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Unlocking English Proficiency: Transforming the English learning curriculum for Colombian middle schoolers with IPT powered by ELSA's AI-Assisted App & ASR[1]

Desbloqueando la proficiencia en inglés: cómo la aplicación asistida por inteligencia artificial Elsa, basada en ASR e IPT, beneficia la competencia en inglés de los estudiantes de educación secundaria en Colombia

Desbloqueando a competência em inglês: transformando o currículo de aprendizagem de inglês para alunos colombianos do ensino médio com IPT alimentado pelo aplicativo assistido por IA da ELSA e ASR

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Abstract

This action research project in Colombia aims to evaluate the effectiveness of Elsa Speak, an AI app integrated with Intentional Phonetic Training (IPT), in enhancing English language proficiency among middle school students. The increasingly interconnected global economies have highlighted the critical importance of English proficiency as a communication and professional requirement in the 21st century. However, in Colombia, English as a Foreign Language (EFL) learning remains predominantly traditional, focusing on grammar rules rather than parallelly developing the phonetic skills necessary for comprehensible and accurate linguistic communication. The study demonstrates a significant improvement in students' English proficiency when utilizing the combination of Automatic Speech Recognition (ASR) technology and IPT, particularly in terms of intonation, fluency, and pronunciation. These advancements indirectly contribute to the overall enhancement of English skills encompassing listening, writing, and reading. The research employed mixed methods, including a language proficiency test (IELTS Speaking Score through the Elsa Speak App), to assess students' learning progress. Data synthesis was conducted using information collected from 55 middle school students. Specifically, the combined use of AI and IPT demonstrated improvements in pronunciation, sound discrimination, and recognition of stressed syllables, thereby enhancing students' English competence. In addition to fostering effective communication skills and promoting

1 This article is derived from the research of teaching phonetics with intentional phonetic training assisted with artificial intelligence that is presented at the El Bosque Unit of the bachelor's degree in bilingualism with an emphasis in English in the Faculty of Education of the University.

self-aware language usage, the forthcoming findings will contribute to the growing body of research on the integration of phonetics education into the Colombian language curriculum. Moreover, using AI as a learning tool can potentially strengthen language competency and teaching strategies.

Keywords: ASR; incidental phonetic training; artificial intelligence; phonetic training; phonetic awareness.

Resumen

Este proyecto de investigación realizado en Colombia evalúa la efectividad de la aplicación de inteligencia artificial Elsa Speak, integrada con Entrenamiento Fonético Intencional (IPT), para mejorar la competencia en inglés en estudiantes secundaria. En el contexto actual de creciente globalización, dominar el inglés es fundamental, sin embargo, el aprendizaje del inglés como lengua extranjera en Colombia sigue siendo tradicional, enfocándose en reglas gramaticales en lugar de desarrollar en conjunto las habilidades fonéticas necesarias para una comunicación lingüística comprensible y precisa. El estudio demuestra una mejora significativa en pronunciación, entonación y fluidez al combinar la tecnología de reconocimiento automático del habla (ASR) con IPT. Estos avances contribuyen indirectamente al mejoramiento general de las habilidades en inglés, incluyendo escucha, escritura y lectura. La investigación utilizó un enfoque mixto con la puntuación de IELTS a través de Elsa Speak,evaluando a 55 estudiantes. Específicamente, el uso combinado de IA e IPT demostró mejoras en la pronunciación, discriminación de sonidos y reconocimiento de sílabas acentuadas, lo que beneficia así la competencia en inglés de los estudiantes. Además, fomenta una comunicación más eficaz y el uso consciente del idioma, contribuyendo a la integración de la educación fonética en el currículo colombiano. La IA se perfila como una herramienta poderosa para potenciar tanto el aprendizaje de inglés como las estrategias de enseñanza en el país.

Palabras clave: ASR (Reconocimiento Automático del Habla); IPT (Entrenamiento Fonético Intencional; inteligencia artificial; formación fonética; conciencia fonética.

Resumo

Este projeto de investigação-ação na Colômbia tem como objetivo avaliar a eficácia de Elsa Speak, um aplicativo de IA integrado ao Treinamento Fonético Intencional (IPT), na melhor das competências no idioma inglês em estudantes de ensino secundário. No século XXI, a crescente interconexão das economias ressaltou a importância crucial do domínio do inglês como requisito comunicativo e profissional. No entanto, o aprendizado de inglês como língua estrangeira na Colômbia continua sendo predominantemente tradicional, focando nas regras gramaticais em vez de desenvolver em conjunto as habilidades fonéticas necessárias para uma comunicação linguística compreensível e precisa. O estúdio demonstra uma melhoria significativa na competência em inglês dos estudantes quando utiliza a combinação da tecnologia de reconhecimento automático de conversa (ASR) e IPT, especialmente em entonação, fluidez e pronúncia. Esses avanços contribuem indiretamente para o aprimoramento geral das habilidades em inglês, incluindo escuta, escritura e palestra. A investigação utilizou métodos mistos, incluindo um teste de competência linguística (pontuação de aula do IELTS através do aplicativo Elsa Speak), para avaliar o progresso de aprendizagem dos estudantes. Foi realizada uma síntese de dados com informações coletadas de 55 estudantes de ensino secundário. Especificamente, o uso combinado de IA e IPT demonstrou melhorias na pronúncia, discriminação de sons e reconhecimento de sílabas acentuadas, melhorando também a competência em inglês dos estudantes. Além de fomentar habilidades efetivas de comunicação e promover o uso consciente da língua, os resultados obtidos contribuirão para a investigação sobre a integração da educação fonética no currículo de idiomas na Colômbia. A utilização da IA como ferramenta de aprendizagem tem o potencial de fortalecer a competência linguística e as estratégias de ensino.

Palavras-chave: ASR; treino fonético incidental; proficiência em inglês; inteligência artificial; treino fonético; consciência fonética.

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1. Introduction

English has emerged as the global lingua franca of the 21st century, essential for communication, education, and career advancement in an increasingly interconnected world. In Colombia, however, the education system has struggled to provide effective English instruction, particularly in the area of phonetic awareness, which is crucial for pronunciation and fluency. Despite the widespread recognition of English proficiency as a key to better employability and educational opportunities (British Council, 2015), many Colombian middle school students face challenges in mastering the language due to differences in phonetics between English and Spanish.

The COVID-19 pandemic further exposed the vulnerabilities in the Colombian education system, such as limited access to digital resources and difficulties in adapting to virtual learning environments (Trotter, 2021). THese challenges underscored the urgent need for innovation in teaching methodologies, particularly the integration of technology to enhance learning outcomes. Traditional teaching methods in Colombian schools often overlook the importance of phonetic instruction, which is essential for developing accurate pronunciation skills and effective communication.

Advances in artificial intelligence (AI) have provided new opportunities for language learning, with tools like the ELSA Speak© app using Automatic Speech Recognition (ASR) technology to target specific language deficiencies, particularly in pronunciation (Kholis, 2021) By integrating ASR and Intentional Phonetic Training (IPT), there is potential to significantly improve students' English proficiency. Yet, research on the effectiveness of AI-driven educational technologies remains limited and context-dependent.

This action research explores how the integration of the ELSA Speak© app and IPT can address the specific phonetic challenges faced by Colombian middle schoolers. Colombia currently ranks 77 out of 111 countries in English proficiency, according to Education First's EF EPI 2022 study (Rodriguez, 2022), highlighting the need for innovative approaches to language instruction. This study will assess the impact of ASR technology and IPT on students' pronunciation, intonation, and fluency, offering insights into the potential for AI-assisted tools to enhance English teaching methodologies.

The primary objectives of this research are twofold: 1) to evaluate the effectiveness of the ELSA AI-assisted app in improving English proficiency through diagnostic testing adapted from the IELTS, and 2) to investigate the broader educational benefits of integrating AI and phonetic training into traditional teaching practices in middle school in Chia, Colombia.

Employing a mixed-methods approach, this research includes both qualitative and quantitative data. Surveys, interviews, focus groups, and quizzes will track students' progress, while statistical analysis will assess improvements in English proficiency. The research questions guiding this study are 1) what insights can be gained about the development of English proficiency through the implementation of the ELSA AI-assisted app, which incorporates ASR technology alongside Intentional Phonetic Training?, and 2) what are the further educational implications, both for learning and teaching, of employing this technology and Intentional Phonetic Training in English language education?

2. Theoretical framework

2.1. Phonetics and Phonology

In the field of language education, phonetics and phonology play fundamental roles in the development of learners' listening and speaking abilities. These disciplines are crucial for understanding how linguistic input is processed and how learners engage in reciprocal communication. Phonetics, which deals with the physical properties of speech sounds, and phonology, which examines the rules governing sound patterns within specific languages, are interconnected with other linguistic domains such as morphology, syntax, semantics, and pragmatics. Together, they provide a

comprehensive framework for analyzing both the articulatory and acoustic aspects of speech, as well as the abstract systems that organize sounds in human language.

Phonetics focuses on the universal physical characteristics of sounds produced by humans, while phonology narrows its focus to the functional patterns and sound systems unique to individual languages. This distinction is critical for understanding the mechanisms of language acquisition and the methods employed in effective language acquisition and methods employed in effective language instruction. The study of phonetics ensures precision in articulation, whereas phonology provides insight into the cognitive rules that guide how sounds are perceived and organized in specific linguistic contexts. By differentiating between these two areas, educators can better analyze sound patterns, enhancing learners' pronunciation and overall communicative competence.

2.1.1. The impacts of phonetics and pronunciation on English proficiency

English proficiency (Hinkel, 2006) is generally defined as a person's ability to use the English language efficiently and precisely across diverse situations., including speaking, reading, writing, and listening. It involves understanding the grammar, vocabulary, syntax, semantics, and pronunciation of the English language, along with the capacity to effectively express thoughts and concepts. clearly.

Understanding the phonetics of a language can indeed be a crucial part of gaining proficiency in it, particularly for languages like English which don't always have a clear correspondence between spelling and pronunciation.

1. Phonetic awareness and comprehension: Phonetics is the study of the physical sounds of human speech. Proficiency in phonetics can improve one's ability to understand and reproduce these sounds, thereby increasing their overall comprehension and fluency in a language. A study by Flege et al. (1995) found that individuals who had a better understanding of English phonetics had a better comprehension and production of English speech.

2. Pronunciation and communication: Pronunciation, which is heavily influenced by phonetics, is crucial for effective communication. Poor pronunciation can hinder comprehension even when vocabulary and grammar are correct. A study by Derwing and Munro (2005) showed that accent and pronunciation were more important than rhythm and intonation for intelligibility.

3. Phonetic training and language learning: Phonetic training can improve L2 (second language) learning. A research conducted by Iverson et al. (2005) demonstrated that explicit phonetic training could significantly improve L2 learners' perception and production of the target language.

4. Phonetics and reading skills: Phonetics is also crucial in developing reading skills. Understanding the phonetic structure of words can help individuals sound out words, improving reading fluency and comprehension. A study by Ehri (2005) highlighted the importance of phonetic awareness in reading development.

5. Pronunciation and social identity: Pronunciation can influence how individuals are perceived and accepted in a particular speech community. For instance, a study by Kang and Rubin (2009) showed that individuals with non-native accents are often perceived negatively, which can impact their social and professional opportunities.

Although learners need targeted practice to improve writing and grammar skills in English, phonetics and pronunciation classes can indirectly support the development of writing and grammar skills in English learners. It's worth noting that while phonetics and pronunciation don't directly impact writing and grammar skills, they do contribute to overall language awareness and can aid in the acquisition of these skills (Trofimovich and Gatbonton, 2006). For example, understanding the phonetic structure of words can aid in spelling and word recognition, which in turn can enhance writing skills. Similarly, the rhythm and intonation patterns of spoken English can provide cues to grammatical structures, which can help learners understand and use these structures more effectively. Here's how:

- Spelling and word recognition: Understanding the phonetic structure of words can improve spelling and word recognition. This is especially true in English, where the spelling of a word often reflects its phonetic composition. Therefore, a student who has a solid understanding of English phonetics may be better equipped to spell words correctly (Treiman and Kessier, 2006).
- Phonemic awareness: Phonemic awareness, or the ability to identify and manipulate individual sounds in spoken words, is a significant skill that can be improved through phonetics and pronunciation training. Research has shown that phonemic awareness is closely linked to reading and writing development, as it helps learners understand the relationship between spoken and written language (Bradley and Bryant, 1985).
- Grammar awareness: Pronunciation practice can help learners become more aware of certain grammatical structures. For example, English verb endings (such as -ed for past tense or -s for third person singular) have specific pronunciation rules. By practicing these pronunciation rules, learners can become more aware of the grammar rules associated with them (Brinton et al., 2010).
- Language rhythm and intonation: Understanding the rhythm and intonation of a language can provide clues to its syntactic structure. This can help learners understand sentence structure, punctuation, and how thoughts and ideas are connected in written language, which can improve their writing skills (Trofimovich and Gatbonton, 2006).

2.1.2. Phonetical awareness

Phonetic awareness is the understanding of the minimal aspects that sentences are made of. This represents an essential element in the process of acquiring a language, as correct pronunciation is essential for effective communication. In Colombia, many students struggle with English pronunciation due to a lack of phonetics knowledge in the English language. Fraser (2000) remarks that "with good pronunciation, a speaker is intelligible despite other errors; with poor pronunciation, a speaker can be very difficult to understand, despite accuracy in other areas" (p. 7). Pronunciation is an integral part of speaking and communicating effectively in a conversation, and it is particularly

important for students who plan to study abroad. According to Yates (2002), pronunciation refers to "the production of sounds that we use to make meaning" (p. 1). By improving their phonetic awareness, students can enhance their ability to communicate clearly and confidently in English.

2.2. Computing and Technology

The integration of Information Technology (IT) into educational settings has emerged as an indispensable tool and means for establishing an effective, communicative-oriented methodology in Language teaching for the 21st century. The emergency and fusion of new technologies such as Artificial Intelligence (AI) and Machine Learning (ML) in language learning are having a significant impact in revolutionizing class management, feedback, and the way we learn, evaluate, communicate, and interact As communication undergoes an evolutionary trajectory facilitated by technology, English proficiency and a digital culture is requested to be implemented in diverse human practices. This necessity is underscored within a market-driven and fiercely competitive educational landscape

Table 1
Explanation of the diagrams

Computing	The study of the methods, techniques, and processes that are used to store, process, and transmit digitally stored information and data.
Artificial Intelligence (AI)	Refers to systems that display intelligent behavior by human-automatic knowledge transferring through conductors such as algorithms and language inputs. **Properties of AI** **Autonomy:** Capacity to executive tasks without the intervention of a person. **Adaptability:** Capacity to improve tasks by learning from experience.
Automatic Speech recognition (ASR)	This cutting-edge technology enables machines to convert speech signals into corresponding texts or commands once they have recognized and interpreted the message. Acoustic feature extraction, and acoustic - language modeling are part of the ASR process (Shi, 2021).
Machine Learning (ML)	Machine Learning is a subfield of AI where machines learn from data to improve their performance or make accurate predictions.
Deep Learning (DL)	Deep Learning, a subset of machine learning, uses neural networks with multiple layers (hence 'deep') to model and understand complex patterns in datasets.
Data Science	Data Scientists investigate, extract, and report meaningful insights into an organization's data.

Source. Author's elaboration is based on Crabtree and Nehme (2024), and Shi (2021).

Table 1 summarizes essential concepts in computing and artificial intelligence (AI). It starts by defining computing as the methods for storing, processing, and transmitting digital information. AI is characterized by its ability to exhibit intelligent behavior through algorithms and language inputs, with key properties like autonomy, performing tasks independently and adaptability to learning from experience. The technology of Automatic Speech Recognition (ASR) is discussed,

which converts spoken language into text using techniques. The table also covers Machine Learning (ML), where systems learn from data to enhance performance, and Deep Learning (DL), which uses complex neural networks to identify intricate patterns. Lastly, Data Science focuses on extracting and interpreting valuable insights from data to support organizational decisions. This overview highlights the interconnectedness and significance of these fields in modern technology.

2.2.1. Elsa Speak app (ASR) automatic speech recognition technology

As a result of technological developments, there is an increasing demand for more skilled and competitive people. For this reason, the knowledge of tech-abilities, adaptability, and expertise in the tech area is more valuable for the globalized market. Those technological innovations are useful in improving many fields like customer support, providing services, automatizing processes, data analysis, and even education. Emergent technologies are an essential part of human progress in the pursuit of improvement.

The field of artificial intelligence in education has been beneficial in this era of improvement. Artificial intelligence works with algorithms that give the computer system a pattern to search through the database to imitate the cognitive process of the human brain. As Holmes *et al.* (2019) mentioned, artificial intelligence in education "includes everything from AI-driven, step-by-step personalized instructional and dialogue systems, through AI-supported exploratory learning, the analysis of student writing, intelligent agents in game-based environments, and student-support chatbots, to AI-facilitated student/tutor matching" (p. 11). However, AI has its limitations, such as its ability to handle only one task at a time, the frequency of updating data to the server, and the amount of information it can process.

Despite these limitations, technology in classrooms serves as a facilitator and instructor in practice (Kholis, 2021). The E.L.S.A. The app is an example of a technological tool that can improve English pronunciation by analyzing speech patterns with different accents through artificial intelligence and rating them based on their native-like accent. The app has an adaptive learning system that personalizes the curriculum based on individual performance and behavioral data. Immediate feedback on pronunciation and fluency is provided through voice recognition, allowing non-native speakers to analyze their speech patterns and improve their pronunciation. This app will be used in our research as a differential tool to study the impact of technology on phonetic awareness, discrimination of phonetic sounds, and pronunciation improvement.

3. Methodology

This study employed a classroom action research (CAR) design, utilizing both qualitative and quantitative methods to promote collaboration among participants and assess improvements in English proficiency among middle school students in Colombia.

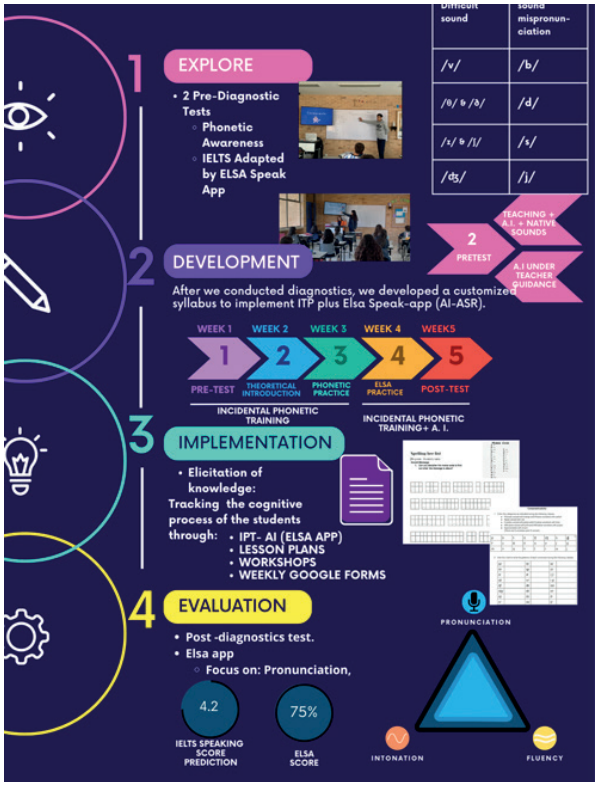
The study consisted of eight sessions, each of which involved planning, action, observation, and reflection to improve pronunciation skills through intentional phonetic training and the use of the ELSA Speak application. The lesson plan and teaching methods were designed and organized around these materials.

Before the intervention, a consent was delivered to the students and their parents to explain the research and its implications if they participated in the investigation. The phonetic class began with an introduction to Phonetics and the ElSA Speak App, after the introduction a written pre-test and ELSA Speak app pre-diagnosis were conducted to assess students' baseline English proficiency, with a particular emphasis on pronunciation. The pre-test allowed for a diagnosis of individual pronunciation difficulties and provided a basis for comparison after the intervention.

Throughout the intervention, the researchers observed students' responses and development during the phonetic classroom sessions, tracking their progress in English proficiency (3 Google forms). The intentional phonetic training aimed to address specific pronunciation challenges commonly encountered by middle school students in Colombia.

The final stage of the study involved reflection on the learning process and its impact on English proficiency. Post-tests, questionnaires, and post-diagnosis with the Elsa Speak App were administered to evaluate the effectiveness of the intervention. The post-test assessed students' pronunciation skills and overall English proficiency after the intervention. The post-diagnosis was the same as the pre-diagnosis in the ELSA Speak app to see the Improvement of students and the questionnaires provided insights into students' perceptions of and engagement with the Elsa Speak app and intentional phonetic training.

Figure 1
Instructional design



Source. Own elaboration

Data analysis focused on changes in students' English proficiency, particularly in terms of communicative skills. The results from the assessments conducted before and after were analyzed to

establish the improvement achieved. Additionally, the questionnaires provided qualitative insights into students' experiences and perceptions of the intervention.

Overall, this study utilized a CAR approach to investigate the effectiveness of intentional phonetic training and the use of the ElSA Speak application in enhancing students' English proficiency among middle school students in Colombia. The study design and methods were tailored to assess improvements in English pronunciation skills and overall language proficiency, with a specific focus on the unique needs and challenges faced by Colombian middle schoolers.

3.1. Context, participants, and data collection

The context was conducted in a catholic private school that is part of an ecclesiastic international movement spread all over Europe, America, Asia, and Oceania. This school follows a holistic method of education, aiming to develop students in every aspect of their personal growth and spirituality by their principles. The classes at this school are student-centered. Where it is considered diverse backgrounds and experiences overseas. The school is currently transitioning to a complete bilingual model, where the idea is that every class is taught in English. Currently, certain subjects such as science, social studies, and eventually mathematics are taught in English. Moreover, English is also used in common spaces such as mass, informal conversations with teachers, billboards, email messages, and physical signage, among others. English plays a crucial role in the improvement of the academic competencies of the students.

The middle and elementary grades are divided by gender. The girls are assigned to rooms "A", while the boys are assigned to rooms "B". This gender distinction is based on the fast development that the female gender undergoes during adolescence. In high school, this separation doesn't exist. However, this separation disappeared in some subjects, where students from both classrooms made collaborative projects and worksheets.

Our population is the seventh and eighth-grade middle school. As we mentioned previously, grade 7A is composed of 18 female students and 7B is composed of 8 male students between the ages of 12 to 13 years. The eighth grade consists of 12 female students from 8A and 18 male students from 8B.

Table 2
Population

/	Number of students	Gender	Native Students	Students who participate with Elsa and Intentional Phonetic Training	Only participate in Intentional Phonetic Training and written post-test
7A	18	Female	1	8	10
7B	8	Male	0	5	3
8A	12	Female	0	10	2
8B	18	Male	1	8	10
Total	55	-----	2	31	25

Source. Own elaboration

To collect data, the researchers utilized a variety of instruments, including checklists, observations, questionnaires, tests, and 7th and 8th-grade English teacher interviews. Pre-test, post-test, and non-test techniques were employed to assess changes in students' pronunciation skills.

For the pre-test in paper and post-tests, the researcher used a Google form test to evaluate students' pronunciation skills. A consistent diagnostic test was used for pre-and post-tests, allowing for easy comparison of results. In addition, the researcher administered a questionnaire in Google form to assess students' perceptions of and use of the ELSA Speak app and intentional phonetic training.

3.2. The "IELTS BY ELSA SPEAK APP" diagnostic test

In this project, we employed a powerful diagnostic test known as the "IELTS BY ELSA SPEAK APP". This assessment tool, developed in collaboration with IDP, is a leading global provider of international education services and co-owner of IELTS (International English Language Testing System), the standard for English proficiency test worldwide, which is essential for studying abroad, migration, or pursuing professional ambitions.

Specifically, the IELTS speaking feature integrated within the ELSA SPEAK APP serves as a comprehensive guide for preparing for the IELTS speaking test. Remarkably, this feature allows the students or users to take the assessment test within the app, eliminating the need for a mandatory purchase. With a free subscription, users can benefit from the capabilities of AI and ML (Machine Learning - a field of computer science focused harnessing data and algorithms to replicate or imitate human learning to progressively enhance accuracy) integrated into the app, which effectively aids them in improving their pronunciation skills.

The significance of attaining better English pronunciation cannot be overstated, as it directly contributes to boosting scores on the IELTS speaking test. The app's meticulously designed lessons align with the Common European Framework of Reference (CEFR), ensuring seamless integration with various standardized tests and curricula.

By combining the expertise of IDP with the technological advancements in AI and ML, this function aims to enhance English language education, specifically for Colombian middle schoolers. This enables students to unlock their full potential in English fluently and confidently pursue their academic and professional aspirations.

The mentioned test consisted of two stages: the pre-diagnostic and post-diagnostic assessments. In the initial stage, the objective was to determine the students' proficiency levels in terms of their communicative skills, including pronunciation, fluency, intonation, and word stress. Additionally, this stage served as the student's first introduction to ELSA app.

Summing up, the researcher utilized various tools and methods to gather and assess information concerning the students' pronunciation abilities, including pre-and post-test techniques, and questionnaires. The use of software for data analysis helped to ensure the accuracy and reliability of the findings.

4. Data analysis & finding

4.1. 7th grade English proficiency improvement with incidental phonetic training and ELSA App analysis

This study began with 17-7th-grade students, with before data available for 15 students, and before and after data available for 13 students. The students received incidental phonetic training along with the ELSA app for English speaking proficiency improvement.

For the 13 students where both before and after data could be obtained, the pre-test average score was 58%, increasing by 12% to a post-test average score of 70%. The pre-test score results ranged between a minimum of 34% and a maximum of 76%, while the post-test score results ranged between 53% and 82%. The minimum score increased from 34% to 53%, and the maximum score increased from 76% to 82%.

Although the average score change was 12%, we observed two of the thirteen students who improved by 22% and 29% respectively (from beginner to lower intermediate), showing a significant benefit from the incidental phonetic training and ELSA app for students at the beginner level. However, three students showed score changes of 0%, 1%, and 3%. Unfortunately, a significantly positive change was not seen in these students, and further investigation is needed to determine the cause. If the data related to these three students are ignored, the average improvement for the other students would increase to 15% from the 12% already discussed. Overall, the findings suggest that incidental phonetic training and the ELSA app can be effective tools in improving English speaking proficiency for 7th-grade students.

4.1.1. 7th grades improving English proficiency with ELSA Speak App: analyzing student performance in IELTS Predictor Speaking Test (student vs % change)

The table presents data on the English proficiency progression of 7th-grade students, comparing their initial performance ("Pre") with their performance after using an intervention (e.g., ELSA Speak App). Each student's proficiency level and corresponding percentage scores have been recorded, highlighting the change in their performance over time. Here's a breakdown of the results:

Table 3
7th grade Student vs % change

Pre	After	Pre	After	Change	Student
Intermediate	Intermediate	67%	75%	8%	1B
Beginner	Beginner	41%	53%	12%	2B
Lower intermediate	Intermediate	61%	77%	16%	3B
Beginner	Intermediate	56%	70%	14%	4B
Lower intermediate	Lower intermediate	61%	64%	3%	5B
Lower intermediate	Intermediate	61%	71%	10%	1A
Intermediate	Advanced	70%	82%	12%	2A
Intermediate	Intermediate	69%	69%	0%	3A

Pre	After	Pre	After	Change	Student
Beginner	Intermediate	54%	71%	17%	4A
Beginner	Lower intermediate	34%	63%	29%	5A
Beginner	Lower intermediate	40%	62%	22%	6A
Intermediate	Advanced	69%	80%	11%	7A
Intermediate	Intermediate	76%	77%	1%	10A
		58%	**70%**	**12%**	**Average**

Source. Own elaboration with Minitab

a. Overall improvement

On average, students improved their speaking performance by 12%, progressing from 58% to 70% across the board. This average reflects a notable overall improvement in English speaking proficiency among the 7th-grade students after using the ELSA Speak app.

b. Highest achievers

- Student 5A had the most significant improvement, *moving from Beginner to Lower Intermediate*, with a 29% increase in performance (from 34% to 63%).
- Student 6A also showed substantial growth, *advancing from Beginner to Lower Intermediate*, with a 22% improvement (from 40% to 62%).

c. Steady advancements

Several students made moderate to significant improvements in their proficiency levels:

- Student 3B progressed from Lower intermediate to Intermediate with a 16% increase.
- Student 4B, initially a Beginner, reached Intermediate with a 14% improvement.
- Student 2B and Student 1A both improved by 12%, with 2B advancing within the Beginner category and 1A moving from Lower Intermediate to Intermediate.

d. Limited change

Some students exhibited minimal improvements:

- Student 1B saw an 8% increase, remaining at the Intermediate level.
- Student 7A and Student 10A barely improved by 1% each, maintaining their proficiency at the Intermediate level.

e. No change

- Student 3A showed no change at all, remaining at Intermediate with a consistent score of 69% before and after using the app.

f. Key takeaways

- Significant Progress for Beginners: Students who started at the Beginner level, such as students 5A, 6A, and 4A, demonstrated the most substantial gains, suggesting that the ELSA Speak app is especially effective for students with lower initial proficiency.
- Mixed Results for Intermediate Students: While some intermediate students advanced to Advanced proficiency, such as 1A and 2A, others (like 7A and 10A) showed only minor or no improvements, implying that students at this level may need more targeted support to continue progressing.
- Effective Overall: With an average improvement of 12%, the use of the ELSA Speak app generally proved beneficial for enhancing students' English-speaking abilities

4.1.2. 7th grades: individual improvement in English proficiency (pre-test, post-test, and change scoring)

Table 4 presents the results of English proficiency tests conducted before and after a learning intervention among 7th-grade students. The columns represent the students' initial and final proficiency levels (pre-test and post-test), as well as the percentage scores in both tests (Pre_1 and After_1). Additionally, the "Change" column highlights the percentage improvement between the two tests, while the "Student" column identifies each student anonymously.

Table 4
7th grade Individual Improvement in English Proficiency: Pre-test, Post-test, and Change Scoring detailed

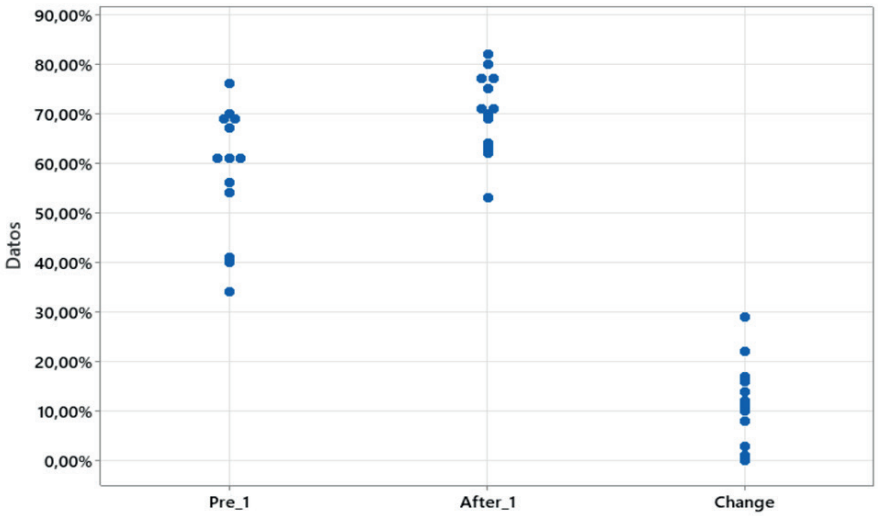
Pre	After	Pre_1	After_1	Change	Student
Intermediate	Intermediate	67,00%	75,00%	8,00%	1B
Beginner	Beginner	41,00%	53,00%	12,00%	2B
Lower intermediate	Intermediate	61,00%	77,00%	16,00%	3B
Beginner	Intermediate	56,00%	70,00%	14,00%	4B
Lower intermediate	Lower intermediate	61,00%	64,00%	3,00%	5B
Lower intermediate	Intermediate	61,00%	71,00%	10,00%	1A
Intermediate	Advanced	70,00%	82,00%	12,00%	2A
Intermediate	Intermediate	69,00%	69,00%	0,00%	3A
Beginner	Intermediate	54,00%	71,00%	17,00%	4A
Beginner	Lower intermediate	34,00%	63,00%	29,00%	5A
Beginner	Lower intermediate	40,00%	62,00%	22,00%	6A
Intermediate	Advanced	69,00%	80,00%	11,00%	7A
Intermediate	Intermediate	76,00%	77,00%	1,00%	10A
		58,38%	70,31%	11,92%	
statistics	**No.**	**Media**	**Mínimo**	**Máximo**	
Pre_1	13	58%	34%	76%	
After_1	13	70%	53%	82%	
Change	13	12%	0%	29%	

Source. Own elaboration with Minitab

a. Key Observations

- Pre-test Performance (Pre_1): The initial proficiency levels show a range of scores, with students starting from Beginner, Lower Intermediate, and Intermediate levels. The average score before the intervention is 58%, with a minimum score of 34% and a maximum of 76%.
- Post-test Performance (After_1): Following the learning intervention, students' performance improved, with an average post-test score of 70%. The minimum score increased to 53%, and the maximum post-test score reached 82%. This indicates overall advancement in English proficiency across the group.
- Performance Change: The average improvement in performance is 12%, with the largest recorded change being 29% and the smallest being 0%. This reflects the varying degrees of individual progress.

Figure 2
7th grade analysis of pre- and post-test results: improvements in performance in PRE_1 and AFTER_1



Source. Own elaboration with Minitab

b. Pre- to post-test transition

- Most students improved their proficiency levels between the pre-test and post-test. For instance, several students transitioned from Beginner to Intermediate, and others from Lower Intermediate to Intermediate.
- Only a few students remained at the same proficiency level, notably Student 3A, who retained the Intermediate level, and Student 5B, who stayed at Lower Intermediate.

c. Significant individual improvements

- Student 5A: This student demonstrated the most substantial improvement, with a 29% increase in their score, moving from a Beginner level (34%) to Lower Intermediate (63%).

- Student 6A: This student also showed significant progress, improving their score by 22%, moving from Beginner (40%) to Lower Intermediate (62%).
- Students 4A and 7A: Both showed strong improvements, with increases of 17% and 11%, respectively. Student 4A advanced from Beginner to Intermediate, and Student 7A advanced from Intermediate to Advanced.

d. Minimal or no change

- Student 3A: Scored 69% in both the pre-and post-tests, indicating no noticeable improvement in performance.
- Student 5B: Showed a marginal improvement of only 3%, remaining within the Lower Intermediate level with scores of 61% and 64%.

e. Statistical overview

- Average scores:
  - Pre-test: 58%
  - Post-test: 70%
  - Average Change: 12%
- Range of improvement: The range of improvement spans from 0% to 29%, with most students achieving between 8% to 17% improvement.

The results demonstrate significant overall progress in English proficiency among the 7th-grade students after the intervention. The average score increase of 12% suggests the efficacy of the learning programme. The detailed breakdown shows individual variance, with some students making remarkable progress, while others displayed minimal improvement. The findings highlight the importance of targeted support for students who did not show substantial gains and reinforce the programme's success for the majority of learners.

4.2. 8th grade English proficiency improvement with incidental phonetic training and ELSA App analysis

These reports evaluate the impact of incidental phonetics training and Automatic Speech Recognition (ASR) using the ELSA Speak App on the English proficiency of 8th-grade students. The data was collected from a sample of 21 students, with before data available for all 21 students and before-and-after data available for 18 students.

The pre-test average score of the 18 students was 64%, which increased by 8% to a post-test average score of 72%. The initial assessment scores varied between 41% as the lowest and 88% as the highest, while the post-test scores ranged from 43% to 92%. The minimum score increased from 41% to 43%, and the maximum score increased from 88% to 92%. Although the average score change was 8%, three of the eighteen students showed a significant benefit from the classes, with improvements of 22%, 24%, and 30%.

Unfortunately, six students showed negative or minimal score changes of -10%, -5%, 1%, 2%, 3%, and 3%. We are currently investigating the causes of these limited improvements. If the data related to these six students are ignored, the average improvement for the other students would increase to 12% from the 8% already discussed.

4.2.1. Improving English proficiency with ELSA Speak App: analyzing student performance in IELTS predictor speaking test (student vs % change)

The Table 5 reflects the impact of the ELSA Speak App on 8th-grade students' English speaking proficiency, measured through its IELTS predictor speaking test. The columns represent the students' English levels before and after using the app ("Pre" and "After"), their respective percentage scores for both tests and the calculated percentage change in performance ("Change"). The "Student" column identifies students anonymously.

The primary focus is to observe how students' English proficiency levels evolved due to their engagement with the ELSA Speak App, specifically examining their progression across proficiency levels (Beginner, Intermediate, Advanced, etc.) and percentage improvement or decline.

Table 5
8th grade student vs % change

Pre	After	Pre	After	Change	Student
Advanced	**Native**	84%	92%	8%	1B
Beginner	Intermediate	56%	68%	12%	2B
Intermediate	Intermediate	62%	68%	6%	3B
Lower intermediate	lower intermediate	60%	63%	3%	4B
Intermediate	**Advanced**	75%	81%	6%	6B
Beginner	lower intermediate	54%	60%	6%	7B
Intermediate	Intermediate	67%	73%	6%	8B
Intermediate	Lower intermediate	71%	66%	-5%	9B
Advanced	**Advanced**	82%	83%	1%	1A
Beginner	Beginner	52%	74%	22%	2A
Intermediate	Advanced	72%	82%	10%	3A
Advanced	**Native**	88%	91%	3%	4A
Beginner	**Advanced**	54%	78%	24%	5A
Beginner	Beginner	41%	43%	2%	6A
Lower intermediate	Lower intermediate	64%	54%	-10%	7A
Lower intermediate	Intermediate	64%	77%	13%	8A
Beginner	Intermediate	43%	73%	30%	9A
Lower intermediate	Lower intermediate	63%	67%	4%	10A
		64%	**72%**	**8%**	**Average**

Source. Own elaboration with Minitab

a. Overall improvement

On average, students showed an 8% increase in their IELTS predictor speaking test scores, indicating that most benefited from using the ELSA Speak App to enhance their English proficiency. The average pre-test score was 64%, while the post-test score averaged 72%.

b. Highest achievers

These students demonstrated the most significant percentage improvements and advanced proficiency levels.

- Student 8A: Improved by 30%, moving from Beginner (43%) to Intermediate (73%).
- Student 4A: Improved by 24%, moving from Beginner (54%) to Advanced (78%).
- Student 1A: Improved by 22%, moving from Beginner (52%) to Beginner (74%).

c. Steady advancements

These students showed moderate but consistent progress:

- Student 7A: Improved by 13%, moving from Lower Intermediate (64%) to Intermediate (77%).
- Student 2A: Improved by 10%, moving from Intermediate (72%) to Advanced (82%).
- Student 6A: Improved by 8%, maintaining Lower Intermediate proficiency but increasing from 64% to 72%.

d. Limited change

These students saw minimal changes in their proficiency levels or percentage scores:

- Student 3B: Only improved by 6%, remaining at Intermediate (62% to 68%).
- Student 4B: Improved by 6%, staying at Lower Intermediate (60% to 63%).
- Student 9B: Experienced a 1% improvement, staying at Advanced (82% to 83%).

e. No change

Some students experienced no change or even declines in performance:

- Student 8B: Experienced a 5% decline, dropping from Intermediate (71%) to Lower Intermediate (66%).
- Student 6A: Saw the most significant drop with a 10% decline, going from Lower Intermediate (64%) to Lower Intermediate (54%).

f. Key Observations

- Pre-test Performance (Pre): Students' initial proficiency levels ranged from Beginner to Advanced, with the lowest pre-test score at 41% and the highest at 88%. The average pre-test score is 64%.
- Post-test Performance (After): The post-test results show improved performance for most students, with scores ranging from 43% to 92%, and the average post-test score reaching 72%.
- Performance Change: The "Change" column reflects the percentage improvement, where most students exhibited positive changes, though a few experienced negative shifts. The average improvement across all students is 8%.

4.2.2. Analysis of pre- and post-test results: improvements in performance in PRE_1 and AFTER_1

The table 6 presents the English proficiency improvement of 18 eighth-grade students by comparing their pre-test and post-test scores. The columns include the pre-test score (Pre_1), post-test score (After_1), performance change, the student identifier, pre-test language proficiency, and post-test proficiency. The results show varying levels of improvement, with some students experiencing significant gains, while others show little to no change, or in some cases, a slight regression.

Table 6
8th-grade individual improvement in English proficiency: pre-test, post-test, and change scoring detailed

Pre_1	After_1	Change	Student	Pre-test	Post-test
84,00%	92,00%	8,00%	1B	Advanced	Native
56,00%	68,00%	12,00%	2B	Beginner	Intermediate
62,00%	68,00%	6,00%	3B	Intermediate	Intermediate
60,00%	63,00%	3,00%	4B	Lower intermediate	lower intermediate
75,00%	81,00%	6,00%	6B	Intermediate	Advanced
54,00%	60,00%	6,00%	7B	Beginner	lower intermediate
67,00%	73,00%	6,00%	8B	Intermediate	Intermediate
71,00%	66,00%	-5,00%	9B	Intermediate	Lower intermediate
82,00%	83,00%	1,00%	1A	Advanced	Advanced
52,00%	74,00%	22,00%	2A	Beginner	Beginner
72,00%	82,00%	10,00%	3A	Intermediate	Lower intermediate
88,00%	91,00%	3,00%	4A	Advanced	Native
54,00%	78,00%	24,00%	5A	Beginner	Advanced
41,00%	43,00%	2,00%	6A	Beginner	Beginner
64,00%	54,00%	-10,00%	7A	Lower intermediate	Lower intermediate
64,00%	77,00%	13,00%	8A	Lower intermediate	Intermediate
43,00%	73,00%	30,00%	9A	Beginner	Intermediate

Pre_1	After_1	Change	Student	Pre-test	Post-test
63,00%	67,00%	4,00%	10A	Lower intermediate	Lower intermediate
64,00%	**71,83%**	**7,83%**			
Statistics	**No.**	**Media**	**Minimum**	**Maximum**	
Pre_1	18	64%	41%	88%	
After_1	18	72%	43%	92%	
Change	18	8%	-10%	30%	

Source. Own elaboration with Minitab

a. Key Observations

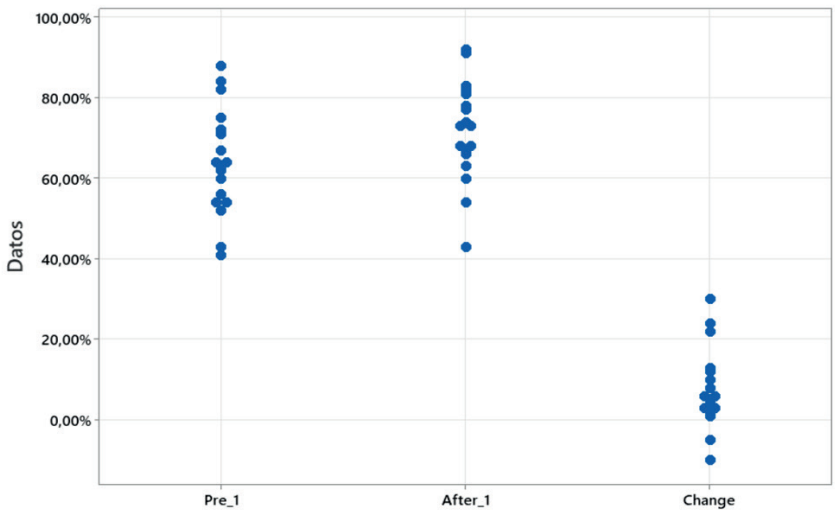
- *Pre-test performance (Pre_1)*: The initial proficiency levels show a diverse range of scores, with students starting from Beginner, Lower Intermediate, and Intermediate levels, as well as a few at Advanced proficiency. The average pre-test score was 64%, with a minimum score of 41% and a maximum of 88%. This indicates a broad variation in initial language proficiency among the group.

- *Post-test performance (After_1)*: After the intervention, students' performance generally improved. The average post-test score increased to 72%, with the minimum score rising to 43% and the maximum post-test score reaching 92%. This shows a clear overall advancement in English proficiency across the group, though individual outcomes varied.

- *Performance change*: The average improvement in performance was 8%, with the largest recorded change being 30% and the smallest being -10%. This reflects the varying degrees of individual progress, with some students showing significant improvement while others experienced minimal or negative change.

Figure 3

8th grades: individual improvement in English proficiency (pre-test, post-test, and change scoring)



Source. Own elaboration with Minitab

Pre- to Post-Test Transition

- Most students demonstrated an improvement in their proficiency levels between the pre-test and post-test. Several students advanced from Beginner to Intermediate, such as 2B, 8A, and 9A, while others like 1B and 6B moved from Intermediate or Advanced to Native proficiency.

However, a few students did not show a positive change in proficiency:

- 9B declined from Intermediate to Lower Intermediate despite a slight drop in score.
- Students like 3B and 8B remained at the Intermediate level, showing little progression.

Significant individual improvements

- 9A: Showed the largest improvement, with a 30% score increase, progressing from Beginner (43%) to Intermediate (73%).
- 5A: Demonstrated substantial progress, with a 24% improvement, moving from Beginner (54%) to Advanced (78%).
- 2A: Increased by 22%, but remained at the Beginner level, despite their score rising from 52% to 74%.
- 8A: Improved by 13%, moving from Lower Intermediate to Intermediate proficiency.

Minimal or no change

- 1A: Showed a 1% improvement, but stayed within the Advanced proficiency range (82% to 83%).
- 6A: Displayed a 2% increase but remained at the Beginner level.
- 7A: Experienced a -10% decline, falling from Lower Intermediate (64%) to 54%, without changing proficiency level.

Statistical overview

- Average Scores:
  - Pre-test: 64%
  - Post-test: 72%
  - Average Change: 8%
- Range of Improvement: Performance changes ranged from -10% to 30%, with most students achieving a positive increase. The majority showed improvements between 6% and 12%.

In comparison to grade 7, a larger score improvement was seen in grade 7, with a higher proportion of students classified as "Beginner" at the outset, giving them a greater opportunity to improve their scores through the program.

In summary, this report demonstrates the impact of incidental phonetics training and ASR on the English proficiency of 8th-grade students. While the average score change was 8%, we observed significant improvements in some students, indicating the efficacy of the program. Nonetheless, further research is required to identify the factors that influence students who showed limited improvement in their English proficiency.

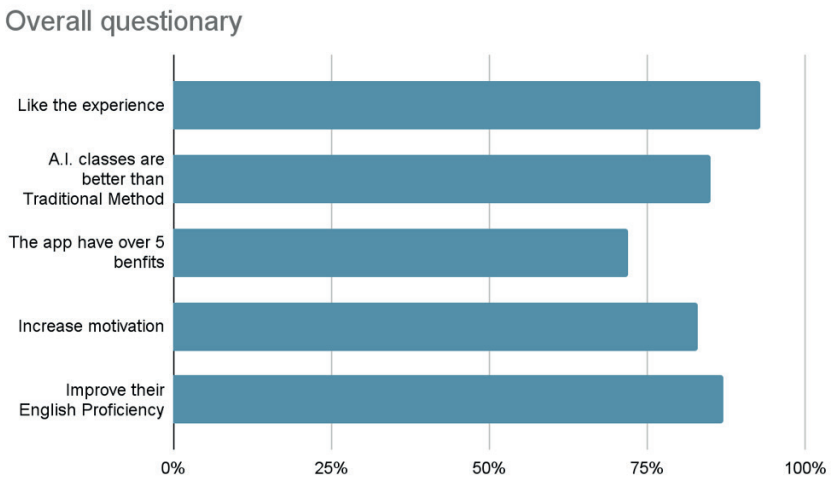
4.3. Data analysis and findings of the AI-assisted phonetic class as beneficial, reporting, increased enjoyment, engagement, and improvement in their English proficiency

The findings from the questionnaires of this study reveal several important insights regarding the use of an AI-assisted app for phonetic training and its impact on English proficiency among middle school students in Colombia. This questionnaire was made to know the students' perspectives related to the experience of learning phonetics assisted with ELSA AI-assisted app with ASR technology and intentional phonetic training.

To start, the majority of the participants perceived the AI-assisted phonetic class as beneficial, reporting, increased enjoyment, engagement, and improvement in their English proficiency. These positive outcomes align with the goals of the study, demonstrating the potential effectiveness of incorporating an ELSA AI-assisted app with ASR technology and intentional phonetic training.

The questionnaires were made to gain insights into students' experiences. The results showed that the majority of the population (93%) of 48 students who responded to the questionnaires, reported enjoying the phonetic class experience and believed that it helped them improve their English proficiency (87%). Additionally, 85% of the population found the AI-assisted App more enjoyable than traditional methods, and 72% believed that the app had over five benefits. Moreover, the update of how we learn can be improved by the evolution of technology and industrial innovation, imposing a challenge to balance the pedagogical approach with the use of AI-assisted learning.

Figure 4
The graphic bar of closed questions in the questionnaire



Source. Own elaboration.

However, it is important to acknowledge that a subset of participants expressed a preference for traditional language learning methods over the use of AI-assisted apps. Their concerns centered around technology and a desire to develop a notable accent rather than striving for a "perfect" AI accent. This resistance to change and new technologies in language learning may indicate the need for additional support and guidance to address such concerns and promote acceptance of AI-assisted tools. A few participants exhibited reservations about incorporating technology into their language learning journey.

Furthermore, a small number of participants had negative experiences with the phonetic class. Some struggled to understand the International Phonetic Alphabet (IPA) symbols, while others expressed concerns about their grades. These negative experiences suggest improving personal instruction and assessment strategies to ensure that all students can fully benefit from phonetic training.

Notably, the lowest-scoring student on the pretest, who also expressed dislike for the Intentional phonetic class, may have had pre-existing negative attitudes towards language learning or lacked prior knowledge in the area. This finding highlights the significance of addressing individual differences in language learning and tailoring instruction to meet the diverse needs of students.

On a positive note, two students, one girl and one boy from the 8th grade, who already possessed advanced pronunciation skills, demonstrated significant improvement and achieved a native-like accent after participating in the phonetic class with the AI-assisted app. Their scores increased by 3% to 8%, highlighting the potential of the intervention even for students who already possess a high level of proficiency.

Interestingly, the students who did not think the AI-assisted app would be more engaging or enjoyable compared to the traditional method (4 students) were split between those who used the app and those who did not. Those who used the app saw a total average of a minimum of 7% to 15% increase in their scores and think the phonetic class combined with an AI-assisted app has benefits. In contrast, those who were closed-minded to the use of AI and preferred traditional methods perceived only three or fewer benefits from combining phonetic classes with AI apps. The benefits mentioned by students are:

- Improved pronunciation & listening 41 (85,4%): AI-assisted helps students to improve their pronunciation and listening skills. Students can compare their pronunciation with AI and work on areas that need improvement.

- Real-time feedback 40 (83,3%): ASR technology could provide students with instant feedback on their pronunciation, allowing them to correct errors more quickly and efficiently

- Personalized learning 40 (83,3%): the app could be tailored to each student's individual needs and abilities, allowing them to focus on areas where they need the most improvement.

- Intonation patterns 35 (72,9%): this phonetic training can help them to develop the skills they need to produce and distinguish between different sounds and intonation patterns in English.

- Enhanced learning experience 34 (70,8%): this technology could make learning English more engaging and enjoyable for students, potentially increasing their motivation to continue learning the language.

- Convenience 33 (68,7%): students could practice their pronunciation and language skills from anywhere, at any time, using just their smartphone or tablet. AI-assisted learning can provide students with the tools they need to take control of their own learning and work towards their language learning goals.

- Increased confidence 28 (58,3%): by using the app and improving their pronunciation, students may feel more confident in their ability to speak English, which could encourage them to practice more and ultimately improve their overall language proficiency.

- Increased awareness of sounds 30 (62,5%): students can become more aware of the sounds of the language they are learning through the use of the app. ASR technology can help students recognize and differentiate between different sounds in the language, which is essential for improving pronunciation and communication.

- Engaging lessons 35 (72,9%): students are more willing to learn phonetics by first understanding the topic and spotting the differences between sounds by practicing the minimal pairs in class.

- Enhanced discrimination of sounds 28 (58,3%): to discriminate between sounds that are difficult to distinguish for non-native speakers. for example, in English the sounds /l/ and /r/ can be challenging for some learners to differentiate with practice exercises that help students to identify and produce these sounds accurately.

- Increased fluency 34 (70,8%): students can increase their fluency in the language. they can gain confidence in their ability to communicate effectively, leading to improved communication skills in social and academic settings.

- All of the above 20 (41, 6%)

- None of the above (0%)

The most commonly mentioned benefit by students was the improvement in pronunciation and listening skills, cited by over 85% of the population. This was followed by real-time feedback and personalized learning, both acknowledged by 83% of the population. These benefits are particularly valuable for students who lack sufficient time for individualized feedback in the classroom due to time constraints or larger class sizes. On the other hand, the least mentioned benefits were the enhancement of sound discrimination and the increase in confidence, with 58% of the participants recognizing these advantages. The lack of confidence improvement may be attributed to the students' self-perception as English speakers, as they did not have enough time to fully reaffirm their pronunciation improvements. Nonetheless, the overall positive feedback regarding the improvement of pronunciation and listening skills underscores the efficacy of the AI-assisted app in addressing these specific language aspects. We could divide those answers into the ones that think ELSA has over 8 Benefits and the ones that consider ELSA has 3 to 4 benefits. Most answers withhold relevance

to the app because of their plans, convictions, insight as an academic requirement, and perceptions of learning apps. The other 85% of the population seems to be more open to the use of the application as a novelty, more engaging, funny, convenient, and encouraging.

About the question "Do you think this phonetic class method helped you improve your English proficiency?", 45 students (85%) responded yes and 6 students (15%) responded No. Based on the student's positive responses, some of the key points of the improvement of their English proficiency were:

1. Improvement in pronunciation and communication

    - The phonetic class helped me to pronounce words correctly and communicate effectively.
    - It improved my pronunciation, and now people understand me better when I speak in English.
    - I learned new sounds and how to pronounce words better, making it easier for me to converse with others.
    - It helped me improve my English pronunciation, leading to better communication.

2. Increased awareness and knowledge

    - The class made me realize that my English proficiency was lacking, and it highlighted areas where I needed improvement.
    - I gained a better understanding of the language and learned new things that I wasn't aware of before.
    - It helped me learn more about English and expanded my knowledge of the language.
    - I discovered aspects of pronunciation that I didn't know, and now I have a clearer understanding of how to pronounce words correctly.

3. Enjoyment and fun learning experience

    - The phonetic class was a different and fun method of learning English.
    - It was an enjoyable experience, and I found it entertaining.
    - Learning through the class was engaging and enjoyable.

4. Personal growth and confidence

    - My English score improved, even if it was just a little, which boosted my confidence.
    - It helped me gain confidence in speaking English and increased my self-awareness in pronunciation.
    - The class provided me with more practice and helped me become more comfortable and confident in my English skills.

To improve pronunciation in a more effective way, we worked on some difficult sounds for Spanish speakers. We focused on difficult sounds acknowledged by Davies (2021). The first sound is the differentiation between the /b/ and /v/ sounds because there isn't a difference between those two when it is commonly used in Spanish informal contexts. Despite this problem, students in eighth and seventh grade increased from 5% to 7.5% of this sound at the end of the study. The second problem was the discrimination between the two TH sounds /θ/ & /ð/. Those sounds are mostly pronounced like the Spanish/d/ when someone doesn't know how they are pronounced. However, TH sound increased from 7% to 15% when we saw the post-test. The third problems were the sounds /ʃ/, /ʒ/, and /dʒ/ because in Spanish only has /z/, /s/ and /tʃ/ sounds. When we find any of those sounds that don't exist in Spanish, Spanish speakers tend to associate those with one that is related but not the same. Due to the fact that those sounds don't exist in Spanish, these sounds were the ones that increased between 10% to 16%. Another common Spanish difficult sound, pointed out by Ethan (n.d.), is the differentiation between the /ʤ/ and /j/. Due to the fact that those sounds are allophones, students may not discriminate between those two sounds. Moreover, this was a decision based on the interactions within the classroom. Owing to when we approach the students with open-ended questions the students answer /ʤɛs/ instead of /jɛs/. We also reinforce the /ʒ/ sound to address pronunciation challenges. Those sounds had an increase of 10 % after the post-test.

These responses highlight the positive impact of the phonetic class on students' English proficiency, including improved pronunciation, better communication, increased knowledge, enjoyment of the learning process, and personal growth in terms of confidence and self-awareness. Further, these responses aligned with our English proficiency theoretical framework, providing additional support to our argument.

Table 7
Supporting theories

Theory	Finding result
Pronunciation and communication: Pronunciation, which is heavily influenced by phonetics, is crucial for effective communication. Poor pronunciation can hinder comprehension even when vocabulary and grammar are correct. A study by Derwing and Munro (2005) showed that accent and pronunciation were more important than rhythm and intonation for intelligibility.	• The phonetic class helped me to pronounce words correctly and communicate effectively. • It improved my pronunciation, and now people understand me better when I speak in English. • I learned new sounds and how to pronounce words better, making it easier for me to converse with others. • It helped me improve my English pronunciation, leading to better communication.
Phonetic awareness and comprehension: Phonetics is the study of the physical sounds of human speech. Proficiency in phonetics can improve one's ability to understand and reproduce these sounds, thereby increasing their overall comprehension and fluency in a language. A study by Flege *et al.* (1995) found that individuals who had a better understanding of English phonetics had a better comprehension and production of English speech.	• The class made me realize that my English proficiency was lacking, and it highlighted areas where I needed improvement. • I gained a better understanding of the language and learned new things that I wasn't aware of before. • It helped me learn more about English and expanded my knowledge of the language. • I discovered aspects of pronunciation that I didn't know, and now I have a clearer understanding of how to pronounce words correctly.

Theory	Finding result
Phonetic training and language learning: Phonetic training can improve L2 (second language) learning. A research conducted by Iverson *et al.* (2005) demonstrated that explicit phonetic training could significantly improve L2 learners' perception and production of the target language.	• The phonetic class was a different and fun method of learning English. • It was an enjoyable experience, and I found it entertaining. • Learning through the class was engaging and enjoyable.
Pronunciation and social identity: Pronunciation can influence how individuals are perceived and accepted in a particular speech community. For instance, a study by Kang and Rubin (2009) showed that individuals with non-native accents are often perceived negatively, which can impact their social and professional opportunities.	• My English score improved, even if it was just a little, which boosted my confidence. • It helped me gain confidence in speaking English and increased my self-awareness in pronunciation. • The class provided me with more practice and helped me become more comfortable and confident in my English skills.

However, six people think this phonetic class method didn't improve their English proficiency. Even though all the grades received the phonetics classes, the practice and assessment with Elsa were only for the ones who wanted to participate in the project. Consequently, five people who said that this phonetic class didn't improve their English proficiency were the ones who didn't use Elsa. The extra practices and assessment with Elsa could solve doubts, misunderstandings, or lack of knowledge about topics given in classes. The lack of free practice to reinforce topics given in class could be related to their perception of improvement in English proficiency. The person remaining was one girl who expressed her perception of phonetic classes and her position on the reliability of those types of apps. Nevertheless, she increased her Elsa score by 10% in the post-test. The other 87% noticed an improvement in their English proficiency level. Among those answers, the enhancement of pronunciation, the engagement in some activities, the novelty, and usefulness were the reasons mentioned in the open questions.

Overall, the findings show that incorporating an AI-assisted app with intentional phonetic training has benefits in improving English proficiency among middle school students in Colombia. However, some students may require more support in understanding the technology and its benefits, and there may be a need to address concerns about accents and the use of AI in language learning.

4.3.1. The motivation to learn English using an AI-assisted app with ASR technology

83 % of the participants answered positively to the question "Do you think an AI-assisted app that utilizes ASR technology could help increase your motivation to learn English?" and their responses highlight several key points:

- Novelty and differentiation: the app's unique and innovative nature is seen as something different and appealing.
- Incentives and Rewards: the possibility of receiving prizes or rewards through the app adds motivation.
- Self-assessment and Progress Tracking: the app's ability to provide immediate feedback and assess pronunciation skills is valuable.

- Convenience and Independence: the flexibility of using the app at home without relying on a teacher is seen as advantageous.
- Confidence Building: the app helps increase confidence and self-trust in language learning abilities.
- Accessible learning: the app's availability on mobile devices allows for studying anytime and anywhere.
- Competitiveness and Personal Growth: the app's interactive nature creates a sense of competition and encourages individuals to improve their skills.
- Practice and Improvement: the app's use facilitates practice and enables learners to enhance their language proficiency.
- Increased Speaking confidence: the app helps students speak more confidently in English.
- Positive and Different Learning Experience: the app's unconventional approach provides a unique and enjoyable learning experience.

Despite 83% of the population finding the ELSA app could help increase motivation to learn English, 8 participants didn't express that the AI-assisted app increased their motivation to learn English. With the ELSA app, most participants saw an average score increase of 16%.

4.3.2. The interview analysis and findings

The interview with a 7th and 8th-grade English teacher, a highly experienced English teacher with a 12-year tenure, offers valuable insights into the research study as the instructor for 7th and 8th-grade students. Her extensive teaching background spans various educational contexts, ranging from kindergarten to High School and University levels. Her journey in the field of phonetics began during her university studies, where she enrolled in a semester-long phonetics course. While her subsequent exploration of phonetics remained limited, she recognized its significance in language instruction. Presently, in language education, she also derives satisfaction from observing her students' engagement with phonetics. Technology holds a prominent role in her classroom, which is actively incorporated into her teaching practices. She views technology as a valuable tool that enhances various educational activities, including website access, video utilization, writing exercises, audio recording, editing tasks, and note-taking. However, she maintains the importance of maintaining a balanced approach, ensuring the integration of traditional methods such as broad writing and paper-based activities.

Recognizing the absence of dedicated pronunciation classes in many bilingual schools, she emphasizes the significance of a communicative approach to language instruction. She advocates for prioritizing effective communication, regardless of students' proficiency levels in pronunciation. Further, she acknowledges the critical role of phonetics and proposes the implementation of more comprehensive phonetic instruction at lower grade levels. This approach, she contends, would foster greater productivity and effectiveness in language acquisition.

The insights shared by the teacher, with her wealth of teaching experience, contribute significantly to this study project. Her perspectives align with the objective of examining the benefits of an AI-

assisted app integrated with intentional phonetic training, shedding light on the pedagogical aspects and the need for a balanced approach in language instruction.

5. Discussion

One of the aims of this research paper was how to incorporate an ELSA AI-assisted app in combination with Intentional Phonetic Teaching Training to benefit middle school students in Colombia to improve their English proficiency. The implementation had a positive impact on aspects related to their English proficiency, like the development of phonetics awareness, improvement of listening & pronunciation, and self-awareness of mistakes. In addition, the students' improvement in pronunciation in post-test scores after the intervention of intentional phonetic training with an AI-assisted app. Bearing in mind the eight sessions the intervention lasted, this was significant. Phonetic awareness enhances not only their pronunciation and communication but it also strengthens their confidence to speak and competitiveness against themselves. An incidental effect of intentional phonetic training was the improvement in orthography by distinction and discrimination of intonation patterns given by phonetic awareness. Flege *et al.* (1995) found that individuals who had a better understanding of English phonetics had a better comprehension and production of English speech, which also contributes to the development of English proficiency in both spoken and written contexts. Providing students the ability to not only transcribe words in academic contexts like dictation, spelling bee contests, or rapid distinction of words in a speech but also improve their production of the language.

Another area of interest in this paper was the effects of implementing (ASR) technology on language education. The most remarkable effects were the acknowledgement of pronunciation mistakes, personal growth, engagement, improvement of the learning experience, and easy and accurate assessment. Those benefits were an addition to the personalized feedback, convenience, and improvement of listening and pronunciation that the application provides by itself. Moreover, the constant use of the app in English classes would enhance the quality of students' productions, giving their students an insight into self-improvement and personal growth. The automatic assessment, self-study activities, and theoretical explanations are practical utilities of ASR technology in the learning context. Notwithstanding the advantages of this technology the major challenge, as Carrier (2017) mentioned, is the adaptation of teaching approaches and material with this technology in an effective way to leverage their benefits.

The limitations of this study, as with every action research, is that the results are not easily comparable or emulated due to their specific settings and population characteristics. Another limitation was the time constraints. Despite these limitations, to determine the effect of intentional phonetic training with ASR in language learning, we found that eight sessions provided enough time to research the students' mastery of the language. In addition to the previous limitations, the findings may be difficult to generalize as a consequence of the restricted sample size and absence of control over variables. Moreover, the accessibility of devices like laptops or tablets and internet connectivity are aspects to consider when trying to implement this intentional phonetic training with AI-assisted apps. Furthermore, the teacher's expertise in assessing phonetics may be a problem that could be easily solved by the application. Without mentioning limitations like the size of students, resources, and student demographics. Due to those factors, Colombian bilingual schools are not prepared to incorporate technology into their lessons. Additionally, the level of existing English language proficiency among students would impact the effectiveness of this implementation.

Another aspect to consider is the willingness of students to work with ASR apps or learning platforms. However, as evidenced in our research, students were not only willing to engage with the app but they also benefited from it. The overall English language proficiency improved, with an increase of 8% to 12% in students' pronunciation. Thus, this method is a valid teaching style to approach phonetics with new technologies. The repetition of traditional phonetics methods may result in resistant behavior by the students, but the AI-assisted app is the differential component that phonetics teaching could take advantage of to start the widespread use of this discipline in Colombian bilingual schools.

One potential bias that this research may have is the importance of phonetics in bilingual schools. The study of phonemes and the production of proper sounds of another language are not seen as something relevant in the learning process of an L2. Phonetics is not a priority for bilingual schools in Colombia. We could evidence this by the lack of this discipline in the curriculums of lower grades. Moreover, the selection of materials must be careful as most of the material is not made for Spanish speakers. As Le Gal (2019) mentioned: "A textbook that has not been designed specifically for Spanish speakers will not be able to tackle their difficulties with English pronunciation whereas a local textbook can address these through tailor-designed activities" (p 8). This change of mind affects variables like the teachers' preparation, time, and funding that a school may not be willing to spend to implement this project in their curriculum.

6. Conclusion

This action research aimed to assess the impact of the ELSA Speak app in conjunction with IPT (Intentional Phonetic Training) on the English proficiency of 55 Colombian middle school students. Through a pre-test/post-test design, data was collected and analyzed, revealing statistically significant improvements in various language skills, particularly *intonation, fluency, and pronunciation*.

5.1. Descriptive Statistics

- Initial Proficiency Levels: At the outset, a substantial percentage of the students were classified as "Beginner" level, indicating a low baseline in pronunciation and listening skills.
- Post-Test Results: The post-test scores reflected an increase of **8% to 12%**, demonstrating improvement across the board, with many students advancing to the "Lower intermediate" or "Intermediate" level. This represents a clear shift in proficiency.
- *Student Feedback*: Qualitative data from the final questionnaire revealed additional benefits such as enhanced listening, spelling, and self-awareness, further validating the positive quantitative results.

5.2. Inferential Statistics

The change in proficiency was measured by comparing the mean scores of the pre-test and post-test. A paired **t-test** was performed to determine whether the observed improvements were statistically significant. The test revealed a **p-value** of less than 0.05, confirming that the improvements in English proficiency were not due to chance, but to the introduction of AI-powered phonetics training through the ELSA Speak app.

5.3. Correlation Analysis

Weekly progress tracking via Google Forms also showed a *positive correlation* between the number of app sessions completed and the extent of improvement in fluency and pronunciation. This suggests that consistent engagement with the AI tool had a direct impact on the student's language development.

5.4. Implications

These findings demonstrate the effectiveness of integrating AI-assisted phonetic training into language education, offering a viable approach to addressing the challenges of English instruction in Colombian schools. The results also provide a statistical basis for advocating for the expansion of such programs under Colombia's National Bilingual Program (GNP), supported by the Ministry of Education.

In summary, the statistical analysis affirms that the implementation of AI technology, in conjunction with phonetic training, leads to measurable improvements in English proficiency, thereby contributing to a broader digital culture in bilingual education.

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Annexes

Abbreviations

EFL	English as a Foreign Language
ASR	Automatic Speech Recognition
IPT	Intentional Phonetic Training
AI	Artificial intelligence
CEFR	Common European Framework of Reference
EF	English First
EPI	English Proficiency Index

Authors' contribution

Valentina Bohorquez conceived the research idea and designed the study. Led the project, coordinated data collection, and conducted quantitative data analysis, including evaluating the effectiveness of the AI and Intentional Phonetic Training (IPT) integration on students' English proficiency. Contributed to writing the initial draft, revising the manuscript, and interpreting the results. Provided critical revisions and ensured the study's alignment with the research objectives.

Heajin Jung coordinated data collection and supervised the research process. Assisted in developing the research methodology and implementing the AI app (Elsa Speak) for data collection. Conducted qualitative data analysis, including evaluating the effectiveness of the AI and IPT integration on students' English proficiency. Contributed significantly to drafting the manuscript, revising it, and ensuring the clarity and accuracy of the findings. Provided critical revisions and ensured the study's alignment with the research objectives.

Alejandro Sandoval played a key role in supervising the research project and ensuring adherence to ethical standards. Provided substantial input on the research design and methodology, particularly in the application of Automatic Speech Recognition (ASR) technology. Contributed to writing, critical revisions, and final approval of the manuscript.

All authors contributed to administering diagnostic exams for students, identifying areas for improvement, and creating phonology and phonetics lesson plans tailored for 7th and 8th grades. They also systematically collected and integrated data from every English class taught into the study, ensuring a comprehensive analysis of the effectiveness of the AI and Intentional Phonetic Training (IPT) integration.

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Conflict of interest

There are no conflicts of interest in the conduct of this research.

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