A Mixed-Method Study on the Impact of ELSA Speak in Enhancing Oral Communication Skills of Introverted ESL Students

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Abstract

This research investigates how the ELSA Speak application enhances spoken English competencies among introverted ESL learners, with particular emphasis on first-year university students and their public speaking capabilities. Employing a mixed-methods research design, the study examined 93 ESL participants aged 20-22 years to evaluate their receptiveness toward utilizing ELSA Speak for public speaking skill development. Participants underwent random selection and engaged in structured ELSA Speak practice sessions, subsequently being allocated into control groups (comprising extroverted learners) and experimental groups (comprising introverted learners). Data collection utilized pre-assessment and post-assessment evaluations, with statistical analysis conducted through paired-sample t-tests and one-sample t-tests. Results demonstrated statistically significant enhancement in speaking proficiency during post-assessments, particularly evident in digital communication contexts and public speaking scenarios. Post-assessment analysis revealed that ELSA Speak's comprehensive feedback mechanisms enabled participants to recognize and remediate specific performance deficiencies. The research advocates for integrating ELSA Speak functionality with virtual conferencing platforms to strengthen both general and professional communication competencies. Findings underscore ELSA Speak's efficacy as an instrumental resource for advancing language proficiency among introverted ESL students, especially within professional contexts, while encouraging additional investigation into its applicability across various academic fields beyond oral communication skills.

Keywords: oral communication proficiency, ELSA Speak application, ESL student populations, introverted learner characteristics, mixed-method research design

1. Introduction

Contemporary global dynamics, characterized by heightened international collaboration and advancing globalization processes, position English language proficiency as fundamental for individuals pursuing professional opportunities. Educational institutions, while emphasizing knowledge acquisition, simultaneously pursue practical objectives centered on preparing students for career readiness and professional achievement. This investigation centers on the Indonesian educational context, where English maintains its status as a compulsory curricular component across all educational levels. Nevertheless, implementation effectiveness varies considerably due to resource constraints and insufficient qualified instructional personnel. Notwithstanding these implementation challenges, English retains its designation as the predominant foreign language targeted for learner acquisition. English language instruction necessitates that students cultivate competencies across speaking, listening, reading, and writing domains (Kuning, 2020). Within these competency areas, oral production capability holds paramount significance as it furnishes the most transparent indication of linguistic fluency. Given that effective communication fundamentally depends upon mutual comprehension, accurate phonetic production assumes critical importance (Muamar et al., 2022).

Interpersonal communication constitutes an essential element of routine social exchanges, with language serving as the fundamental mechanism enabling these interactions. Language facilitates connections among individuals operating at personal, collective, and international levels. English language pedagogy aims to develop productive competencies encompassing speaking and writing, alongside receptive competencies comprising listening and reading. Robust language command enables individuals to articulate cognitive processes with precision while simultaneously enhancing comprehension of others' communications (Hakim et al., 2022; Banegas et al., 2023). Contemporary society undergoes rapid transformation, particularly within educational technology domains. These technological advancements exert substantial influence across multiple sectors, notably within educational systems that occupy pivotal positions in learning facilitation. Technology integration within educational contexts provides students access to expanded knowledge repositories and enhanced learning experiences (Nurdyansyah et al., 2017).

Contemporary educational expectations require students to achieve English proficiency while concurrently developing technological competencies essential for modern professional environments. Technology's significance has intensified to such extent that organizational success becomes unattainable without its integration. Following parallel reasoning, educational institutions failing to incorporate

technological resources into pedagogical practices inadequately prepare students for contemporary and future demands. Technology's transformative impact on education remains indisputable (Ghory & Ghafory, 2021). However, educators and policy architects continue confronting persistent challenges in motivating students to recognize the critical importance of both English proficiency and technological capabilities within their personal and professional trajectories. Artificial Intelligence (AI) emerges as a formidable instrument for enhancing oral communication through sustained practice opportunities essential for language acquisition. Research evidence indicates that AI generates efficacious learning environments potentially surpassing traditional methodological approaches. AI applications within educational contexts possess considerable historical depth, with exploratory investigations dating to the 1960s. Initial research concentrated on developing intelligent tutoring systems engineered to deliver individualized instruction through adaptive learning content responsive to individual student requirements and developmental progress (Annamalai et al., 2023; Hakim & Putra, 2021; Zou et al., 2023).

Implementation of ELSA Speak as an instructional instrument for oral communication skill development demonstrates favourable influences on learner performance outcomes (Nguyen, 2021). Through its AI-powered functionalities, students engage in pronunciation practice without temporal restrictions, including home-based practice environments, eliminating performance pressure associated with instructor or peer presence. The application delivers customized feedback addressing pronunciation accuracy, intonation patterns, fluency measures, lexical stress, auditory comprehension, and vocabulary expansion, thereby strengthening English speaking capabilities. Additionally, it incorporates contextual practice scenarios, interactive task engagement, and motivating learning environments that enhance student engagement. For instructional personnel, ELSA proves beneficial in identifying learners experiencing pronunciation difficulties, facilitating collaboration with native speakers and enabling more targeted instructional intervention design.

ELSA represents an AI-powered language learning application engineered to assist non-native English speakers in refining pronunciation through concise, interactive exercise sequences. Utilizing voice recognition technology integrated with artificial intelligence algorithms, the application assists learners in achieving more accurate English word articulation (Pilar et al., 2013). Following system guidance protocols, users progressively refine their spoken language production. The platform provides thematically organized lessons enabling practice with lexical clusters, phrasal structures, and complete sentences (Tamala & Santosa, 2023), supplemented by an interactive lexicon modeling accurate pronunciation patterns (Darsih et al., 2021). According to Gilchrist (2020), ELSA's development by Vu Van aimed to create technological solutions capable of detecting pronunciation inaccuracies and providing accessible, comprehensible corrections, thereby offering cost-effective alternatives to private tutoring services. Achieving 95% accuracy in identifying pronunciation errors, ELSA establishes itself as a reliable pronunciation training instrument. While numerous language-learning applications exist commercially, few provide complimentary access (Arbain et al., 2023), positioning ELSA as a practical option for research and classroom implementation.

Pinotoan et al. (2022) executed qualitative investigations examining ELSA Speak's instructional effectiveness. Research findings demonstrated substantial pronunciation score improvements, with mean scores advancing from 4.6 during pre-assessments to 7.9 during post-assessments. These outcomes verify that appropriately selected digital learning instruments can significantly enhance students' learning achievements, with ELSA Speak demonstrating exceptional effectiveness in advancing pronunciation proficiency.

2. Literature Review

Artificial intelligence continues gaining recognition as an invaluable educational resource for language instruction, attributed to its capacity for delivering interactive task frameworks, instantaneous feedback mechanisms, and instructional content calibrated to individual learner proficiency levels. According to Zhai and Wibowo (2023), AI-integrated applications employ machine learning algorithms to engineer customized content and activities, thereby enhancing overall language learning effectiveness. Furthermore, AI facilitates authentic communication by connecting learners with native English speakers or language exchange partners, enabling engagement in genuine real-world interactions. Through AI-powered chatbot systems and virtual tutoring platforms, students participate in conversational practice simulating authentic communication scenarios. As documented by Rejeb et al. (2024), interaction with these AI-powered instruments enables learners to advance their speaking proficiency while simultaneously building confidence in English language utilization within practical contexts.

Among AI-powered applications, the English Language Speech Assistant (ELSA) Speak has undergone extensive research investigation for pronunciation enhancement purposes. For instance, Kholis (2021), conducting research at Nahdlatul Ulama, University of Yogyakarta (UNU), utilized interview protocols and pronunciation assessments to examine application impact, discovering that ELSA Speak substantially enhances pronunciation capabilities while promoting active learner participation. Similarly, Akhmad and Munawir (2022) documented consistent findings, attributing improvements to the application's utilization of sophisticated algorithms and AI technology for delivering individualized feedback, thereby enabling more effective pronunciation refinement. Additionally, Anggraini (2022) explicates that ELSA Speak integrates speech recognition technology, provides instruction ranging from individual lexical items to complete sentences, and incorporates an interactive dictionary feature for accurate pronunciation guidance.

Further substantiating these research findings, Huda and Rahmawati (2024) contend that ELSA Speak cultivates fluency through error correction and accurate pronunciation modeling, consequently developing learners' communicative competence. Its flexibility, permitting unrestricted temporal and spatial access, renders it particularly appropriate for self-directed learning environments. This aligns with Syakur et al.'s (2020) observation that online learning instruments, when integrated with AI-based applications such as ELSA Speak, can

substantially improve speaking proficiencies. Moreover, Samad and Aminullah (2019) emphasize that ELSA Speak provides focused training in vowel production, consonant articulation, and lexical stress patterns, establishing it as a comprehensive resource for pronunciation mastery.

To optimize learning outcomes, researchers have investigated combining ELSA Speak with interactive pedagogical strategies including role-play activities. Indrian and Sakina (2022) determined that role-play activities not only provide students enhanced speaking opportunities but also strengthen confidence, concentration, vocabulary acquisition, and peer interaction dynamics. Consistent with this perspective, Putra and Fitriani (2023) propose that integrating AI pronunciation tools into communicative activities provides both structured feedback and authentic language application, thereby bridging the gap between practice environments and real-world communication contexts.

Beyond pronunciation-oriented tools, AI-based adaptive learning systems have materialized as effective mechanisms for personalizing instruction. These systems analyze learner performance data and adjust instructional content correspondingly, ensuring students receive targeted support. As Sosas (2021) notes, AI-based adaptive learning systems generate personalized learning trajectories and adjust materials according to learners' proficiency levels, rendering their learning experiences more effective. Similarly, Rokhayati and Widiyanti (2022) and Shakespeare and Anonymous (2017) emphasize that AI enables more flexible, interactive, and individualized learning environments, allowing educators to address diverse student requirements. Expanding upon this foundation, Lee and Park (2023) demonstrate that AI-enhanced language platforms increase learner motivation and diminish anxiety by tailoring challenges to each user's developmental progress, while Martinez (2022) observes that speech recognition combined with gamification elements sustains learner engagement across extended timeframes.

Collectively, the scholarly literature demonstrates that AI applications, particularly ELSA Speak, not only enhance pronunciation and speaking capabilities but also provide adaptive, learner-centered environments. Through combining AI-powered tools with communicative techniques such as role-play, educators can engineer language-learning experiences characterized by engagement, adaptability, and exceptional effectiveness.

3. Research Objectives

This investigation endeavours to assess ELSA application significance in enhancing public speaking competencies. The subsequent research objectives guide this study:

1. To ascertain ELSA's role in cultivating public speaking competencies among introverted learners within ESL contexts.
2. To investigate how introverted and extroverted learners experience enhancement of public speaking skills through ELSA application.

4. Research Questions

The following research inquiries have been formulated to direct this investigation:

1. What role does ELSA fulfill in cultivating public speaking competencies among introverted ESL student populations?
2. Through what mechanisms do introvert and extrovert learners enhance their public speaking proficiency via ELSA?

5. Theory

Social Cognitive Theory

Apprehension regarding public speaking constitutes one of the most prevalent challenges confronting language learners. Research by Dwyer and Davidson (2012) identified it among the most common fears experienced by college students across the United States. This phenomenon appears throughout literature under various terminological designations, including communication apprehension, public speaking anxiety (Bodie, 2010), and glosso-phobia (Hancock et al., 2010). Despite terminological variations, these concepts consistently reference situations wherein learners experience nervousness, worry, or fear when engaging in public speaking contexts.

Causative factors underlying public speaking anxiety have received extensive scholarly examination. For example, Aida (1994) observed that such anxiety may emerge from fear of instructor judgment, apprehension regarding feedback reception, or previous unsuccessful experiences. Correspondingly, Toubot, Seng, and Abdullah (2017) identified six additional factors potentially intensifying this anxiety: hereditary predispositions, learned behavioural responses, limited speaking skill development opportunities, absence of encouraging role models, embarrassment sensations, and various external circumstances.

Beyond examining causative factors, scholars have additionally classified distinct public speaking anxiety typologies. For instance, Wang et al. (2020) differentiated between trait anxiety, representing stable personality characteristics, and state anxiety, manifesting in specific speaking contexts. Individuals experiencing elevated public speaking anxiety frequently exhibit physical manifestations including perspiration, accelerated cardiac rhythm, or tremulous vocal quality. Furthermore, LeFebvre et al. (2018) categorized public speaking anxiety into internal and external apprehensions. Internal apprehensions originate from speakers' cognitive and affective processes regarding their performance, whereas external apprehensions connect to the experience of occupying audience attention focal points during address delivery.

To more effectively address communication-related challenges, Nakatani (2006) developed the Oral Communication Strategy Inventory

(OCSI), a systematic instrument designed to more precisely assess how learners manage spoken interactions. The OCSI categorizes these strategies into eight principal classifications: social-affective strategies, fluency-based strategies, meaning negotiation strategies, accuracy-based strategies, message reduction and modification approaches, non-verbal approaches, message abandonment techniques, and strategies involving direct English thinking processes. Since its development, the inventory has experienced widespread employment in investigations examining learners' strategic behaviors (e.g., Rastegar & Gohari, 2016; Yaman & Irgin, 2013; Zhou & Huang, 2018), demonstrating robust relevance and versatility across diverse research contexts.

Alternatively, some scholars have employed different classification frameworks for communication strategies. For example, Putri (2013) applied Dörnyei's (1995) model, organizing communication strategies into two principal categories: avoidance strategies and achievement strategies. Avoidance strategies encompass actions including message abandonment or particular topic circumvention. Conversely, achievement strategies enable speakers to maintain communication through techniques including direct translation, cross-linguistic borrowing, word foreignization, approximation usage, term coinage, circumlocution employment, general word utilization, self-repair engagement, assistance appeals, and filler or pause incorporation as time-gaining strategies.

6. Method

Research Design

This investigation aimed to evaluate the instructional speaking software ELSA's impact on public speaking proficiency among ESL engineering students, with particular focus on comparing introverted and extroverted learners. To achieve this objective, researchers employed a quasi-experimental design incorporating both pretests and post-tests across two participant groups. Furthermore, a mixed-methods approach was adopted, integrating quantitative assessments through pretests and post-tests to measure speaking ability changes, alongside qualitative observations to capture learners' experiences. This design enabled researchers to systematically examine the progress of both introverts and extroverts before, during, and after the intervention, thereby providing comprehensive understanding of ELSA's effectiveness in enhancing public speaking skills.

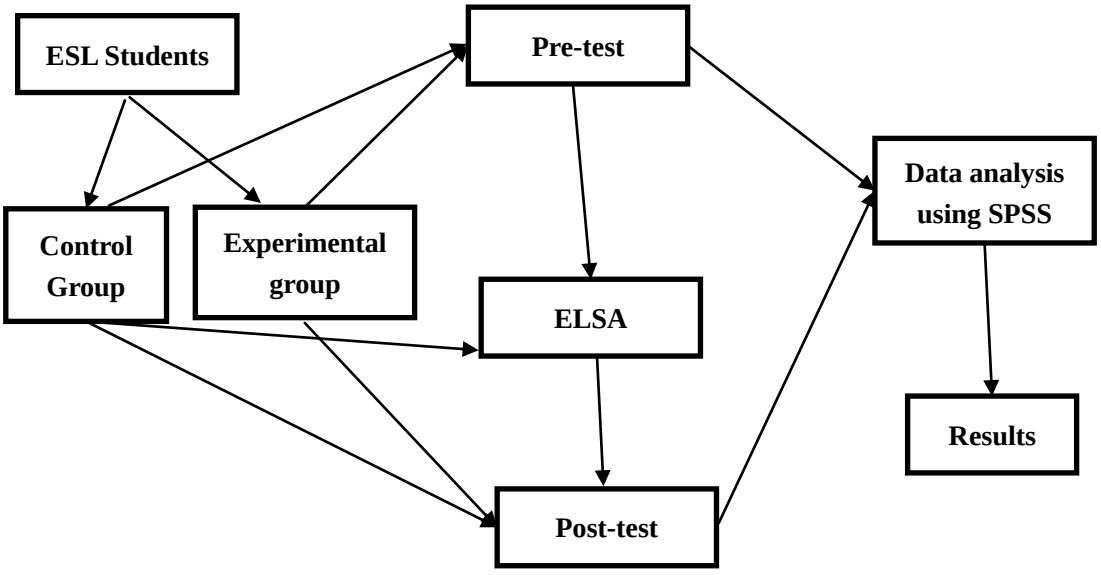

Figure 1. Research Design using Schematic Diagram

Sample and Sample size

The investigation involved a total of 93 engineering students, aged between 20 and 22 years, who underwent random selection through a comprehensive sampling method. These participants enrolled in a public speaking course specifically designed to enhance their oral communication abilities. As part of the intervention, they received instructions to utilize ELSA, an English language learning application, both during the training phase and in the post-test stage. Through this integration, researchers aimed to provide learners with structured practice opportunities and personalized feedback, thereby fostering improvements in their public speaking skills. Moreover, this approach enabled systematic collection of performance data, which in turn facilitated rigorous assessment of ELSA's effectiveness in developing public speaking proficiency among engineering students.

Data collecting techniques

Data for the study were collected through multiple methods, namely assessments, semi-structured interviews, and a teacher's log. The assessment component consisted of a pre-test and a post-test, both designed to evaluate students' public speaking skills in the areas of grammar, vocabulary, fluency, comprehension, and pronunciation. In the pre-test phase, students engaged in guided discussions on a predetermined topic, thereby allowing researchers to establish a baseline for their speaking proficiency. In contrast, the post-test

comprised two parts in which participants delivered speeches on specific topics, enabling direct comparison with their initial performance. Furthermore, to gain deeper insights into learner perceptions, twelve students participated in semi-structured interviews, during which they shared their opinions on the use of educational technology tools for speaking practice. In addition, a teacher's log was maintained throughout the study to document classroom observations and instructional notes, thereby supplementing the quantitative data with qualitative perspectives.

Data analysing method

The collected data underwent analysis through a combination of quantitative and qualitative methods. For the quantitative analysis, test results were processed using statistical tools, specifically a one-sample t-test and a paired-samples t-test, conducted with SPSS software (version 26). These statistical procedures were employed to determine whether significant improvements occurred in public speaking skills, including vocabulary, grammar, comprehension, fluency, and pronunciation among both introverted and extroverted students. Moreover, the analysis involved a comparison between students who engaged with traditional learning materials and those who used the ELSA speaking application, both before and after the intervention. This comparison provided clearer understanding of the application's effectiveness in enhancing speaking proficiency. In addition to the quantitative evaluation, qualitative methods were applied to analyze students' responses from the semi-structured interviews, thereby offering deeper insights into their perceptions of using ELSA to develop public speaking skills.

Reliability and Validity

To ensure accurate and consistent measurement of students' public speaking skills, the assessment instrument used in this study underwent rigorous reliability and validity checks. Reliability was established through a Cronbach's alpha test, which yielded a coefficient of 0.89, indicating high internal consistency (Creswell & Creswell, 2018). This value suggests that the items used to evaluate pronunciation, fluency, grammar, vocabulary, and comprehension were closely related and measured the same construct effectively. Additionally, an inter-rated reliability check was conducted by having two independent evaluators score a sample of the pre-test and post-test recordings. The Cohen's kappa value of 0.87 reflected a strong level of agreement between rates (McHugh, 2012), further confirming scoring consistency. In terms of validity, content validity was ensured by aligning the assessment criteria with established public speaking evaluation frameworks used in ESL contexts (O'Hair et al., 2020). Three experts in applied linguistics and English language pedagogy reviewed the instrument, confirming that it covered all key dimensions of oral communication, including pronunciation, fluency, grammar, vocabulary, and comprehension. By ensuring high reliability and strong validity, this study minimized measurement error and enhanced the credibility of its findings.

7. Result

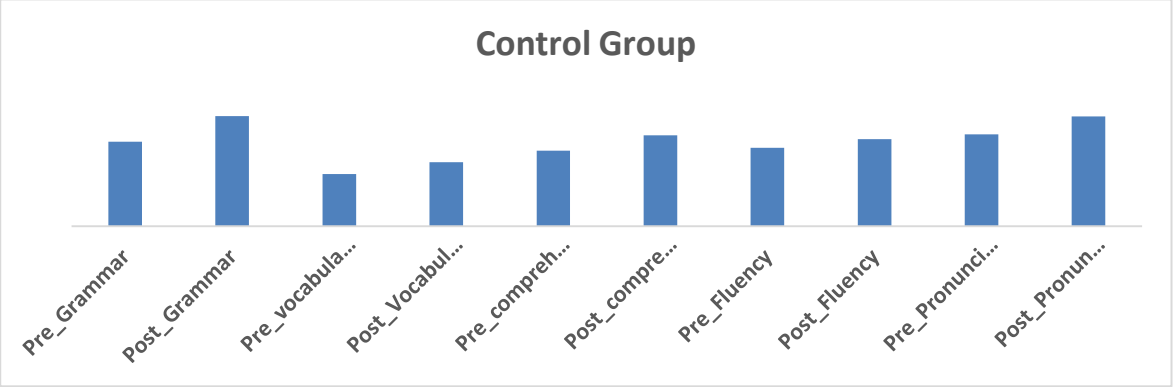

Figure 2. Control group pre-test and post-test results

Figure 2 shows the pre-test and post-test results of the control group in different areas of spoken English, including grammar, vocabulary, comprehension, fluency, and pronunciation. These students learned through traditional classroom methods and still made some progress in their speaking skills over time. At first, their grammar skills were average, but they improved a lot in the post-test, probably due to regular lessons and practice. Vocabulary had the lowest scores in the pre-test, and even though there was some improvement, it was not as much as in other areas, showing that learning new words was slower without extra focus.

Comprehension skills started at a moderate level in the pre-test, and students improved in the post-test, meaning they got better at understanding spoken English through listening activities and classroom discussions. Fluency was slightly better than vocabulary in the pre-test, but it improved slowly, suggesting that regular classroom methods alone were not very effective in making students confident speakers. Pronunciation had higher scores in the pre-test and got better in the post-test, but the improvement was slow because there was no special focus on pronunciation practice. The control group improved in all areas, but their progress was limited because they didn't get enough speaking practice, personal feedback, or corrections in real time. Traditional learning methods like teacher-led lessons and group discussions helped, but students could have improved faster if they had more chances to practice speaking, get personal guidance, and

focus more on pronunciation exercises.

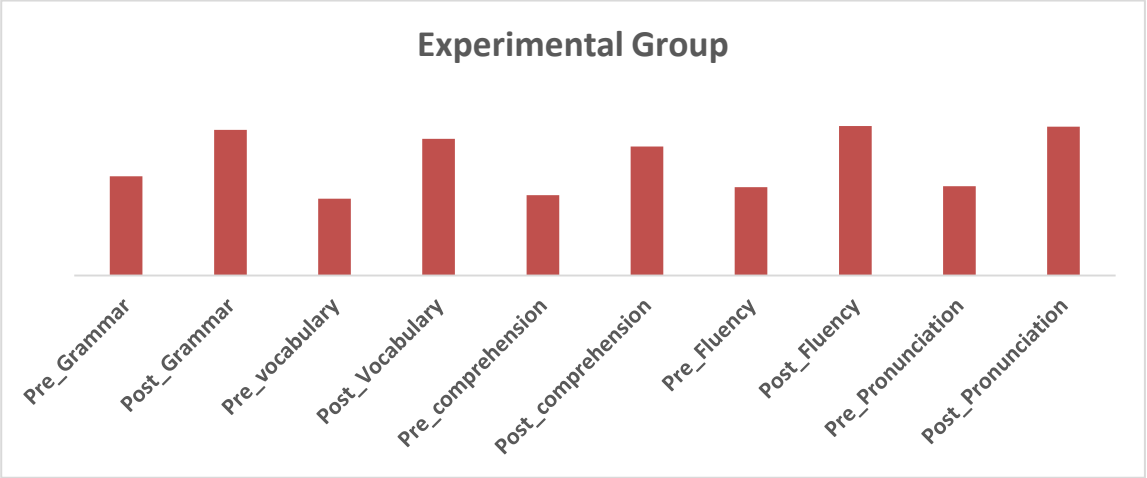

Figure 3. Experimental group pre-test and post-test results

The figure 3, shows the pre-test and post-test results of the experimental group, which used the ELSA tool to improve their public speaking skills. This group consisted of introverted engineering students, who often struggle with fluency, pronunciation, and confidence in spoken English. The pre-test scores indicate that their grammar, vocabulary, comprehension, fluency, and pronunciation were at a moderate or low level before using the AI tool. However, after practicing with ELSA, their post-test scores improved significantly in all areas. Grammar and vocabulary showed noticeable growth, indicating that the tool helped students build better sentence structures and expand their word usage. Comprehension and fluency also improved greatly, suggesting that regular speaking practice with AI feedback boosted their ability to understand and express ideas clearly. Pronunciation, which was initially one of the weaker areas, showed the most remarkable progress, proving that ELSA's real-time feedback on pronunciation and speech clarity helped introverted students speak more confidently. Overall, the ELSA tool played a key role in helping these students overcome their hesitation and develop better public speaking skills.

Table 1. One Sample Test on Control group post-test

One-Sample Test			
	Test Value = 0		
	t	**df**	**Sig. (2-tailed)**
Post_Grammar	46.734	92	0.000
Post_Vocabulary	31.345	92	0.000
Post_comprehension	52.282	92	0.000
Post_Fluency	39.538	92	0.000
Post_Pronunciation	49.689	92	0.000

The table shows the one-sample t-test results for the control group's post-test scores in different areas of spoken English: Grammar, Vocabulary, Comprehension, Fluency, and Pronunciation. The high t-values mean that students improved in all these areas, and the p-values (0.000) confirm that the results are statistically significant. The degree of freedom (df) is 92, which means that 93 students took part in the study. Even though these students learned through traditional methods without AI-based tools, they still made good progress in their speaking skills. The highest improvement was seen in comprehension and pronunciation, while vocabulary had the lowest t-value, suggesting that students found it harder to learn new words using traditional methods. Overall, the results show that classroom teaching and practice helped students improve their spoken English, though their progress may have been slower compared to students using structured AI-based learning.

Table 2. One Sample test for experimental group Post-test

One-Sample Test				
	Test Value = 0			
	t	**df**	**Sig. (2-tailed)**	**Mean Difference**
Post_Grammar	51.151	92	0.000	7.118
Post_Vocabulary	51.413	92	0.000	6.677
Post_comprehension	36.894	92	0.000	6.301
Post_Fluency	46.676	92	0.000	7.312
Post_Pronunciation	40.046	92	0.000	7.280

The table shows the one-sample t-test results for the experimental group's post-test scores in different areas of spoken English: Grammar, Vocabulary, Comprehension, Fluency, and Pronunciation. The high t-values mean that students improved a lot in all these areas, and the

p-values (0.000) confirm that the results are statistically significant. The degree of freedom (df) is 92, which means 93 students took part in the study.

The Mean Difference values show how much each skill improved. Fluency (7.312) and Pronunciation (7.280) improved the most, meaning students gained confidence in speaking and pronouncing words correctly. Grammar (7.118) and Vocabulary (6.677) also got better, showing that students learned more about sentence structure and new words. Comprehension (6.301) had the lowest improvement, meaning students' ability to understand spoken English improved, but not as much as other skills. The results show that the experimental group made great progress in spoken English, most likely because they had a structured and interactive way of learning that helped them practice speaking more effectively.

Table 3. Paired samples Test for Control Group

Paired Samples Test							
		Paired Differences					
		Mean	**Std. Deviation**	**Std. Error Mean**	**t**	**df**	**Sig. (2-tailed)**
Pair 1	Pre_Grammar – Post_Grammar	-2.043	1.160	0.120	-16.982	92	0.000
Pair 2	Pre_vocabulary – Post_Vocabulary	-1.699	0.622	0.064	-26.349	92	0.000
Pair 3	Pre_comprehension – Post_comprehension	-1.720	0.757	0.079	-21.915	92	0.000
Pair 4	Pre_Fluency – Post_Fluency	-2.075	0.647	0.067	-30.948	92	0.000
Pair 5	Pre_Pronunciation – Post_Pronunciation	-1.398	0.645	0.067	-20.898	92	0.000

The table presents the paired-samples *t*-test results for the control group's pre-test and post-test scores across five areas of spoken English: grammar, vocabulary, comprehension, fluency, and pronunciation. The negative mean values indicate that students performed substantially better in the post-test than in the pre-test, reflecting noticeable progress in their speaking skills. Furthermore, the *p*-values (0.000) for all pairs confirm that these improvements are statistically significant. The degree of freedom ($df = 92$) shows that 93 students participated in the analysis.

Among the assessed skills, fluency (−2.075) and grammar (−2.043) recorded the highest levels of improvement, suggesting that students became more confident in speaking smoothly while also using more accurate sentence structures. Vocabulary (−1.699) and comprehension (−1.720) also demonstrated significant gains, indicating that students expanded their word knowledge and enhanced their ability to understand spoken English. Although pronunciation (−1.398) exhibited the smallest improvement, students still achieved measurable progress in speaking more accurately. Overall, the results reveal that the control group improved in all evaluated areas of spoken English. This progress can be attributed to the structured practice and interactive learning activities provided during the course, which facilitated more effective skill development compared to their initial performance.

Table 4. Paired Samples test for Experimental Group

Paired Samples Test							
		Paired Differences					
		Mean	**Std. Deviation**	**Std. Error Mean**	**t**	**df**	**Sig. (2-tailed)**
Pair 1	Pre_Grammar – Post_Grammar	-2.269	1.217	0.126	-17.977	92	0.000
Pair 2	Pre_vocabulary – Post_Vocabulary	-2.925	1.329	0.138	-21.224	92	0.000
Pair 3	Pre_comprehension – Post_comprehension	-2.376	1.961	0.203	-11.686	92	0.000
Pair 4	Pre_Fluency – Post_Fluency	-2.989	0.903	0.094	-31.930	92	0.000
Pair 5	Pre_Pronunciation – Post_Pronunciation	-2.914	1.213	0.126	-23.171	92	0.000

The table presents the paired-samples t-test results for the experimental group's pre-test and post-test scores in grammar, vocabulary, comprehension, fluency, and pronunciation. The negative mean values indicate that students performed considerably better in the post-test compared to the pre-test, thereby demonstrating substantial progress in their speaking skills. Furthermore, the p-values (0.000) for all skill areas confirm that these improvements are statistically significant, indicating that the results are unlikely to have occurred by chance. The degree of freedom (df = 92) confirms that 93 students participated in this phase of the study.

Among the assessed skills, fluency (−2.989) and pronunciation (−2.914) demonstrated the highest improvement, suggesting that students became significantly more confident and accurate in their speech delivery. Vocabulary (−2.925) also exhibited strong gains, indicating an increased ability to learn and apply new words effectively. Likewise, grammar (−2.269) and comprehension (−2.376) improved markedly, reflecting better control over sentence structure and enhanced understanding of spoken English. Overall, the results reveal that the experimental group achieved notable progress across all measured areas of spoken English. This improvement can be attributed to the structured learning approach, which likely incorporated interactive activities and real-time feedback, thereby fostering stronger communication skills.

For data management and analysis, pre-test and post-test scores for both experimental and control groups were systematically entered into SPSS. Variables were clearly labeled (e.g., Group, PreTestScore, PostTestScore) and assigned appropriate data types to ensure accuracy. Descriptive statistics, including means, standard deviations, and score distributions, were calculated to summarize performance patterns. A paired-samples t-test was conducted to compare pre-test and post-test scores within each group, thereby assessing improvement over

time. In addition, a one-sample t-test was applied to compare the mean post-test scores against a benchmark value. Significance testing involved reviewing p-values and confidence intervals to confirm statistical relevance. Finally, the results were interpreted in alignment with the research question, with particular emphasis on observed changes in oral proficiency and public speaking skills.

8. Discussion

At the initial phase of the research, researchers carried out a pre-test to determine the public speaking performance of ESL engineering learners. The purpose of this test was to understand how well the students could speak in English before receiving any training. During the pre-test, students were asked to speak in English, allowing researchers to observe and evaluate their real-time communication skills. This included looking at their pronunciation, fluency, grammar, vocabulary, comprehension and overall confidence while public speaking. After completing the pre-test, the students were divided into two groups: the control group and the experimental group.

The findings of this study indicate that the usage of the ELSA Speak significantly improved the public speaking skills of experimental group ESL engineering students. Specifically, the post-test results revealed substantial gains in pronunciation, fluency, grammar, vocabulary, and comprehension compared to pre-test performance. These improvements are consistent with previous research emphasizing the effectiveness of technology-enhanced language learning tools in developing oral communication skills. For example, Bai and Wang (2023) observed that AI-assisted pronunciation training provided learners with targeted feedback, resulting in more accurate speech production. Similarly, Yudhiantara and Saehu (2017) reported that mobile-assisted language learning (MALL) applications foster learner autonomy and confidence by offering flexible, self-paced practice opportunities.

In the present study, the greatest gains were recorded in fluency and pronunciation, suggesting that the structured, repetitive, and interactive nature of the ELSA app effectively addressed common challenges faced by ESL learners, such as overuse of filler words, unclear articulation, and lack of rhythm in speech. This aligns with the work of Fouz-González (2017), who demonstrated that mobile applications incorporating speech recognition technology can improve learners' awareness of segmental and supra-segmental features of speech. Moreover, the app's immediate corrective feedback appears to have contributed to increased accuracy in grammar and vocabulary use, echoing the findings of Godwin-Jones (2018), who highlighted that adaptive feedback mechanisms help learners identify and correct errors in real time.

An important dimension of this research was the differential impact of the intervention on students with varying levels of prior speaking practice. While control group students, who engaged in more frequent social interactions, displayed relatively higher baseline scores, the experimental group demonstrated the most pronounced improvement. This reinforces the findings of Burston (2015), who noted that technology-mediated language learning interventions tend to yield greater benefits for learners with limited real-world speaking opportunities, as they compensate for reduced face-to-face interaction.

Overall, the results support the notion that AI-assisted speaking tools like ELSA are effective not only in improving discrete language skills but also in fostering overall communicative competence. These findings have significant implications for both educators and curriculum designers, suggesting that technology integration can bridge performance gaps between students with varying social interaction patterns. As the demand for proficient communicators in technology-driven workplaces continues to grow, such tools are likely to play a central role in preparing learners for future academic and professional success.

9. Conclusion

This study examines how effective the ELSA application, an AI-powered tool, is in improving the public speaking skills of introverted ESL (English as a Second Language) engineering students. The results show that, at the beginning, extroverted students performed better than their introverted classmates in areas such as pronunciation, fluency, and grammar. This is mainly because extroverts engage in more social interactions and have more opportunities to practice speaking.

After using the ELSA application, both groups of students showed improvement. Interestingly, introverted students made much greater progress, as shown by their scores before and after the training. One reason for this improvement is that ELSA provided them with a safe and comfortable learning space where they could practice speaking without feeling pressure or anxiety. Since introverts usually have fewer chances to speak in public, this supportive environment helped them gain confidence and improve their skills.

The ELSA tool helped students in several key areas, including pronunciation, grammar, fluency, comprehension, and vocabulary. By working on these skills, the students were able to overcome many of the challenges that often make communication difficult for them. For extroverted students, who already had stronger speaking abilities, ELSA served as an extra learning tool. It helped them polish their skills even further by offering specialized exercises and real-life speaking simulations.

The training program also included courses specifically designed to improve public speaking. These courses allowed students to apply what they learned and further develop their speaking confidence. ELSA proved to be a valuable tool for ESL students, especially for introverts, because it provided structured lessons and personalized practice based on their individual needs.

Another important benefit of the ELSA application was that it helped introverts and extroverts communicate better with each other. This highlights how technology can make learning more inclusive, accessible, and effective for all students. Future research could explore additional courses within the ELSA app to help an even wider range of students, making language learning more effective for different types of learners.

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Mr. Abhisek David John, was responsible for the study design, the collection of data and drafting the manuscript and Dr. S. Soundiraraj proof read the manuscript and revised it. All authors read and approved the final manuscript.

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