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EXPLORING THE IMPACT OF ARTIFICIAL INTELLIGENCE (AI) ON THE LISTENING SKILLS OF ENGLISH AS A SECOND LANGUAGE (ESL) LEARNERS

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Abstract
The introduction of Artificial Intelligence has profoundly influenced language education by improving the listening practice of students who learn English as a second language. The research explores how AI-enabled tools affect ESL students' listening skill development with a special focus on speech recognition software and two additional tools that include virtual tutors and TTS systems. The research applied a quasi-experimental setup through which students in the experimental group worked with AI tools during their instruction yet students in the control group practiced standard listening techniques. The experimental group participants outperformed controls by exhibiting enhanced listening comprehension scores that increased by 26.15 points rather than the 8.30-point rise of controls during post-testing. Research data verifies that AI tools generate customized learning environments that combine immediate feedback with interactive sessions which boost listening abilities significantly. The evaluators encountered issues in AI's dependency on algorithms and problems with automatic speech recognition during the analysis. The research findings demonstrate that ESL listening instruction will achieve maximum optimization when AI technology unites with established instructional methods. AI language acquisition research has significant implications for education professionals and government officials and academic researchers who need to utilize balanced advising approaches to maximize the benefits of AI systems. Researchers should investigate over time how AI interventions affect students' listening skills and their progress toward fluency through future studies.

Keywords: Artificial Intelligence (AI), ESL Listening Skills, Language Learning Technology, AI-Assisted Learning, Listening Comprehension

Introduction
The educational revolution brought about by artificial intelligence (AI) affects language learning specifically. AI-powered tools, because of improving technological advancements, provide enhanced language acquisition capabilities that focus on ESL listening skills. According to Li and Yang (2022),. The AI-enabled speech recognition software, alongside chatbots and automated listening comprehension programs, gives students personalized experiences they could not access before traditional classes ended (Zhou & Wang, 2021).

ESL students build all their linguistic skills from basic listening competencies because listening forms the essential foundation needed to progress speaking, reading, and writing abilities. The acquisition of language skills level becomes difficult for listeners due to unfamiliar accents, fast speech rates, and complex vocabulary, according to Goh (2017). The advantages of AI-integrated listening exercises with intelligent tutoring systems surpass traditional teaching by providing student-specific support through real-time feedback (Sun & Xu, 2020).

The practice of listening becomes easier for students because AI applications allow them to guide their own learning at any desired pace. Natural language processing (NLP) along with

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machine learning algorithms apply technological solutions that improve student pronunciation and listening comprehension as well as general listening ability, according to Kim (2023). The listening abilities of ESL learners receive substantial improvement through AI-powered virtual assistants along with language learning platforms such as Duolingo and ELSA Speak, which deliver interactive, engaging content (Huang & Lin, 2022).

Research must conduct additional empirical studies to understand fully how the expanding use of AI systems affects ESL learners who are developing their listening ability. Several research studies demonstrate promising outcomes, but researchers continue to question whether technology dependence, digital inequalities, and AI's inability to duplicate natural conversations are valid concerns (Chen & Liu, 2021). An examination of artificial intelligence's effects on ESL listening abilities through an assessment of its educational strengths and technical boundaries remains the main purpose of this research.

Significance of Study

The fast development of artificial intelligence has revolutionized language education because it helps English as a Second Language students enhance their listening abilities. The research finds vital importance because it investigates how AI-powered speech recognition software with virtual assistants alongside adaptive listening platforms improves ESL learners' understanding and pronunciation alongside their comprehensive listening capabilities.

This research extends AI-assisted language learning literature by demonstrating the effects AI technology creates on ESL student listening performance. Automatic speech recognition (ASR) and text-to-speech (TTS) AI-supported applications deliver personal learning experiences with real-time feedback that advances listening comprehension, according to Li & Wang (2023). The analysis of this research will enable effective AI implementation as an educational tool by ESL curriculum designers and educators.

The research outcomes will demonstrate helpfulness to language educators who can understand how AI systems drive learner engagement and motivational results. Through AI platforms that include chatbots and virtual tutors, students experience real-life dialogues and encounter different accents and speech patterns, which enhance their listening skills, according to Zhao and Morgan (2022). The assessment of these tools by instructors will produce information that they can use to create novel educational approaches that cater to their students' specific needs.

The research addresses a missing part in existing studies that examine the persistent consequences of AI-based listening education for ESL students. The growing interest in AI language learning programs faces strong opposition from research that does not fully understand the impact of continuous AI contact on language listening abilities and cognitive skills acquisition (Jones & Smith, 2021). The research will establish whether artificial intelligence interventions create lasting enhancements in English as a Second Language listening abilities.

The research discoveries offer important insights for educational institutions regarding both language planning and modern technological advancements in education. AI development requires research-guided practices for its integration into language teaching methods. The study produces findings that will enable policymakers to determine suitable implementation of AI tools within ESL learning programs (Brown & Lee, 2020).

Theoratical Framework

The research frameworks its approach using Petersen’s (2020) AI-Assisted Language Learning Model that demonstrates Artificial Intelligence (AI) boosts second language acquisition by utilizing personalization along with multimedia approaches and real-time feedback as well as interactive sessions and data-driven results. AI-based educational platforms employ learner-specific assessment to match them with appropriate challenges

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during their listening exercises. Through the combination of speech recognition and text-to-speech (TTS) technology with audiovisual resources AI tools deliver multiple language examples which help learners develop their listening skills. AI-based applications provide rapid feedback systems which help learners enhance their listening approaches effectively. The use of virtual tutors alongside chatbots produces simulated real-time conversations which help learners develop their active listening abilities. Learner data tracking through AI shows educators and trainees how to enhance their strategy implementation by identifying listening problem areas based on analysis results. The study evaluates AI mechanisms for their ability to improve ESL learner listening proficiency as part of an effective language learning process (Petersen, 2020).

Research Objectives

1. To examine the impact of AI-assisted language learning on the listening comprehension skills of ESL learners.
2. To analyze the effectiveness of AI-driven tools, such as speech recognition and virtual tutors, in enhancing ESL learners' listening abilities.

Research Questions

1. How does AI-assisted language learning impact the listening comprehension skills of ESL learners?
2. What role do AI-driven tools (e.g., speech recognition, virtual tutors, and text-to-speech systems) play in improving ESL learners' listening abilities?

Literature Review

The use of Artificial Intelligence (AI) remains extensively studied for improving language acquisition especially among English as a Second Language (ESL) learners when developing their listening capabilities. Studies have investigated how AI-powered systems including speech recognition systems and adaptive listening platforms along with AI-powered chatbots help improve listening skills through personalized shopping experiences and real-time feedback and interactive moments.

The research has confirmed that AI technology delivers customized listening instruction through content adjustments which correspond to students' language abilities. Li and Wang (2023) documented the effects that AI-based adaptive learning systems generate for ESL learners to develop their listening abilities. Students who utilized AI-adjusted listening platforms which automatically customized exercises according to their performance outcomes outperformed traditional curriculum learners in comprehension development. The research by Huang et al. (2021) established that AI platforms enhanced student motivation along with retention rates through their personalized exercises which tailored to different listening challenges and speech characteristics and speed variations.

Particular attention has been paid to AI-generated immediate feedback because it strongly influences the improvement of listening capabilities. Zhao and Morgan (2022) executed a study testing ESL students' use of AI speech recognition software which evaluated pronunciation and intonation and stressed patterns thus providing instant feedback. Concurrent AI feedback systems allow students to enhance their listening abilities and speech processing ability at a faster rate according to experimental data. Students who used AI-generated feedback tools during their listening tasks performed better when recognizing English accent phonetic differences compared to students who received teacher-led or delayed feedback according to Kim and Park (2020).

Research investigations demonstrate that AI-based interactive platforms deliver improved ESL listening abilities to students. Jones and Smith (2021) studied AI conversational agents to determine their capability in conducting real-time dialogues with humans. The authors demonstrated through their research that students who interacted with AI-powered virtual

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tutors developed improved understanding of genuine vocal patterns together with speech pauses and contextual elements. Additional evidence on this subject comes from Wang and Chen (2022) who established that AI chatbot systems trigger listeners to process information carefully before they respond.

Multiple studies have analyzed the restrictions and problems which emerge when using AI-based listening methods in classroom instruction. Brown and Lee (2020) studied AI speech recognition technology accuracy and established its capability but identified problems with diverse accents and non-standard pronunciation that could result in misinterpretations. Patel and Singh (2023) examined the adverse consequences behind heavy dependence on AI feedback when they reported that students who solely used AI corrections lost vital real-life communication skills involving independent listening strategies.

The research literature demonstrates without exception that Artificial Intelligence serves as an efficient method to strengthen English as a second language listening abilities. AI-driven Natural Language Processing (NLP) and machine learning algorithms are improving their accuracy and adaptation capabilities because of continuous technical advancements according to Petersen (2020) and Chen et al. (2022). Future academic inquiries will optimize AI-based listening programs to handle current impairments while making the tools effective across various linguistic backgrounds.

Research Methodology

Research Design

As part of this study researchers utilized an experimental design to study how Artificial Intelligence technology affects English as a Second Language learners' listening abilities. The researchers used a pre-test and post-test control group design to separate participants into two groups. One group experienced AI-assisted listening training whereas the other group used traditional teaching methods. Researchers examined the performance of AI-based learning solutions compared to traditional instructional methods regarding ESL listening proficiency development.

Population and Sampling

The research target group included secondary school ESL students attending language learning programs. Two groups of learners (experimental and control groups) totaling sixty students were chosen through purposive sampling from an ESL learning institute. The chosen screening process added advanced with intermediate students for the study according to their initial language ability standing.

Study Approach

The study adopted a **quantitative research approach**, utilizing statistical methods to analyze the impact of AI tools on listening skill development. Quantitative analysis was conducted to determine the effectiveness of AI-assisted listening training through comparative performance scores between the pre-test and post-test results.

Experimental Study

Both the experimental and control groups performed listening exercises by using artificial intelligence software and virtual teaching tools. The students in the control group practiced listening comprehension through conventional educational techniques of teacher instruction combined with textbook material. Both groups spent six weeks doing listening practice activities but received equal durations of time.

Test as a Tool for Data Collection

A standardized listening comprehension test served to evaluate learner proficiency before the intervention and again after it. The evaluation measured participants' abilities to recognize phonetics as well as their capacity to segment speech and their understanding of both accents

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and contextual meanings in spoken conversations. AI-assisted learning received objective evaluation through the scores obtained from the standardized tests.

Validity and Reliability of the Test

To ensure the validity of the listening comprehension test, expert validation was conducted by three ESL specialists. The test items were assessed based on content relevance, clarity, and alignment with established listening proficiency frameworks. Additionally, the test was piloted with a small group of ESL learners (N=10) before implementation, and adjustments were made based on their feedback.

The reliability of the test was measured using Cronbach's Alpha, which resulted in a reliability coefficient of 0.87, indicating a high level of internal consistency. The test-retest method was also applied by administering the test to a subset of students twice within a two-week interval, yielding a correlation coefficient of 0.82, confirming its reliability in measuring listening proficiency consistently.

Pre-Test and Post-Test Analysis

Group	Pre-Test Mean Score	Post-Test Mean Score	Mean Difference	p-value (Significance)
Experimental Group (AI-assisted)	52.30	78.45	26.15	$p < 0.05$ (Significant)
Control Group (Traditional)	50.80	59.10	8.30	$p > 0.05$ (Not Significant)

The results indicate that the experimental group, which received AI-assisted listening instruction, demonstrated a significant improvement in listening comprehension, as reflected in the mean score increase of 26.15 points. The p-value (<0.05) confirms statistical significance, meaning that AI-based learning tools had a measurable positive impact on listening skills.

In contrast, the control group, which followed traditional listening instruction, showed only a modest improvement of 8.30 points, with a p-value (>0.05) indicating that the change was not statistically significant.

Findings and Discussion

The findings of this study are discussed in relation to the research objectives (ROs) and research questions (RQs) to evaluate the effectiveness of AI-assisted listening instruction for ESL learners.

Research Objective 1

To examine the impact of AI-assisted language learning on the listening comprehension skills of ESL learners.

Research Question 1

How does AI-assisted language learning impact the listening comprehension skills of ESL learners?

Data from pre-tests and post-tests proves that ESL students experienced meaningful improvements in listening skills through artificial intelligence-based language education. The students in the AI-assisted learning group recorded higher post-test results that amounted to a mean score of 78.45 while their pre-test score stood at 52.30. The respondents in the traditional instruction group improved their scores by a relatively minimal extent with progress from 50.80 in the pre-test to 59.10 in the post-test. Experimental group participants demonstrated an enhancement of 26.15 points after using AI-assisted instruction for listening comprehension. The p value of less than 0.05 proved statistically significant, indicating AI-based instruction successfully outperformed conventional education methods in its effectiveness.

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Research by Li and Wang (2023) along with Kim and Park (2020) established that AI-based learning system provides data-oriented adaptive courses which accelerate language acquisition. The AI-assisted learners received customized content because the system adjusted their listening exercises difficulty settings according to their performance data. Learners extracted maximum value from spoken English materials because of personalized instruction which enhanced their phonetic understanding as well as their speech segmentation abilities and comprehension abilities.

Furthermore, student feedback highlighted that AI-based tools increased motivation and engagement, as they offered an interactive and immersive learning environment. This supports Huang et al. (2021), who found that AI-assisted language learning enhances student motivation, leading to higher retention rates in listening comprehension.

Research Objective 2

To analyze the effectiveness of AI-driven tools, such as speech recognition and virtual tutors, in enhancing ESL learners' listening abilities.

Research Question 2

What role do AI-driven tools (e.g., speech recognition, virtual tutors, and text-to-speech systems) play in improving ESL learners' listening abilities?

The study found that AI-driven tools played a crucial role in enhancing ESL learners' listening abilities by providing real-time feedback, adaptive learning, and interactive engagement. Three key AI tools contributed significantly to listening comprehension improvements:

1. **Speech Recognition Software**
    - AI-driven speech recognition tools helped students identify pronunciation errors, stress patterns, and variations intonation.
    - Studies such as Zhao & Morgan (2022) confirm that real-time speech recognition feedback leads to substantial improvements in listening accuracy.
    - In this study, students reported that speech recognition technology helped them process spoken words more effectively, particularly in distinguishing similar-sounding words and phrases.
2. **Virtual Tutors and Chatbots**
    - AI-powered virtual tutors simulated real-life conversations, improving students' ability to understand different accents and natural speech variations.
    - Research by Jones & Smith (2021) found that virtual tutors expose learners to diverse linguistic inputs, reinforcing their ability to process spoken language in context.
    - The experimental group students reported that interacting with AI chatbots helped them become more confident in understanding spoken English from various speakers.
3. **Text-to-Speech (TTS) Systems**
    - AI-driven text-to-speech tools provided synthetic speech models that allowed learners to adjust speed, pitch, and clarity, enhancing their listening adaptability.
    - Studies by Wang & Chen (2022) indicate that TTS systems significantly improve learners' ability to process spoken input effectively.
    - The findings from this study confirm that students who used AI-based TTS tools were better able to recognize speech variations and contextual meaning in spoken dialogues.

While the findings indicate that AI-driven tools significantly improved listening skills, some challenges were noted. Technical limitations, such as inaccurate speech recognition and

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limited contextual understanding, occasionally led to misinterpretations of spoken input. These challenges are consistent with those reported by Brown & Lee (2020), who found that speech recognition technology struggles with complex linguistic variations. Additionally, some learners became overly dependent on AI-generated feedback, which might limit their ability to develop independent listening strategies, as observed in Patel & Singh (2023).

Conclusion

Research investigated how AI language learning tools benefit ESL students' listening abilities and evaluated their successful implementation with speech recognition and virtual tutor system and text-to-speech technologies. The study results showed AI instruction resulted in superior listening comprehension skills because experimental group participants outperformed controls in their post-test scores. The combination of AI tools delivered customized learning activities and live feedback with interactive approaches lead to better oral language processing and pattern recognition capabilities and accent comprehension among learners.

The implementation of AI-supported learning involved multiple obstacles because of technical constraints alongside incorrect speech detection along with learner dependence on computer-generated analyses. The research demonstrates that educational programs must strike a balance between AI technology and conventional teaching practices to achieve the best student outcomes.

Research findings indicate that AI tools strengthen ESL listening education by delivering independent and flexible language practice opportunities to learners to achieve better results. Ongoing research needs to address how AI systems affect the maintenance of listening competencies along with fluency levels as students use artificial intelligence for long periods.

Recommendations

Following the study results, a set of recommendations exists for both educators and policymakers, as well as researchers who will follow.

For Educators and Language Instructors

1. Educators should combine AI-assisted techniques with conventional educational methods to optimize student development by handling system restrictions together with excessive reliance on artificial intelligence feedback.
2. Real-time speech recognition systems coupled with feedback tools should be implemented in English as a second language classrooms to enable students in improving their pronunciation together with their stress and intonation skills.
3. Learners should connect with AI virtual tutors and chatbots for their exposure to natural language inputs that enhance their understanding when listening as part of their learning process.
4. Students require training to master AI-based tools properly, so they learn independent listening methods beyond AI feedback dependence.
5. Identify learner advancement through AI-produced analytics, then modify educational methods through data-based results.

For Policymakers and Educational Institutions

6. Educational institutions should create curriculum plans that synchronize AI-supported learning systems with teaching advice for ESL students during listening activities.
7. Acquire highly effective AI-based language tools specifically made to equip diverse language skills from multiple accents.
8. AI-learning platforms must be made affordable and accessible to every ESL learner, especially those in disadvantaged learning settings.

For Future Research

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9. Extended time period investigations must evaluate the sustained result of AI-powered listening instruction on language mastery and speaking skills acquisition.
10. A study should evaluate how AI-based education impacts students depending on their English as a second language level, from beginner to intermediate to advanced understanding.
11. Studies should explore how AI systems use their potential to teach various language skills, including speaking, reading, and writing, in order to build complete ESL abilities.
12. The creation of artificial intelligence models should focus on boosting speech recognition contextual understanding because it would decrease failed responses during listening comprehension exercises.

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