieving self-imitation for English intonation learning: The role of corrective feedback. *Chinese Journal of Applied Linguistics, 45(1)*, 106-125.

Matiso, N. H. (2023). A comprehensive approach to eliminate English second language learners' grammatical difficulties. . *International Journal of Learning Teaching and Educational Research, 22(10)*, 306-323. https://doi.org/10.26803/ijlter.22.10.17.

May, L. S., Rosly, R., & Azmi, A. S. (2024). AI integration in English language oral proficiency: A study of diploma students' readiness in a Malaysian public university. *International Journal of Research and Innovation in Social Science, 8(3s)*, 5112-5121.

Mohammadkarimi, E. (2024). Exploring the use of artificial intelligence in promoting English language pronunciation skills. *LLT Journal: A Journal on Language and Language Teaching, 27(1)*, 98-115. https://doi.org/10.24071/llt.v27i1.8151.

Mohebbi, A. (2025). Enabling learner independence and self-regulation in language education using AI tools: A systematic review. *Cogent Education, 12(1)*, 2433814. https://doi.org/10.1080/2331186x.2024.2433814.

Narayan, D., & Jauhari, D. (2025). Challenges of integrating AI into the education system. *Praxis International Journal of Social Science and Literature, 8(5)*, 40-51. https://doi.org/10.51879/pijssl/080505.

Nawas, A. A., Shim, G. T., Ibrahim, A. D., & Hussain, S. I. (2025). Pre-university students' perception towards the use of online learning in Mathematics subject. . *International Journal on Studies in Education, 7(1)*, 89-102. https://doi.org/10.46328/ijonse.284.

O'Neill, E., & Carson-Berndsen, J. (2023). Investigating the sensitivity of automatic speech recognition systems to phonetic variation in L2 Englishes. *arXiv:2305.07389v1* , 1-10. https://doi.org/10.48550/arXiv.2305.07389.

Oyetade, K., Harmse, A., & Zuva, T. (2024). Evaluating students' willingness to use digital technologies. *International Journal of Education and Practice, 12(3)*, 1027-1039. https://doi.org/10.18488/61.v12i3.3820.

Pan, Z., Xie, Z., Liu, T., & Xia, T. (2024). Exploring the key factors influencing college students' willingness to use AI coding assistant tools: An expanded technology acceptance model. *Systems, 12(5)*, 176. https://doi.org/10.3390/systems12050176.

Ping, L., & Tao, N. (2025). Innovative approaches to English pronunciation instruction in ESL contexts: Integration of multi-sensor detection and advanced algorithmic feedback. *Frontiers in Psychology, 15*, 1484630. https://doi.org/10.3389/fpsyg.2024.1484630.

Pudin, C. S. J., Mohamed, N. Z.N., Din, W. A., & Edward, E. I. (2021). Pronunciation errors among Malaysian undergraduates in English for oral communication course. *International Journal of Education, Psychology and Counselling, 6*(43), 40-48. https://doi.org/10.35631/IJEPC.643004

Sridharan, K., & Sequeira, R. P. (2024). Artificial intelligence and medical education: application in classroom instruction and student assessment using a pharmacology & therapeutics case study. *BMC Medical Education, 24(1)*, 1-13. https://doi.org/10.1186/s12909-024-05365-7.

Tsang, A. (2025). The relationships between EFL learners' anxiety in oral presentations, self-perceived pronunciation, and speaking proficiency. *Language Teaching Research, 29(4)*, 1639-1659.

Wah, J. N. (2025). Artificial intelligence in language learning: A systematic review of personalization and learner engagement. *Forum for Linguistic Studies, 7(9)*, 327-341, https://doi.org/10.30564/fls.v7i9.10336.

Yee, P. C., & Seman, E. A. (2025). Instructional planning for STEM learning in computer science. *Malaysian Journal of Social Sciences and Humanities, 10(4)*, 1-17. https://doi.org/10.47405/mjssh.v10i4.2771.

Yıldız, T. (2023). Measurement of attitude in language learning with AI (MALL: AI). *Participatory Educational Research, 10(4)*, 111-126. https://doi.org/10.17275/per.23.62.10.4.