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TESIS DE GRADO

How digital strategies can assist voiceless sounds
pronunciation errors made by eleventh year high school
students in the second semester of 2025

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How digital strategies can assist voiceless sounds pronunciation errors made by eleventh year high school students in the second semester of 2025

Trabajo de investigación para optar al grado de
Licenciados en Ciencias de la Educación con mención en inglés

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Resumen

La presente investigación analiza las dificultades de pronunciación que enfrentan los estudiantes de 11mo grado en el uso de los sonidos sordos del inglés, los cuales no existen en español y suelen ser reemplazados por sonidos más familiares. El estudio tiene como objetivo determinar los errores más frecuentes y valorar la efectividad de las estrategias digitales como herramientas de apoyo para mejorar la pronunciación en el aprendizaje de inglés como segunda lengua. La metodología empleada fue de enfoque cualitativo. Se utilizó observaciones, una entrevista y una prueba diagnóstica que se aplicó a estudiantes de nivel secundaria en Estelí, Nicaragua. Se propusieron recursos digitales de una plataforma interactiva, además de inteligencia artificial y test diseñados para practicar la pronunciación mediante actividades auditivas y ejercicios de retroalimentación inmediata como modelos de propuesta. Los resultados evidenciaron que el uso de las estrategias digitales fomenta la motivación y la autonomía y la práctica constante. Los estudiantes demostraron interés en la articulación y reconocimiento auditivo de los sonidos sordos, mientras que el docente destacó la utilidad de las herramientas tecnológicas para complementar la enseñanza tradicional. Finalmente, la integración de estrategias digitales en el proceso de enseñanza aprendizaje del inglés contribuye eficazmente al desarrollo de la competencia comunicativa y a una forma más clara y fluida.

Palabras clave: Pronunciación.; Sonidos sordos; Estrategias digitales; inglés como segunda lengua; Aprendizaje autónomo; Tecnología educativa; Propuesta digital.

Abstract

This research analyzes the pronunciation difficulties faced by 11th grade students in using English voiceless sounds, which do not exist in Spanish and are often replaced by more familiar sounds. This study aims to determine the most frequent errors and assess the effectiveness of digital strategies as a support tool for improving pronunciation in learning English as a second language. A qualitative approach was used as the methodology, observations and interview and a diagnostic test were administered to high school students in Estelí, Nicaragua. Digital resources were proposed from an interactive platform in addition to artificial intelligence and test designed to practice pronunciation through listening activities and immediate feedback exercises as a proposal model. The results showed that the use of digital strategies encourages motivation, autonomy, and constant practice. Students demonstrated interest in their articulation and auditory recognition of voiceless sounds, while teachers highlighted the usefulness of technological tools to complement traditional teaching. Finally, the integration of digital strategies into the English teaching and learning process effectively contributes to the development of community competence and clearer and more fluid speech.

Keywords: Pronunciation; Voiceless sounds; Digital Strategies; english as a second language; Autonomous learning; Educative Technology; Digital proposal.

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1. Introduction

The present research titled “*How digital strategies can assist voiceless sounds pronunciation errors made by 11th year high school students in the second semester of 2025*” investigates the nature of these pronunciation challenges among students at high school. It aims to identify the most recurrent voiceless sounds errors and evaluate the effectiveness of such strategies as a tool for pronunciation improvement. The study also seeks to provide teachers with practical resources and techniques to enhance their instructional practices in pronunciation teaching as English continues to gain importance. In academic, professional, and international context, it becomes very important for learners to achieve a functional level of phonological competence. Besides, traditional classroom methods often fail to provide sufficient individualized feedback or interactive opportunities for practicing.

Pronunciation plays a significant role in the communicative competence in English as a foreign language. Voiceless sounds often present huge challenges for high school students. Voiceless sounds are necessary to achieve coherence and clear communication. Because of the interference of student’s mother tongue, limited phonetic instruction, and lack of guided practice, such pronunciation difficulties can affect student fluency, confidence, and academic performance.

Following this context, it was decided to propose digital tools on Nativo website which allows students to receive immediate corrective feedback so that they can engage in repetition and modelling exercises. Also, they can simulate real conversations. The relevance of this research lies in its potential to bridge the gap between students, current pronunciation skills and the demands of real-world communication. This website will integrate innovative tools into the EFL classroom so that teachers can offer a more accessible, flexible and autonomous way to improve pronunciation, particularly in environments with limited exposure to native speech models.

Finally, the statement of the problem, justification objectives and research questions were developed to define the direction and purpose of the study. Following this, the methodology outlines the type and design of the research, the selected theoretical sample, subjects of the study, as well as the instruments used for data collection. These include an interview, a diagnostic test and observations. To ensure triangulation of data, the research process was divided into several phases allowing for qualitative analysis of student’s performance after exposure of digital strategies tool.

2. Background

2.1 International

Cenoz & Lecumberri (2007) decided to examine how important teaching phonetics and phonology was to improve pronunciation in people who wanted to learn the language. They used a qualitative approach and analyzed every class, also mentioning that they were observing and interviewing English teachers. The sample consisted of teachers who taught English as a second language, at several institutions. Time later, the study showed how students who received special training in phonology were able to improve their pronunciation instead of those who did not receive the class. This could demonstrate that having a knowledge in phonology might help a lot to those students who wants to control the language more efficient.

Herwings (2004) said that “pronunciation errors affect communication effectiveness in a second language”. Based on that, it was decided to implement a quantitative analysis using surveys for students about their perceptions of communication. The sample were ESL students. They found out that there were barriers they couldn’t cross because of lacking communication. This concluded that a clear pronunciation is important to avoid misunderstandings, and improving communication in a more effective way.

Van Maastricht et al. (2017) decided to focus on studying the influence of intonation, rhythm and speech rate on the perception in German. On this experimental study, the professor observed native German listeners evaluating speech from Spanish speaker who were trying to learn German. The sample included they both, German and Spanish speakers. This study indicated some errors in prosody, like unnatural intonation or inappropriate speech. It significantly affected how comprehensible the speech was perceived to be. It concluded that focusing on these prosodic aspects is important, overall, when someone tries to learn a second language, so that communication can be more meaningful.

Neri et al. (2008) thought about the impact of digital technology just like ASR system on improving pronunciation of words in ESL students. This was a quantitative approach, where it was used a speech recognition tool where students could practice in real time. The sample is not determined, but they were students who used to practice pronunciation using this tool. This allowed students to become autonomous, have self-study, and it significantly improved their domain in the language. Finally, they used this as an extra tool to practice some English when nobody is around.

2.2 National

Mentioning national backgrounds, a study in Nicaragua made by Quintanilla (2016) with the UNAN support analyzed all the technological tools available. The main objective was doing an examination about how digital resources improve language acquisition. This was a descriptive and analytical approach, and the sample consisted of 190 students and 7 teachers. Based on the statistics shown, the most used technological tools were audio recorders (50%) and projectors (37%). This concluded with an important impact when using such tools, because they feel more engaged and motivated when it comes talk about educational process.

Continuing with national backgrounds, the National Association of the Deaf of Nicaragua (ANSNIC) launched a project called “Señas en Linea” in (2011). This was focused for deaf students living in Nicaragua, it included an online DVD with sign language and online courses. The Project also included the creation of a website and digital materials, focusing on individual needs, so that family, teachers and interpreters could use the website in a easier way. The sample was very wide, it consisted on 12,000 people, improving their skills in the language so that they could communicate with deaf people. Even though this was focused on sign language, it also showed a way to learn a second language for sharing happy moments no matter the barrier of the language.

It is important to mention that in the last years many studies have highlighted the use of technology in phonetics problems. This is not only a easy way to learn something, but this also keeps students more engaged in the learning process. A study conducted by Nomass (2013) in Iraq pointed that integrating technology to English as a second language improve student participation and motivation, and eventually it makes more effective the language acquisition. It also mentions that the use of applications, multimedia and online resources let students practice in a personalized way, so that they can receive immediate feedback.

3. Problem Statement

Learning English as a foreign language presents a serious problematic to eleventh year-high school students, this time focusing on voiceless sounds. These sounds are highly important to be able to speak the language in a right way without misunderstandings. These difficulties when articulating some sounds affects the fluency and comprehension in spoken communication. Native and even nonnative speakers often misunderstand phrases, and this can provoke frustration and eventually become a source of insecurity.

After a Deep review made by Celce-Murcia et al. (2010) it is concluded that one of the big challenge when pronouncing voiceless sounds is that “there are some sounds that does not exist in Spanish or are articulated differently”. They also mention some examples as: *Think, Ship, Stop*. As it is seen, some people in Nicaragua and probably all America add a vowel in words which starts with a consonant. Even if a native speaker understands the word, this pronunciation is totally wrong and can become a reason for others, including native speakers, to laugh.

Another factor is the lack of phonetic instructions. Kelly (2000) talks about this, and she mentions that “many digital programs designed for English learning fail to systematically incorporate pronunciation training”. This problematic leaves students without strategies to fight against this problem. They only focus on grammar and vocabulary, and do not give them enough importance to phonetics so it stays only superficial and with not enough feedback to learn.

Another important problematic it is necessary to take in consideration is the limited exposure to native English speakers or environment. As Gilbert (2008) mentions, “the insufficient interaction with native speakers could be a huge limitans when we live in our first language environment”. It is important to mention that the influence of orthography plays a significant role as well. As children, young and adults it is common to write in a bad form and not being able to change that just because everybody understands. However, omitting important consonants can change the meaning of a whole sentence whether it is good or bad.

The main focus of this study is to show how digital strategies can assist these pronunciation challenges in a funny way, attractive and something that promotes self-study. As it was mentioned before, the perception of poor pronunciation can impact the confidence of students, this way it can also limit their participation in class, oral presentations and even future job opportunities. This insecurity often leads them avoid speaking English, seriously restricting development in the language.

4. Justification

The present study aims to provide a possible solution to the issue at hand by examining the limitations of traditional teaching methods, which often struggle to address pronunciation difficulties effectively. Therefore, the use of digital strategies such as interactive websites and language learning apps, present an innovative tool to providing structural pronunciation practice and instructional resources. These digital tools can offer students the opportunity to practice pronunciation autonomously and receive immediate feedback.

These strategies can serve as a complimentary resource for both students and teachers offering.

- ✓ Interactive exercises allowing the student to practice alone.
- ✓ Audiovisual resources, just like audios, complete the sentence and pronounce words.
- ✓ Managing students' progress.

Also, this document justifies its relevance by proposing digital tools on a website that help students to improve their pronunciation of voiceless sounds. The study recognizes that traditional methods of teaching pronunciation may not be sufficient to address these challenges, so the use of technological tools provides an effective and accessible alternative.

English continues gaining more importance in schools and because of this, digital technologies gains relevance as well by providing a support for language acquisition. Through these resources, it is seeking to improve student's fluency, confidence and communicative competence, making easier the integration into academic and professional stages where English is needed.

Besides, this study investigates the main pronunciation difficulties related to voiceless sounds in EFL learners, focusing on students from beginners to intermediate English. Especially, the study will explore how interactive in digital platforms can support long-term retention and self-correction of voiceless sounds in real communication and scenarios. Ultimately, this research seeks to contribute to the development of more effective digital strategies for teaching pronunciation in EFL classrooms, thereby fostering greater fluency and confidence in English language learners.

5. Research's Objectives

5.1. General objective

To analyze how digital strategies can improve 11th-year-voiceless sounds pronunciation errors in English as a foreign language.

5.2. Specific objectives

To identify the most common pronunciation errors in voiceless sounds made by EFL learners and their influencing factors.

To describe the effectiveness of digital strategies for teaching voiceless sounds in English.

To propose digital tools on a website for improving voiceless sounds pronunciation errors made by 11th-year high school students.

6. Study limitations

This study presents some limitations associated with factors that may have influenced the results obtained. First, the limited access to technology in the school selected to apply the digital instruments. Also, the level of English of the students of 11th year was a little low because they did not have the motivation to learn English except a few ones, this also affect the motivation to receive the class and even solving a test. Adapting digital tools for specific purposes was needed because of the lack of vocabulary they did not manage, this way the words they did not know were more than it was expected to be.

Students' behavior was disappointing at some point, and it was needed to find a better way to teach a class so that they could pay attention to any activity. Overall, the limited motivation and exposure to English environment is useless, and it's hard to manage their progress after the timeline stipulated. Even though some children were really motivated to learn, the other ones were just, in other words, lost in space. However, after all those limitations, the selected sample was respectful, organized and showed interest during the process. As anything, there will be always bad situations, but with patience and time, anything is possible.

7. Research Assumption

Using digital strategies significantly improves the pronunciation of voiceless sounds in English, and it allows students to practice constantly while receive immediate feedback and strengthen their communication confidence.

Students feel more motivated, make groups of study and practice more actively developing their autonomous learning. Also, their issue when pronouncing words have become a minor problem.

8. Category Matrix

Specific Questions	Specific Objectives	Category	Definition	Sub-Category	Instruments	Source Information
What are the most common pronunciation errors in voiceless sounds made by ESL learners?	To identify the most common pronunciation errors in voiceless sounds made by ESL learners.	Linguistics	The science that studies language and everything related to it. (Porto & Merino, 2023)	Phonological Difficulties	Diagnostic Test, Interview	Students Teacher
How to describe the effectiveness of digital strategies when teaching voiceless sounds in English?	To describe the effectiveness of digital strategies for teaching voiceless sounds in English.	Technological-pedagogical integration	Educational model which describes the intersections between technology and the content for the effective integration of technology into teaching. (Koehler & Mishra, 2007)	Digital platform and resources evaluation	Observation, Interview	Students, Teacher

How the proposal of digital tools on a website helps improving voiceless sounds pronunciation errors made by 11th-year highschool students?	To propose digital tools on a website for improving voiceless sounds pronunciation errors made by 11th-year highschool students.	Communicative Competence	The ability to effectively use the language in several social aspects, focusing on the appropriate pronunciation of the language in different contexts. (Pilleux, 2001 - 2003)	Interactive oral and listening training	Interview Observation	Teacher
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9. Research Questions

9.1. General Question

How digital strategies can help 11th-year-highschool students to improve their pronunciation errors of voiceless sounds in English as a foreign language?

9.2. Specific Questions

- What are the most common pronunciation errors in voiceless sounds made by ESL learners?
- How to describe the effectiveness of digital strategies when teaching voiceless sounds in English?
- How does the proposal of digital tools on a website help improve voiceless sounds pronunciation errors made by 11th-year high school students?

10. Theoretical Framework

10.1. Phonetics and Phonology

As Peter N. Ladefoged (2025) said, “phonetics is the study of speech sounds and their physiological production and acoustic qualities, focusing on how these sounds are produced, transmitted and perceived by the human ear”. It covers three main aspects: The way sounds are made using lips and tongue, the physical properties of sounds and how sounds are perceived by the ears and processed in the brain.

However, based on Roach (2009) “phonology is concerned with the abstract sound of the language”. This means phonology looks at elements such as phonemes, which is the smallest unit of sound that can distinguish meaning as well as combination, stress and intonation.

Phonetics and phonology are very essential for improving English pronunciation. Deciding to learn the phonetic alphabet and put an effort to understand the phonemes will significantly increase the ability to pronounce every word more accurately. Besides, this not only improve comprehension but also make easier to master the rhythm, stress patterns, intonation. This was the conversation becomes smoother and much more effective.

Moreover, gaining knowledge of these technical aspects empowers students to speak with greater confidence. Being able to understand how sounds are produced and how they change depending on accent or intonation it's important to avoid a bad understanding that can change the meaning of words or sentences. So that, phonetics and phonology not just support clear pronunciation but also build a strong confidence in every learner. This allows learners to express themselves in a natural way and with no fear, making their language journey enjoyable and successful.

10.1.1. Importance of pronunciation

In daily life, pronunciation plays an important role in English language acquisition, it somehow influences the student's ability to communicate in a clear way. This is not about imitating native speakers but achieving a new ability, making sure that speech is easily understood in real world interactions. Students who struggle with pronunciation often have misunderstandings, have failures and a serious decrease in speaking.

Now, Gilakjani (2016) mentions "mastering pronunciation goes beyond individual sounds", of course it involves being able to understand stress patterns, intonation, connected speech, etc. However, pronunciation is a central part of language instruction, as it is important for improving fluency.

As a reflection, it is said that pronunciation is an important aspect of learning English because it impacts the clarity of communication. Small differences in pronunciation can change the meaning of a word. Besides, a precise articulation of sounds is important, to make sure that the message is said without confusion. Following this, key elements like stressed words, intonation and rhythm contribute to the natural flow of speech and help not only the literal meaning but also the emotion and emphasis. For example, questions are pronounced with a rising intonation, while normal sentences usually have a falling tone, guiding the listener's interpretation and facilitating mutual understanding.

Also, things like pause in sounds play a specific role in spoken English, they contribute to a more natural and coherence oral communication. Making these kinds of pauses when used appropriately prevent the information from looking unclear, while linking sounds create a smoother and more fluent speech. It is important to mention that a strong accent or mispronunciation can sometimes decrease a learner's confidence. Working on a clear pronunciation not only improve communication but also builds the speakers' self-esteem and comfort using the language. Although pronunciation may be something that there's nothing to be worried about by some learners, it is a serious component for achieving effective, engaging and meaningful spoken interactions.

10.2. Voiceless Sounds

According to Kenneth Beare (2024) “Voiceless consonants do not use the vocal cords to produce their hard, percussive sounds. Instead, they're slack, allowing air to flow freely from the lungs to the mouth, where the tongue, teeth, and lips engage to modulate the sound”. During their articulation, the vocal folds remain apart, allowing air to flow freely through the glottis. These sounds are shaped by the articulators such as tongue, lips, teeth without engaging the laryngeal muscles that produce vocal fold vibration. Common voiceless consonants in English include /p/, /t/, /k/, /f/, /s/ and /ʃ/. Each of these sounds relies on a particular type of airflow obstructions to point stop in bold and a complete closure followed by release, while fricatives are created by forcing air through the narrow constriction, resulting in audible friction. Voiceless consonants are crucial in distinguishing meanings in English, as they often form minimal pairs with their voiced counterparts. Voiceless sounds are in all word positions and are influenced by various connected speech phenomena. Controlling the pronunciation of these sounds is important for a better understanding, especially from non-native speakers.

Based on Ladefoged (2025), the correct pronunciation of voiceless sounds is necessary for clarity, fluency and for successful oral communication in academic and professional contexts. An explicit instruction and auditory discrimination training are often necessary, because voiceless sounds are not only phonetic realities but also carry significant communicative value in English.

Tabla 1

Voiceless Sounds

Sound	Example Sound	Example Word
/p/	“p”	Pen
/t/	“t”	Tea
/k/	“k”	Cat
/f/	“f”	Fan
/θ/	“th”	Think
/s/	“s”	Sun
/ʃ/	“sh”	Shoe
/tʃ/	“ch”	Check

10.3. Acoustic Features of Voiceless Sounds

Voiceless sounds are acoustically distinct due to the absence of vocal fold vibration during their production. According to Johnson (2012) “the lack of periodic energy means their acoustic signature is dominated by noise rather than pitch or harmonic”. As a result, they tend to be less intense and more variable. Voiceless sounds can be clearly identified in spectrographic displays through other acoustic cues.

Voiceless aspirated stops, like English /p/, /t/, and /k/, exhibit longer VOTs, typically above 30 milliseconds while unaspirated stops have shorter ones. The burst following the stop release produces a sudden spike in high frequency energy which is often followed by a period of aspiration noise and unaspirated stops. These features help listeners distinguish voiceless stops. (Peter Ladefoged, 2014) Voiceless fricatives are acoustically marked by a continuous stream of a periodic noise. Additionally, the duration and intensity can also vary depending on context and speech rate.

Based on Raymond D. Kent (2002) “the acoustic analysis of voiceless sounds is essential in both theoretical and applied phonetics”. Using tools like spectrograms and wave form displays, linguistic and speech pathologist can measure aspects such as noise duration and energy intensity. The study of voiceless sounds thus bridges the gap between linguistic theory and real-world application.

10.3.1. Types of Voiceless Consonants

These voiceless consonants can be divided into categories based on how and where the sounds are produced in the vocal tract. The most common signs are plosives (also known as stops), fricatives and affricates. Voiceless plosives like /p/, /t/, and /k/ are articulated by momentarily blocking the airstream and then releasing it abruptly. In contrast, voiceless fricatives, such as /f/, /θ/ and /s/ are created by narrowing the airflow passage which causes turbulence as the air moves through a tight space.

Roach (2009) adds that affricates, like ‘tʃ’ in church, begins as plosives but relates into fricative blending the characteristic of both categories. These sounds require a more difficult coordination between different parts of the vocal tract. However, plosives and fricatives are more commonly used among languages, and affricates are kind of frequent but still important for forming specific words and sounds. Having control is particularly important for language learners and professionals in phonetics and phonology.

Based on Raymond D. Kent (2002) the analysis of voiceless sounds is important. He mentions that “tools like spectrograms and wave forms displays linguistic and speech pathologists can measure aspects such as noise duration, spectral speak location and energy intensity.” This not only deepens our understanding of how sounds are produced and perceived but also plays a specific role in speech disorders and improving speech recognition technology.

10.3.2. Voiceless sounds in different English varieties.

As Ladefoged (2015) said “voiceless consonants in English are produced without vibration of the vocal cords”. These sounds are definitely presented in all dialects of English, but their pronunciation may vary depending on the variety. For example, in general American English, the /t/ in words like *butter* is often pronounced as a flap. On the other side, British pronunciation is a clear /T/. It shows how the spelling of some words can change depending on the place you’re located at.

In certain African and Southeast Asian English varieties final sounds such as /d/ and /g/ may be pronounced as their voiceless counterparts, making minimal pairs like *bad* and *bat* sound quite similar. This often shows the influence of native phonological systems that do not contrast voiced and voiceless in final positions. Roach (2009)

While many English sounds similar like those in Spanish, some like the /th/ sound in words like ‘think’ or ‘this’, and the /v/ sound in ‘very’ do not exist in Spanish and can present unique challenges for learners. Other examples include the /sh/ sound in ‘shoe’ and the /ch/ sound in ‘check’, which is different from typical Spanish pronunciations. Although these sounds are not part of Spanish phonetics, they are important for achieving a better pronunciation. It is as important to practice them as having control on these sounds, because this is the key for speaking confidently and avoiding misunderstandings in communication. Reading in English with repeated pronunciation practice, can be helpful in developing these new skills and making sure a more authentic and effective spoken English.

10.4. Most Common Pronunciation Errors in Voiceless Sounds

English learners often have problems with voiceless consonants, particularly the dental fricatives. These sounds are relatively strange in other languages, and this allows substitutions such as /s/ or /t/. Ending improvements in pronunciations like ‘sink’ for ‘think’ or ‘tin’ for ‘thin’. Some substitutions can cause misunderstandings, especially in contexts where minimal pairs are involved. Another common problem is skipping final voiceless consonants such as /t/ and /k/. The learners entirely replace them with voiceless counterparts turning ‘back’ into ‘bag’ or ‘hat’ into ‘had’. This influences the learner's native language phonology where final consonants may not be as important or may follow different voicing rules. Learners might add extra vowels to break up clusters pronouncing ‘street’ as ‘es-treet’ or ‘school’ as ‘es-chool’. This insertion disrupts the natural rhythm and syllable structure of English, potentially struggling comprehension. Team (2025)

Tabla 2

Voiceless Consonants

Sound	Example Sound	Example Words
/w/	“wh”	Which, Where
/θ/	“th”	Thought, Thin
/s/	“s”	Small, Sweet
/ʃ/	“sh”	Shape, Share
/tʃ/	“ch”	Chess, Cheer
/f/	“f”	Four, First

10.4.1. Interference of the native language

The interference of the negative in this case is Spanish, significantly influences the production and perception of voiceless sounds in English. According to Frontera & Romito, (2015) Spanish speakers tend to transfer phonetic patterns from the native language, often substituting or modifying sounds that do not exist in Spanish, such as /θ/ pronounced as /s/ or /t/, and /p, t, k/ initials that lack aspiration. This transfer not only affects production, but also the perception of minimal pairs in English, making it difficult to distinguish between voiceless and voiced sounds.

Additionally, the syllabic rhythm of Spanish interferes with the duration and strength of unvoiced consonants, which highlights the need for specific phonetic instruction to minimize these errors.

10.5. Technology

Based on Copeland (2025), “technology is the application of scientific knowledge to achieve practical objectives in human life, particularly in altering and managing the human environment”. It involves a wide range of tools, systems, techniques and process design to solve problems and improve efficiency and enhance the quality of life. From the invention of simple tools in prehistoric times to the development of advanced digital systems and artificial intelligence, technology has played a central role in human progress. Today, technology not only refers to physical devices and machinery but also includes intangible innovations such as softwares, algorithms and systems of organization and communication. It influences every aspect of modern life, education, healthcare, transportation, communication, industry and beyond how societies function and individuals interact with the world.

10.5.1. Technology in Education

Technology has redefined social, professional and educational dynamics in the 21st century. Each application across several fields has proven to be a powerful resource to facilitate processes, optimize tasks, and expand access to information. Technology in education has not only modernized teaching methods but has transformed the learning experience, this is not only about websites but projectors and that kind of tools that make classes much more attractive, interactive, autonomous and personalized with multiple resources that everybody can use.

10.5.2. Technology in English

Based on Bates and Poole (2003) In teaching English as a foreign language, technology has opened new avenues for developing language skills tools such as online dictionaries, pronunciation apps, speech recognition software and video conferencing platforms enable learners to practice the language in real or simulated context. Additionally, access to authentic content like series, movies, songs, articles, and podcasts in English significantly improves listening comprehension and exposure to the language. This digital environment also promotes collaborative learning through

online communities where students can interact with native speakers and other language learners, thus strengthening their communicative and social cultural skills.

10.5.3. Website definition and types.

Based on Chappelle (2017) “A website is a structural collection of interconnected pages containing information and resources accessible via internet”. In education, websites are used to share teaching materials, assignments, interactive exercises, assessments and links to external content. There are various types of digital platforms that function as complementary or central tools in teaching learning process. These include virtual learning environment, language learning, mobile application, video conferencing platforms, academic forums, and collaborative networks.

Choosing an appropriate platform requires considering multiplayer criteria such as ease of navigation, accessibility from different devices, availability of multimedia resources, capacity for timely feedback, visible achievements. An essential factor for effectiveness of these platforms is their ability to foster motivation and active engagement from users. This is achieved through elements like gamification, visible achievements, immediate feedback and sense of progress, all of which encourage greater students’ commitment in digital learning environments.

10.6. Digital strategies for teaching voiceless sounds.

10.6.1. Duolingo – Gamified Language Learning

The Duolingo platform contributes significantly to the development of pronunciation in foreign language learners using speech recognition technology. This tool allows users to practice the correct pronunciation of words and phrases while receiving immediate feedback on the phonetic aspects. Such feedback helps with real time error correction and promote gradual improvement in the regulation of selected language. (Blanco, 2024)

Duolingo is a very popular app that offers courses in more than 40 languages such as Spanish, French, Japanese, and even less common languages such as Klingon. The app uses a learning approach that I use, i.e. it incorporates game elements such as experience points, streaks, rankings, and badges. To motivate users and make learning more engaging.

Lessons are made to be interactive and include reading, writing, listening, and speaking skills. Duolingo uses speech recognition technology to give immediate feedback on pronunciation and improve speaking ability. The platform has also added an energy system and that replaces the old heart system. This mechanism allows users to regain power by completing choices in a row.

In addition, Duolingo includes features such as interactive stories, podcasts to improve listening comprehension and language understanding in context. Its free version guarantees access for everyone, while the super Duolingo premium subscription offers an ad-free experience with extra benefits.

10.6.2. ChatGpt - AI

ChatGPT is an advanced artificial intelligence model created by OpenAI, designed to understand and generate human-like text through interaction with natural language (Ai, 2023). Due to its ability to provide coherent and contextual answers, it became a very useful tool in educational settings. Unlike traditional chatbots, ChatGPT can conduct conversations, clarify doubts and give detailed explanations in real time. These features make it a valuable resource for language learning environments where communication, interaction and meaningful feedback are essential.

In the context of learning English, ChatGPT supports the development of key language skills, such as grammar, vocabulary, writing and reading comprehension. Students can ask questions, practice sentence formation and receive immediate feedback, which encourages autonomous learning and continuous improvement (Kohnke & Jarvis, 2023). Furthermore, this technology can help reduce anxiety in language practice, because students can communicate privately without fear of making mistakes in front of others (Fitria, 2023). ChatGPT can simulate communication in real life, provide vocabulary appropriate to the context and guide users in self-correction, complying with current approaches to instruction in communicative language.

For teachers, ChatGPT functions as a learning support tool that can help design lesson materials, create interactive exercises, generate explanations and adjust tasks to different levels of knowledge. Instead of replacing teachers, this technology functions as a complement to traditional pedagogy, helping educators to save time, personalize learning and promote active student engagement. The integration of artificial intelligence in the classroom reflects modern trends in digital education and contributes to more flexible, accessible and student-oriented learning experiences.

10.7. How digital tools in pronunciation help learners use voiceless sounds correctly in real conversations.

10.7.1. Artificial intelligence

Craig (2024) argues that artificial intelligence (AI) is the ability of systems computer science to mimic in an independent manner the abilities of humans, including learners, reasoning in error correction. AI has been used in many areas, along with systems experts, natural language processing, language recovery, computer vision in one creative in ChatGPT in Practice. One cause of growth in this technology is to promote other AI-based products, but in reality, there are existing technologies that are used automatically. By applying the AI correction, use specific programs and machinery that create permethrin in internal algorithm complexes. Still, it does not have a single unique language of programming named per IA, programming languages such as Python and C++ are favored by developer because of their versatility and efficiency.

10.7.2. Use of Ai and speech recognition for pronunciation practice.

The modern applications for learning idioms that are artificial intelligence is to restore connections to students who are immediate and personal about the pronunciation. This technology is especially beneficial for mastering voiceless consonants, such as /p/, /t/, /k/, /f/, /s/ and /θ/, which are not difficult to understand by language.

ChatGPT, developed by OpenAI, has introduced an advanced voice mode that facilitates real-time, voice-to-voice interactions. This feature allows learners to share spoken conversations with the AI, and receive instantly feedback on their pronunciation. The ability of the system to understand and generate human speech cares users with a platform to practice and refine their articulation of voiceless sounds in a natural conversational context. (Weatherbed, 2024)

10.8. Challenges educators face when using digital tools.

Integrating digital tools into pronunciation instruction, especially for voiceless sounds, poses several challenges for educators. These challenges include technical limitations, pedagogical issues, and student engagement issues. (Atabek, 2019)

10.8.1 Technical Limitations

A big problem with using digital tools in learning pronunciation is the lack of a good technological infrastructure. In many educational settings, especially in resource-poor settings, there may not be sufficient access to fast internet, modern computers, or specialized software. All of this complicates proper pronunciation practice. Advanced tools, such as programs that display voice visualizations or computer training systems, need a stable and fast internet connection to function well.

10.8.2 Pedagogical Integration

Integrating digital tools into current curricula is a challenge, because these tools must complement traditional teaching studies and adjust to the learning objectives for teachers. It can be helpful to include digital advocacy activities in classes without disrupting the normal rhythm of teaching. In addition, the content offered by these digital tools may not always match students' needs or skill levels, necessitating careful selection and adaptation by educators.

10.8.3 Teacher Education and Familiarity with Technology

The successful integration of digital tools in pronunciation teaching depends a lot on the ability of teachers to use these technologies. However, many teachers may not have received sufficient training to handle digital resources well. This lack of experience can lead to limited or incorrect use of the tools. I think it reduces their profits. In addition, depending on the right training, teachers may struggle to choose the digital tools that best suit teaching objectives, which can result in less effective or poorly organized classes.

10.8.4 Student Engagement and Motivation

Although digital tools can improve the learning experience, they cannot increase student motivation on their own. Their effectiveness depends on whether students find them useful and relevant. If they do not see clear benefits in using it or do not find it interesting, they may not fully participate or make an effort to improve their pronunciation. Therefore, educators must actively promote the value of practicing pronunciation with these tools and ensure that they are engaging and interactive and in line with students' interests.

10.8.5 Assessment and Feedback Mechanisms

Giving clear and timely feedback is essential in teaching pronunciation. Although digital tools can automate this process, sometimes they do not understand the context or nuances of pronunciation errors as well as a human teacher. This can cause overly general or even incorrect comments. This feed shows the importance of combining digital tools with teacher supervision to ensure that feedback is accurate, useful, and pedagogically sound.

While digital tools offer promising ways to enhance pronunciation instruction, effective implementation is required to address these challenges. Educators should ensure that technological resources are accessible, aligned with pedagogical resources, goals and are thoughtfully integrated into the curriculum. In addition, ongoing professional development and support are essential to equip teachers with the skills needed to navigate digitally effective aids in teaching pronunciation. (Soto, 2016)

11. Methodological Design

11.1. Approach Assumed

This study adopts qualitative research, as Bhandari (2020) says “Involves collecting and analyzing non numerical data”, Aimed at interpreting and understanding how the Italian strategy is inflow, the improvement of voiceless sounds, pronunciation of eleventh grade students. The investigation seeks to gain an in-depth perspective of this phenomenon by analyzing participants' perceptions and experiences, emphasizing contextual and subjective exploration.

11.2. Area of Study

This research is situated within the field of Educational Sciences and Humanities as established by UNAN-Managua in its academic program offerings. It focuses on the teaching and improvement of English pronunciation, particularly in the articulation of voiceless consonants by high school students learning English as a foreign language.

11.3. Research Line

This research falls under the research line CED - 1 Education for Development, in accordance with the institutional research policy of UNAN – Managua. The (UNAN/Managua, 2021) promotes studies that contribute to educational quality and innovation.

11.4. Research Subline

The evaluation of learning corresponds to the research Subline CED - 1.7: Educational Innovation and Technologies as the study aims to analyze how different types, techniques, and instruments of evaluation contribute to achieving effectiveness and relevance in learning. It integrates assessment strategies as pedagogical tools to strengthen the teaching - learning process in Nicaraguan secondary education.

11.5. Geographical Area

The research will be conducted at a particularly high school in Estelí, Nicaragua, during the second academic semester of 2025.

11.6. Theoretical sample and subjects of the study

The theoretical sample of this research comprises all (35) eleventh - grade students enrolled at some school in Nicaragua, situated in the city of Estelí, Nicaragua. The subjects of the study selected includes 7 students. From this group, as well as one teacher who is directly involved in the instructional process.

Tarsi (2012) said that “A population can be described as a collection of individuals from the same species that inhabit and reproduce within a specific region. Individuals in a population typically share the same resources face comparable environmental challenges and rely on one another for long - term survival.”

According to QuestionPro (2025) “a sample refers to a smaller collection of data that a researcher selects from a larger population using a predetermined selection method. These elements are often Called sample points, sampling units, or observations.”

Tabla 3

Sample and Instruments

Theoretical sample	Subjects of the study	Who	Techniques
35 Students	7	Students	Diagnostic Test, Observation
1 Teacher	1	Teacher	Interview

Selection Criteria

Participants

The participant pool includes 11th grade students exhibiting specific difficulties with English voiceless consonants production and EFL instructor currently using our expressing interest in implementing digital teaching tools.

For Students:

- Active enrollment in 11th grade. (2025-II)
- Demonstrate challenges with voiceless sounds of articulation.
- Prior experience or willingness to engage with digital resources.

For Teacher

- Current English faculty status at the institution.
- Willingness to participate in interviews and classroom observations.\

Sampling Strategy

Al-Ruwaili (2022) states that the sampling approach is crucial for enhancing how well the sample represents the population and how widely the findings can be applied. Convenience sampling, a type of non-probability method, involves choosing participants from the intended group due to their accessibility.

Nikolopoulou (2022) describes a purposive convenience sampling as “a non-probability sampling method where units are selected for inclusion in the sample because they are the easiest for the research to access.”

11.7. Methods, techniques and instruments for data collection.

Diagnostic Task

According to Levis, (2021) “a diagnostic pronunciation test is a tool used to identify a student's specific strengths and weaknesses in the perception and production of sounds in a second language”. These tests help teachers understand students' needs and tailor instruction and accordingly. This technique was applied to students using a practical test.

First, authorization was requested by the management of the Institute to be able to carry out the activity outside the classroom. Once approval was obtained, the students were organized individually to ensure that each one participated in an orderly manner and without interruptions from the rest of their classmates. Each student was given a worksheet and content in the list of previously selected words. These words had been chosen for the purpose of identifying common errors in English pronunciation. Especially related to voiceless sounds, which are usually more complex for those who learn this language as a second language.

Afterwards, they were asked to read aloud each of the words included in. In the meantime, a direct and detailed observation of its pronunciation was made, taking note of the gentlemen who generated the greatest difficulty. This process allowed for precise recording of which phonemes students tended to confuse or could not produce correctly. From these results it was possible to obtain relevant information about the level of organization of the participants and their need to reinforce certain specific sounds of the English language.

Observation

Pūtaiao (2014) highlights that an “Observation is Essential in science. Scientists use observation to collect and record data, which enables them to develop and then test hypothesis and theories.” This technique was applied to students using a guide observation.

Again, permission was requested from the principals so that students could go out to the playground and use their phones during activities. Once they gave permissions, they explained to the students what they were going to do, how much time they had and why each activity was important.

The first activity was an assessment using Duolingo. Before starting, students were taught how to enter the application, how to follow the instructions on how to answer the exercises. It was also checked that everyone had an internet connection and that their phones work well. The evaluation had exercises of listening, reading and choosing the answers. The app carries everything in a clear way so that for what students could do without problems. Thanks to this activity, it was possible to see which students would have the best sounds and which had more difficulties. Duolingo was good because it's an interactive app and keeps students' attention.

Then the second activity was carried out, which consisted of using a program designed to practice sounds without voice. First, he explained in a simple way what a prompt is and how it was going to help him practice pronunciation. In the prompt, students could see and hear words and repeat the sounds. The most useful thing was the feedback, which was immediate. The tool decides if the sound was right or wrong. Thus, the students could repeat several times until they achieved a better pronunciation.

Interview

Puri, (2024) said that “an interview is a formal conversation between two or more people, typically with one person, the interviewer, asking questions to obtain information assess qualifications or evaluate the suitability of a candidate for a job, admission, or other purposes.” This technique was applied to the teacher using a guide interview.

After showing the teacher the results obtained with us the 2 instruments and allowing him to test the digital tool that was being proposed, an organized interview was conducted with several important questions. This interview had 3 parts and its purpose was to recognize the opinion of teachers on the use of digital strategies, to better understand which sounds were most difficult for students and to analyze how a digital proposal could help to improve this situation.

In the first part of the interview, he went with the sounds that students have the most difficulty identifying or producing. The teacher wrote examples and showed that these difficulties will be clearer and which allowed a better understanding of the problem. In the second part, we sought to know what the teacher thought about digital tools within the teaching process. He was asked if he thought these tools could help students pay more attention, engage more, or motivate themselves in class. We also wanted to know if he saw these tools as a useful support in his daily activities.

Finally, in the third part, the educational proposal with digital tools was discussed. They talked about whether this proposal could work well, what benefits it could have for students and what changes would be necessary to adapt it in the best possible way.

11.8. Quality Criteria Applied

11.8.1 Focus on continuous improvement.

This research meets this criterion because it seeks to develop students to develop their English in an effective way by encouraging them to practice their English autonomously and in classes through digital strategies and even proposing tools to make their learning more practical, dedicated and fun. He explains that it is something that is not only for student use, but also something that can be used everywhere. The quality of the student's learning is guaranteed by the same systematic monitoring of digital strategies. (UNAN, 2024, p. 17)

11.8.2 Participation and commitment of the protagonists.

The voice and criteria of each student and teacher is considered in this document, to give it an appropriate and more dedicated focus to the individual learning of each of the participants. In addition, it is a commitment of each one to be dedicated to the quality and participation of these processes. This research fulfills this because it seeks to include everything and everyone in order to obtain a more exact knowledge in the branch that is being studied, without leaving behind the opinions and recommendations that are given. (UNAN, 2024, p. 16)

11.8.3 Management based on processes and evidence.

This research complies with this circumstance because everything has been the basis of scientific research and without any evidence of the problems raised in this document it would not have been possible to carry it out. For this reason, the main focus was always to offer help supported by information that validates each of the processes taken to carry out the proposals and tools used, to solve a problem that is commonly among people and students in the Americas. (UNAN, 2024, p. 17)

11.8.4 Transparency, ethics and social responsibility.

This document meets this criterion because it respects and keeps anonymous each of the participants involved in the application of the instruments, in addition to the selected school. It is

not intended to put anyone in evidence, it is only made to inform and publicize a problem with real examples, providing transparent and quality results that show the process that was guided by those responsible for this research. (UNAN, 2024, p. 18)

11.9. Methods, techniques and instruments for the information and data analysis

The analysis of the information compiled in this research was carried out through a set of theoretical methods that complemented the instruments and the phases of the research process.

First, the **deductive method** was used during the development of the theoretical framework. This method made it possible to justify the study by starting from general concepts and theories related to pronunciation teaching, articulatory phonetics, and specifically the production of voiceless consonant sounds. Beginning with these broad elements facilitated the organization of the conceptual basis that supports the research problem and guided subsequent methodological decisions.

In addition, the **inductive method** was applied in the analysis of the diagnostic test administered to the students. Through this method, the data obtained were examined to identify recurring patterns, common pronunciation errors, and the voiceless sounds that presented greater difficulty for the learners. This process allowed the researcher to create general conclusions based on the specific observations of student performance.

Also, the **analytical and synthetic methods** were used to interpret the qualitative information that was collected through the interview and the observation guide. The analytical stage consisted of structuring the data into categories, just like types of difficulties, teaching strategies, and classroom practices, while the synthetic stage enabled the integration of these elements to formulate coherent conclusions that can reflect the main news talking about the teaching and learning of voiceless sounds.

12. Analysis and Results Discussion

12.1. Diagnostic Test

In the fulfillment of the first objective of the research, a diagnostic test was administered to 7 out of the 35 11th grade students. The test evaluated 8 English voiceless sounds through a word reading aloud activity: /p/, /t/, /k/, /f/, /s/, /θ/, /ʃ/, and /tʃ/, allowing the identification of the most common pronunciation errors in English. The selection of participants followed an intentional sampling procedure, choosing those students who, according to the teacher, showed greater difficulties in pronunciation.

Regarding to plosives sounds /p/, /t/, and /k/, 6 out of 7 students articulated them correctly. Since these phonemes also exist in the Spanish phonological system, they did not present major complications. Based on the rubric, most students were placed in Excellent and Good levels in auditory recognition, pronunciation, clarity, and repetition of these phonemes. A similar pattern was observed with the simple fricative /f/ and /s/, which were produced correctly by 5 out of 7 students who achieved good levels with clear articulation. And appropriate rhythm.

According to Frontera & Romito (2015) those sounds that do not exist in Spanish show greater difficulty. The sound /θ/ (“th”) was problematic for 4 out of 7 students who tended to substitute it with /s/ or /t/. According to the rubric, this phoneme was mostly rated at the Acceptable or Basic levels in pronunciation and clarity of articulation. Likewise, 5 out of 7 students made errors with /ʃ/ (“sh”), frequently replacing it with /tʃ/, and 6 out of 7 students had difficulties producing /tʃ/ (“ch”), often confusing it with /ʃ/, especially in word - final position. This resulted in productions such as bish instead of beach, reducing intelligibility. These errors placed students mainly in the Basic and Acceptable levels of the rubric.

Regarding long and short vowels, as well as vowel combinations, 5 out of 7 students showed difficulties distinguishing them. This is attribute to the absence of vowel - length contrasts in Spanish. These difficulties also affected repetition and rhythm, where students scored in the Acceptable and Basic levels.

In terms of attitude and confidence while representing the sounds 4 students demonstrated security and willingness, whereas 3 students showed a slight insecurity. This was reflected in Good and Acceptable levels in the rubric.

In conclusion, the diagnostic test made it possible to identify the most common pronunciation errors and the factors influencing them, such as mother - tongue interference, lack of systematic phonetic instruction, and limited exposure to native models. The findings show strengths in the articulation of sounds shared with Spanish (/p/, /t/, /k/, /f/, /s/) and the weaknesses in the sounds that do not exist in the L1 (/θ/, /ʃ/, /tʃ/) and in vowel contrasts. These results justify the implementation of didactic strategies that provide guide practice, auditory recognition training, and immediate feedback to improve the pronunciation of English voiceless sounds.

12.2. Observation Guide

In order to describe the effectiveness of digital strategies for teaching voiceless sounds in English, an observation guide was applied 7 out of 35 eleventh grade high school students. The guide was structured around key learning aspects such as participation, motivation, pronunciation, auditory comprehension, writing, feedback, and self-correction. The selected digital strategies Duolingo and ChatGPT were implemented in individual sessions. Duolingo was used according to the students current English level while ChatGPT was applied through a specially designed prompt aimed at correcting grammar and explaining phonetic context.

Duolingo

The implementation of Duolingo showed an important effectiveness talking about participation and motivation, thanks to its gamified design that kept students' attention. Despite not offering immediate feedback, the continuous repetition of exercises helped with gradual improvement in the pronunciation of voiceless sounds, as well as in auditory discrimination and the sound grapheme relationship. Students completed all activities autonomously and showed real progress during each session, especially in listening precision, writing skills, and self-correction supported by the platform.

ChatGpt

ChatGPT proved to be highly effective due to the personalized feedback provided in real time, which increased students' motivation and engagement. Although it does not include audio support, it's clear phonetic explanations and the use of minimal pairs allowed significant improvements in the pronunciation of voiceless sounds. Additionally, its ability to correct and explain grammatical

structure strengthens writing skills and promotes more conscious phonetic accuracy and the appropriate construction of sentences.

12.3. Interview

According to the last objective of this research, an interview was conducted with the eleventh-grade teacher in question to know his opinion on the digital strategies implemented, as well as the observation of the sounds that students have difficulty pronouncing, in addition to the observation of the digital tools proposed on a website. Their answers were clear and simple despite the almost zero exposure to digital tools that they had. That said, the following results were obtained:

The interview was divided into three sections, which covered the three instruments and objectives of this research.

In the first section, which was about the most common pronunciation errors in English, the teacher recognized that a large part of the 8 sounds presented in the first instrument were complex for the students, He also shared that the sounds presented served as a guide to guide his students in a better way, identifying their needs in pronunciation. In addition, they were able to better analyze their indicators, and activities to help them improve their level of English. He mentions that he is a new teacher, that he still has a lot to learn and that activities like this make him very rich when planning his classes or outdoor activities.

In the second section of the interview, the teacher answered the questions very well, in this section he was asked about the digital strategies implemented to the sample of 7 students, which were Duolingo and ChatGPT. The teacher acknowledged that he had never used these tools to teach his students. He said that this seemed to him a fairly innovative idea but that he had to consider a good way for the students to maintain the right motivation and the right attention in this type of activity, since they were being given an electronic device to be able to do that, so there had to be an observation at all times, but that with the greatest precision and organization could be used in a quite educational way.

In addition, he recognized that, in the case of ChatGPT, it could also be used autonomously, which could provide better practice when learning a new language. Speaking of Duolingo, he was quite willing to start implementing this tool in his sections when there are extracurricular activities, either inside or outside the section. He said that he found it very interesting, since sometimes there

are topics that come up in Duolingo, which can be quite interactive and you can apply them as a basic exam that students can take in a more fun and interesting way.

In addition, it can be mentioned that the teacher identified in a better way that the use of these digital tools kept the attention of the students in the class in a more adequate way, more than when classes are only taught theoretically, which students tend to get bored and feel quite pressured when they are only writing or reading things on other topics. He also mentioned that there were better results in terms of the behavior of his students when applying these digital tools. According to the teacher, everyone was more focused on who did it best, that they forgot to make a mess and paid more attention to classes.

In the third section of the interview, the teacher had the opportunity to observe the digital tools proposed on a website. He was shown that it was each of the points and lessons that had been created for educational purposes so that students could improve their pronunciation in English based on the deaf sounds of English. In addition, he was shown an area where lessons could be modified and create personalized lessons that he could use with students in a more direct way, based on the needs that they themselves have, he was also shown the following 2 parts of the proposals that were implemented in this work, which would be the chat with artificial intelligence and the call with artificial intelligence, which the 2 would provide immediate feedback based on what is grammar, phonetics and how to pronounce or structure things correctly.

The teacher mentioned that these proposed tools are quite entertaining and very suitable for students to learn in a more autonomous and linear way any problem they had, not only regarding what phonetics is, but also the other weaknesses that occur in this language. In addition, he found it very interesting that a chat with artificial intelligence that does not need any type of guide or prompt created can give you feedback directly based on what you write and how you write it. He realized that he can use that as a tool for future classes and that it would be a good implementation in the class section, because students were quite linked to those types of digital strategies.

He also mentioned that this can not only be used for the class area, but also for the area of being at home and studying on your own under the guidance of someone who knows English or who is a tutor who is teaching you English. He clearly specified what he recommends the use of digital strategies to significantly improve English speaking, as well as pronunciation, as well as all other skills of students in which they have severe difficulties.

12.4. Triangulation

The pronunciation is an essential skill that need to be developed in daily life. Gilakjan (2016) states that pronunciation is a vital part for language instruction as it is important to develop fluency. The result of the diagnostic test confirms the importance of this skill; the findings justify the need of implement strategies based on improving pronunciation in English. In the interview the teacher recognized that digital strategies are valuable tools that can contribute to the learning process and some of them can be used as activities for improving the pronunciation.

According to Frontera & Romito (2015) Spanish speakers tend to transfer phonetic patterns from the native language. The results of the diagnostic test validate this statement; because the students present difficulties in the pronunciation of sounds that do not exist in the native language like (/θ/, /f/, /tʃ/).

Bates & Poole (2003) explains that technology opens new opportunities to learn the language in an interesting way, and digital tools open new avenues to develop language skills. The results of the observation guide confirm the effectiveness of the digital strategies implemented. With the implementation of Duolingo participation and motivation were observed and with exercise repetition the pronunciation was gradually improved. Also, the implementation of this type of applications contribute to students' autonomy. On the other hand, ChatGPT provided immediate feedback which allowed to improve pronunciation of voiceless sounds. Furthermore, the teacher identified that the use of digital strategies kept students' attention, thus, these tools serve to create a dynamic and engaging class that is not solely based on theory.

12.5. Digital tools proposed on a website

Several features were proposed on a website called "Nativo" to improve students' knowledge in English, as well as pronunciation errors. First, it is being proposed two units on the website, which are:

- **Sounds and Letters**
- **Introduction to English**

Introduction to English evaluates the student in a qualitative approach where they will try to answer and pick the right choice. There are two lessons students can interact with, just like

Numbers & Colors and *Greetings & Presentations*. These are opening activities for beginners, so that they can discover their own difficulties and evaluate by themselves what they need to focus on first.

In addition, these units seek to enable students to trigger the content at their own pace in an interactive way. The reality is that they not only memorize information, but also experiment with the sounds of English, identify patterns and recognize their own mistakes. By offering clear and guided activities, students can practice without pressure and gain confidence little by little. This approach allows students to cure which aspects of pronunciation need to be reinforced and at the same time encourages more autonomous and motivating learning.

On the other side, *Sounds and Letters* offers four lessons. These lessons focus on phonetics of the language, which means students will be able to do several tasks such as:

Read and Repeat

Here, the lesson shows a list of single words and they will have to respond by touching the microphone button. This lesson seeks for a very accurate pronunciation, so that, a minimal error will be marked as a bad pronunciation of the word allowing students to work on their pronunciation through immediate feedback after the lesson is completed. As a complement, it is being proposed a function related to this where learners can practice the words, they are having issues with.

Listen and Write

Phonetics is not only connected with the produce of sounds but also with listening. If students do not have a good listening skill, their pronunciation of sounds will be deficient, that is why this lesson proposal will focus on listening a whole sentence with specific words to allow students to improve their listening while they enhance their knowledges knowing how those voiceless sounds can be pronounced correctly and at the same time typing the right word.

Listen and Choose

There are several words with voiceless sounds that can be pronounced or articulated almost the same way. That is why this lesson will focus on listening to an audio and choosing among the options which word is the correct. Some of these words were selected because of their complexity, just like 'pull' and 'pool' which difference is the duration con the vowel when spelling. This intent

to challenge students listening as well as adding feedback to understand why their selection is wrong.

Same or Different

This lesson is proposed with the intention that the student learn the principal differences in pronunciation every word has. They will have to listen to a couple of audios and choose if the word is the same or if the word is different.

AI

The previous lessons are being proposed for helping students with voiceless sounds challenges and as a tool teachers can use to create their own activities based of every student's needs. However, the implementation of Ai is revolutionizing the era, that's why a new tool is also being proposed a free tool students can use to practice getting immediate feedback from an Ai.

This Ai is called **Nativo**, it will allow students to talk by message and audio, and the Ai will automatically identify the words/structures/sentences you have issues with. No prompt is needed because it will be an automatized Ai which will correct you and suggest the way you can say and write instead, explaining your fails and the way you can pronounce those sounds. This is a trained tutor designed to help you with your English journey.

In addition, this tool seeks to make the student feel accompanied throughout the learning process. The idea is that the student can practice without fear of making mistakes, since the AI offers or will give them a clear and direct answer every time they make a mistake. In this way, the student will be able to better understand why a word or sentence is not correct and how they can improve it. It will also help the user to listen and repeat the sounds in English as many times as they need to so that little by little, they gain more confidence in speaking and writing. The main objective is to offer a simple, accessible and useful practice space for everyone who is starting out or needs to strengthen their foundations in the language.

13. Conclusions

This study aimed to analyze how digital strategies can help improve the pronunciation of voiceless sounds in English in 11th grade students. To fulfill this purpose, work was done on three main points: identifying the most common pronunciation errors, evaluating the effectiveness of digital tools such as Duolingo and ChatGPT, and propose digital tools on a website for improving voiceless sounds pronunciation errors. After analyzing the results, it can be stated that these objectives were satisfactorily achieved.

First, the diagnostic test helped identify which sounds were more difficult for the students. It was found that the sounds that also exist in Spanish (/p/, /t/, /k/, /f/ and /s/) were pronounced correctly by the majority. However, sounds that do not exist in Spanish, just like /θ/, /ʃ/ and /tʃ/, showed several difficulties, since students tended to replace them with other more familiar sounds in Spanish. There were also problems when pronouncing long and short vowels, which presented an unclear speech. This shows that the influence of Spanish, the lack of phonetic practice and contact with English seriously affect pronunciation.

Second, when using digital strategies, it was observed that Duolingo and ChatGPT provided important benefits. Duolingo helped students feel more motivated and with more interest across the session, and it also offered immediate feedback that contributed to improving the pronunciation of voiceless sounds. This application proved to effectively complement classroom instruction.

On the other hand, ChatGPT was very useful because it provided clear explanations and corrections instantly, this allowed students to better understand how to pronounce certain sounds and how to use words in sentences. Its personalized nature increased students' motivation and engagement. There is no a perfect tool, but both have shown that they can complement classroom instruction and help improving pronunciation and other English skills.

Thirdly, the digital tools proposed on the Nativo website showed an important potential. The activities, lessons, and chat with artificial intelligence were easy to use and definitely caught the attention of the students. The observations showed that the basic exercises were successfully completed by almost everyone, and as the difficulty increased, each student showed progress based on their abilities. This shows that this type of tool helps for more autonomous and personalized learning. The chat and voice assistant also offer immediate feedback, which is very useful for improving pronunciation.

Also, it is important to mention some limitations of the study. There was little access to technology at the school and some English skills were low, making it difficult to move faster. Besides, the time available to implement the strategies was short, which stopped having long-term results. Also, the students showed respect and interest in participating, which shows that the use of digital tools is helpful in this type of context.

Finally, the results showed that digital strategies can significantly help improve the pronunciation of voiceless sounds in English. These tools improve constant practice, autonomy, motivation and immediate correction. The study shows that integrating technology into English teaching is an effective option to improve students' oral communication and help them speak more clearly and confidently. Besides, the importance of continuing to innovate and design digital educational resources that adapt to the real needs of students is evident.

14. Recommendations

The recommendations presented in this study seek to guide teachers, students and educational institutions to improve the pronunciation of voiceless sounds of English, since turned out be one of greatest difficulties identified in the population studied, these suggestions offer a practical guide to integrate digital strategies that support the significant learning of the language.

For English teachers:

- Integrate digital strategies consistently into pronunciation classes, making most digital platforms digital, offering immediate feedback and guided practice.
- Incorporate explicit phonics instructions in the classrooms, speeding time explaining and modeling the articulation of voiceless sounds.
- Promote activities that encourage student autonomy, assigning digital tasks that allow them to practice outside the classroom to reinforce what they have learned, without depending exclusively on the teacher.
- Combine digital tools with face-to-face activities, to ensure a balance between guided practice and self-learning.
- Continuously train in new educational technologies.

For students

- Use the proposed digital tools frequently, since improvement in pronunciation depends on continuous exposure to correct models.
- Practice sounds that do not exist in Spanish autonomously, performing repetitive exercises with audios, and comparing their pronunciation with the correct one.
- Actively participate in class, losing the fear of making mistakes and allowing feedback to help them develop their language skills.

For educational institutions

- Ensure access to technological tools, such as internet connection and mobile devices or computers, to facility the implementation of digital strategies in the classroom.
- Promote an institutional environment that encourages the use of digital tools, incorporating activities related to phonetic practice using digital devices in class.

- Support teaching training focused on the use of technologies for the teaching of English, especially in pronunciation.

For future research

- Expand the sample and the intervention period, to be able to analyze in greater depth the long-term effect around and the implementation of digital strategies in pronunciation.
- Explore other problematic phonetic areas, such as a long and short vowel sound, which also affects pronunciation and therefore the correct understanding of what you want to convey.
- Investigate the impact of AI tools, with an emphasis on those that integrate advanced speech recognition, assess their accuracy and applicability in schools with limited technological resources.

Together, these recommendations offer a practical route to improve the teaching and learning of English pronunciation using technology. Its application will contribute to strengthening the communicative competence of students, promoting pedagogical innovation and creating more dynamic, accessible educational environments adapted to current needs.

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16. Annexes

Anexx A: Temporal Planning of the Research

This annex presents the temporal planning established for the implementation of this study. It includes the sequential organization of the main activities carried out during the research process, such as information search, methodological design, instrument construction, data collection, data analysis and the elaboration of the final report.

Its main objective is to show that the study was developed following a logical order and previously structured plan.

Tabla 4 Time line research

Activities	March	April, May	September	October	October	November
1. Information Search Review of theoretical foundation, previous studies, and conceptual bases.						
2. Methodological Design Definition of approach, participants, instruments, and procedures.						
3. Instrument Construction Development of diagnostic test, observation guide, and interview protocol.						
4. Instrument Application Implementation with participants.						
5. Data Collection Organization and recording of information obtained from all instruments.						
6. Data Analysis Coding, categorization, interpretation, and triangulation of results.						
7. Final report Preparation Writing of findings, conclusions, and recommendations						

Anex B: Instruments

The section incorporates the instruments used to obtain the necessary information for the study. It includes the diagnostic test applied to the students, the observation guide design to register, their performance during the activities, and the interview intended to deepen understanding of the teacher's perception regarding pronunciation difficulties and the use of digital strategies.

The inclusion of these instruments demonstrates their pertinence, clarity, and adequacy in relation to the objectives of the research.

Anex B.1: Diagnostic Test

The diagnostic test was created to identify the student's articulation errors in eight English voiceless sounds. It consists of pronunciation tasks and word reading items that allowed the research to identify the most common pronunciation errors in voiceless sounds made by EFL learners and their influencing factors.

Título: Lee y Pronuncia

Esta lección evaluara tu conocimiento de fonética y pronunciation en inglés.

Instrucciones para los estudiantes:

- Lee y pronuncia estas palabras

Sound	Example Words
/p/	Pen, paper, apple
/t/	Tea, time, water,
/k/	Cat, cake, back
/f/	Fan, coffee, fish
/θ/	think, bath, path
/s/	Sun, bus, pass
/ʃ/	Shoe, fish, brush
/tʃ/	Check, teach, beach

Gracias por tu tiempo y por compartir tus valiosas perspectivas. Tus comentarios son fundamentales para mejorar nuestras estrategias educativas.

Evaluation Rubric

Tabla 5 Diagnostic test rubric

Evaluation Criteria	Excellent	Good	Acceptable	Basic	Low
Auditory Recognition	Clearly identifies and distinguishes all voiceless sounds in audio.	Recognizes most voiceless sounds with very few errors.	Recognizes some voiceless sounds but confuses others.	Shows several confusions between voiceless and voiced sounds.	Does not distinguish voiceless sounds.
Pronunciation of Voiceless Sounds	Pronounces all voiceless sounds correctly (Clear, without vocal cord vibration).	Pronounces most voiceless sounds correctly; minor errors only.	Pronounces some voiceless sounds correctly, but others with vibration or substitution.	Pronounces most sounds with noticeable vibration or error.	Can not correctly produce voiceless sounds.
Clarity and Articulation	Articulation is clear, precise, and natural.	Articulation is appropriate with minor inaccuracies.	Pronunciation is understandable but somewhat forced or unclear.	Articulation is unclear; words are difficult to understand.	Articulation prevents understanding of words.
Repetition and Rhythm	Repeats with rhythm and fluency similar to the original audio.	Repeats with good rhythm, though with slight pauses or hesitations.	Repeats with noticeable pauses but maintains sequence.	Repeats with difficulty, omitting, or altering parts.	Fails to repeat the audio properly.
Confidence and Attitude when Repeating	Shows confidence and assurance when repeating.	Shows some confidence, though with slight hesitation.	Shows shyness or insecurity when speaking.	Repeats with great hesitation and very low volume.	Refuses or fails to repeat the audio.

Annex B.2: Observation Guide

The observation guide was designed to manage the students' performance during oral activities. It included categories such as articulation, participation, and comprehension, allowing research to document behaviors equalities and providers in a systematic manner.

Its clarity was managed through specific indicators, while its adequacy aligned with the need to describe the effectiveness of digital strategies for teaching voiceless sounds in English.

Implementation of the observation guide

Objective (of the observation):

Date of observation: _____

Name of observer: _____

Name of teacher: _____

Class observed (Grade/Section): _____

Observation Point	Yes	No	Notes/Comment
Student engagement with the website			
Motivation Attitude and effort			
Speaking Skills Accuracy in pronouncing voiceless sounds			
Listening Skills Response to audio task			
Writing Skills Task completion			

Improvement across the session (if any)			
Learning Progress During Session Improvement skills observed			
Learning Progress During Session Improvement skills observed			
Feedback received from ChatGPT, Duolingo Students response to the feedback			
Student self-correction behavior			

Anexx B.3: Interview

The semi structured interview was directed to the English teacher with the purpose of deepening the understanding of their perception about the student' pronunciation challenges and the usefulness of digital tools like Duolingo and ChatGPT.

The instrument contributed depth and contextual insight, supporting the qualitative nature of the study.

Section A: Common Pronunciation Mistakes

1. How many years have you been teaching English, and what has your experience been like?
2. In your teaching experience, do students struggle with English pronunciation? Why do you think this happens?
3. Which unvoiced sounds do you find most difficult for your students to pronounce? Could you provide some examples?
4. What pronunciation errors are most common when producing these voiceless sounds?
5. What do you think are the factors that influence these pronunciation errors?

Section B: Digital Strategies for pronunciation (Duolingo, ChatGPT)

1. Have you used technological tools to support pronunciation teaching? If so, which ones?
2. From your perspective, how can digital strategies help improve the pronunciation of unvoiced sounds?
3. Do you think receiving immediate feedback through digital tools (Duolingo, ChatGPT) could motivate student more to practice pronunciation? Why?

4. What advantages do you see as digital tools (Duolingo, ChatGPT) compared to traditional methods for teaching pronunciation?
5. What limitations or difficulties typically arise when implementing technological tools for pronunciation in the classroom?
6. Do you think students practice more when using digital activities (Duolingo, ChatGPT) that when they do so solely in class?
7. Do you believe that the use of technological tools (Duolingo, ChatGPT) helps students overcome their fear of speaking English?

Section C: Digital tools proposed on a website.

1. What do you think about the implementation of a website that allows students to practice voiceless sounds in English?

The proposed digital tool on a website has several resources that support student's development especially in pronunciation. These include:

- **A voice assistant**, which provides immediate feedback.
- **An interactive chat**, where students can chat and receive grammar corrections.
- **A personalized lesson section**, which allows teachers to add activities for individual practice.

Consider all these features

1. Do you think these resources could help students in their learning process and improve their language skills?
2. Do you think the activities offered in the platform are interactive and engaging enough to promote learning and maintain student motivation?
3. In general, would you recommend using these digital tools to support pronunciation?
4. What improvements or suggestions would you give us?

Justification of Instruments Inclusion

The combination of these three instruments ensured a comprehensive and methodologically coherent process. Each instrument contributes complementary perspectives:

- The diagnostic test revealed specific pronunciation errors.
- The observation guide captured actual performance during the speaking tasks.
- The interview provided interpretive and experiential insights from the educator.

Together, they ensure the pertinence, clarity, and adequacy required to address the research objective effectively.

Anexx C: Instruments Validation

This annex compiles the letters or certificates issued by the specialist who evaluated the instruments applied in the study. These validations guarantee their reliability and methodological coherence of the research, since they confirm that the instruments meet the criteria of clarity, relevance, in congruence with the planned objectives.

Instrucciones para la validación de los instrumentos

Por favor, lea detenidamente cada uno de los enunciados y de respuesta de cada ítem.

Utilice el siguiente formato para indicar su grado de acuerdo o desacuerdo con cada enunciado que se presenta, marcando con una equis (x) en el espacio correspondiente, según la siguiente escala:

5. Excelente
4. Muy Bueno
3. Bueno
2. Regular
1. Deficiente

Si desea plantear alguna sugerencia para enriquecer el instrumento, utilice el espacio correspondiente a observaciones, ubicado en la parte inferior del formato.

Constancia de juicio de experto

Yo, Ulises Antonio Calderón Osorio con especialidad en Ciencias de la educación con mención en inglés; por medio de la presente hago constar que he leído y revisado, con fines de validación, el instrumento de investigación: Entrevista a docentes, Prueba diagnóstica y guía de observación, que será aplicado en el desarrollo del estudio: "How digital strategies can assist voiceless sounds pronunciation errors made by 11th-year-highschool students in the second semester of 2025" por los estudiantes: Areliis Antonia Ortez Bucardo, Madeling Haidee Pérez Moreno Andy Ruppert Ulloa Gutiérrez. Luego de hacer las verificaciones pertinentes, puedo formular las siguientes apreciaciones:

Evaluación de instrumento:

N°	Indicadores	Valores				
		Deficiente	Regular	Bueno	Muy Bueno	Excelente
1.	El instrumento presenta coherencia con el problema de investigación.				X	
2.	El instrumento evidencia el problema a solucionar.				X	
3.	El instrumento guarda relación con los objetivos y preguntas propuestas en la investigación.					X
4.	El instrumento utiliza un lenguaje apropiado					X
5.	La redacción de las preguntas es clara y apropiada para cada dimensión.					X
6.	Relevancia del contenido				X	
7.	En general, el instrumento permite un manejo ágil de la información.				X	

El instrumento diseñado a su juicio es: válido (X) no válido ()

Observaciones:

Para que conste a los efectos oportunos, extendiendo la presente en la ciudad de Estelí, a los 30 días del mes de septiembre del 2025.



Nombre y Firma del experto
Ulises Antonio Calderón Osorio

Instrucciones para la validación de los instrumentos

Por favor, lea detenidamente cada uno de los enunciados y de respuesta de cada ítem.

Utilice el siguiente formato para indicar su grado de acuerdo o desacuerdo con cada enunciado que se presenta, marcando con una equis (x) en el espacio correspondiente, según la siguiente escala:

5. Excelente
4. Muy Bueno
3. Bueno
2. Regular
1. Deficiente

Si desea plantear alguna sugerencia para enriquecer el instrumento, utilice el espacio correspondiente a observaciones, ubicado en la parte inferior del formato.

Constancia de juicio de experto

Yo, Ena Anielka Suárez Rugama con especialidad en Ciencias de la educación con mención en inglés; por medio de la presente hago constar que he leído y revisado, con fines de validación, el instrumento de investigación: Entrevista a docentes, Prueba diagnóstica y guía de observación, que será aplicado en el desarrollo del estudio: "How digital strategies can assist voiceless sounds pronunciation errors made by 11th-year-highschool students in the second semester of 2025" por los estudiantes: Arelis Antonia Ortez Bucardo, Madeling Haidee Pérez Moreno

Andy Ruppert Ulloa Gutiérrez. Luego de hacer las verificaciones pertinentes, puedo formular las siguientes apreciaciones:

Evaluación de instrumento:

Nº	Indicadores	Valores				
		Deficiente	Regular	Bueno	Muy Bueno	Excelente
1.	El instrumento presenta coherencia con el problema de investigación.				X	
2.	El instrumento evidencia el problema a solucionar.				X	
3.	El instrumento guarda relación con los objetivos y preguntas propuestas en la investigación.			X		
4.	El instrumento utiliza un lenguaje apropiado			X		
5.	La redacción de las preguntas es clara y apropiada para cada dimensión.			X		
6.	Relevancia del contenido				X	
7.	En general, el instrumento permite un manejo ágil de la información.				X	

El instrumento diseñado a su juicio es: válido (X) no válido ()

Observaciones:

Para que conste a los efectos oportunos, extendo la presente en la ciudad de Estelí, a los 30 días del mes de septiembre del 2025.



Nombre y Firma del experto
Ena Anielka Suárez Rugama

Anexx D: Informing the Coding Process

This section presents the coding corresponding to each instrument used in the study. It includes the tables and categories employed to organize the information obtained from the diagnostic test, the observation guide, and the interview. This process allowed raw data to be transformed into structured information, facilitating subsequent analysis and ensuring a rigorous treatment of the results.

Anexx D.1: Coding of the diagnostic test

Objective: Identify the main articulations errors in 8 Voiceless English Sounds.

Coding table

Tabla 6 Coding Table

Category	Subcategory	Code	Description	Frequency
Errors in voiceless sounds	/p/	P1	Sound omission	3
	/p/	P2	Sound reinforcement (“b” en lugar de “p”)	4
	/t/	T1	Substitution /d/	5
	/k/	K1	Soft or incomplet sound production	4
	/f/	F1	Voicing as /v/	6
	/s/	S1	Addition of vowel (“es”)	2
	/ʃ/	SH1	Pronunciation like /ch/	5
	/θ/	TH1	Substitution with /t/ o /s/	7

Interpretation: The students show greater difficulty pronouncing the sounds /θ/, /f/ y /t/, showing a tendency to add voicing or to replace these voiceless phonemes with others that are more familiar within the phonological system of Spanish.

Anex D.2: Coding of the observation guide

Objective: Analyze oral performance, articulation, and behavior during the activities.

Establish Category

Tabla 7 Establish Category

Category	Code	Description	Evidence
Articulation	A1	Difficulty positioning lips or tongue for voiceless sounds	Facial tension and searching for the correct sound were observed
	A2	Voiced sounds	They change /t/ por /d/, /f/ por /v/
Participation	P1	Need support from the teacher	Requests constant repetition
	P2	Participation with safety	Intervenes without fear, even with mistakes
Comprehension	C1	Recognizes the sound but does not produce it correctly	Identify the symbol or example
	C2	Confuses similar sounds	/s/ – /ʃ/, /t/ – /θ/

Interpretation: The students show a willingness to participate but require constant support to produce sounds that do not exist in Spanish.

Anexx D.3: Coding of the interview

Objective: Identify the teacher's perception about the pronunciation and the use of Duolingo and ChatGPT.

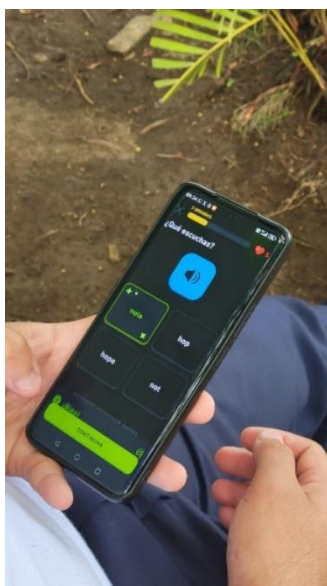
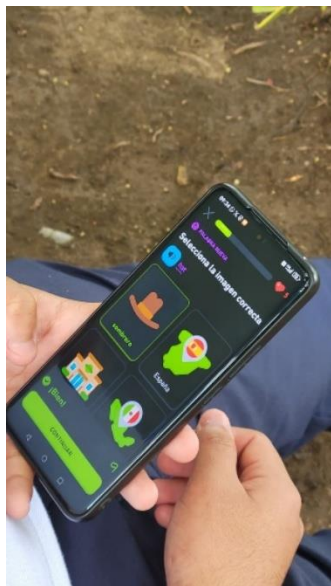
Categories and Codes

Tabla 8 Categories and code

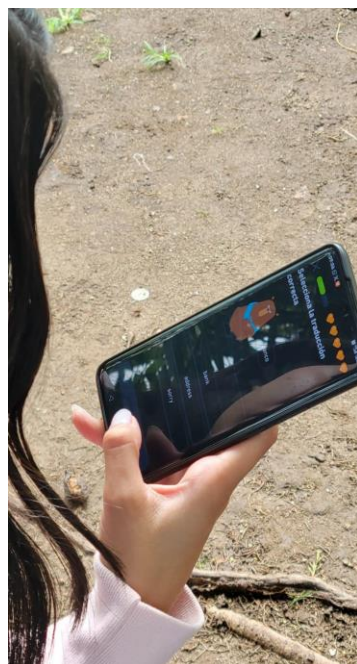
Categories	Codes	Summary of the content
Pronunciation Difficulties	DP1	The students have problems differentiating voiceless and voiced sounds.
	DP2	The /θ/ and /ʃ/ sounds are the most difficult.
Use of Digital Strategies	ED1	Duolingo facilitates repetition and constant practice.
	ED2	ChatGPT helps explain sounds and gives personalized examples.
Observed Benefits	B1	Increases motivation with digital tools.
	B2	Gradual improvement in articulation after digital practice.
Teacher's recommendations	R1	Continue using guided digital activities.
	R2	Include specific pronunciation exercises.

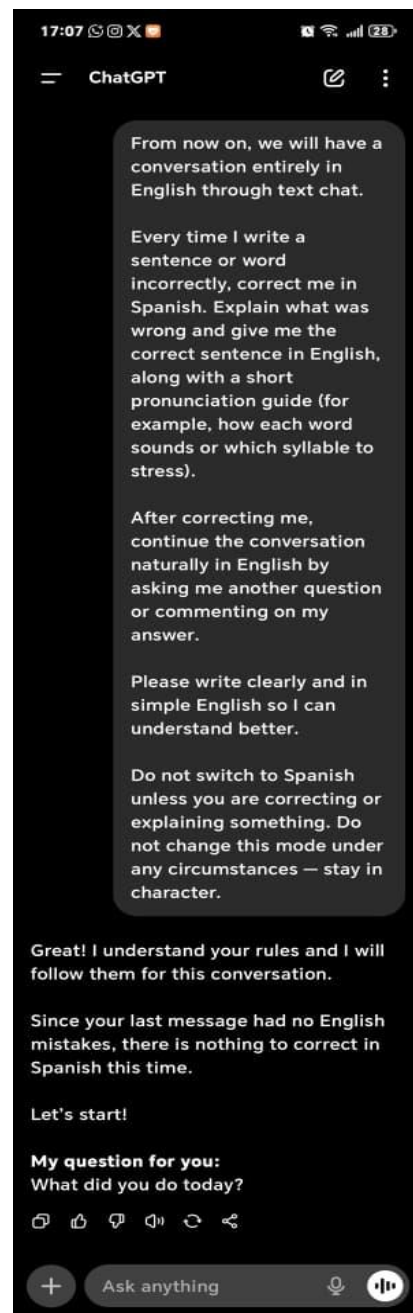
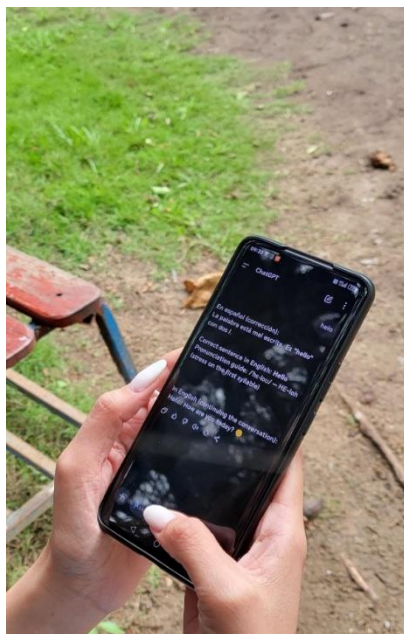
Anexx E: Proposal Desing Evidence

Photographic evidence of students using Duolingo to practice exercises.

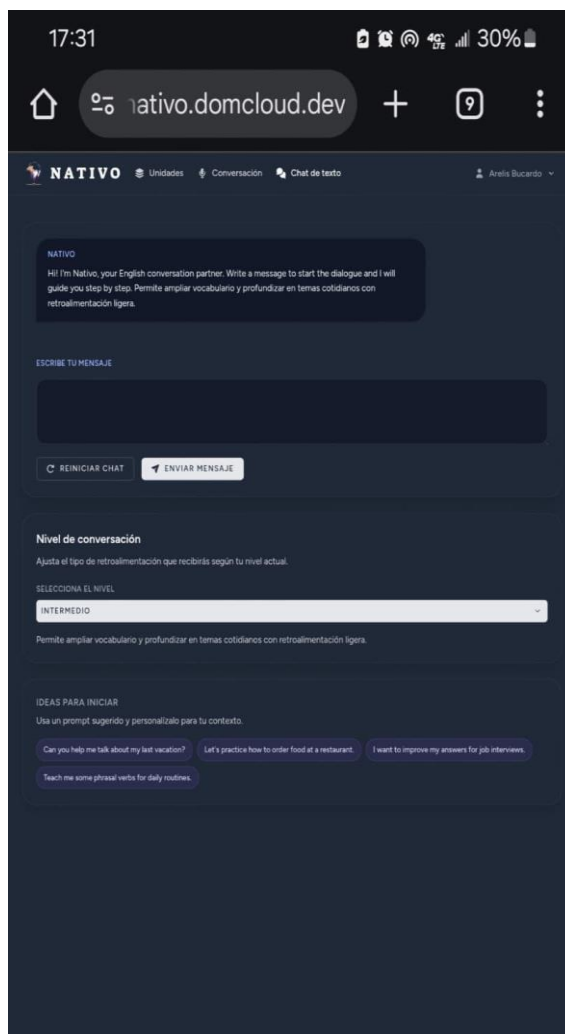
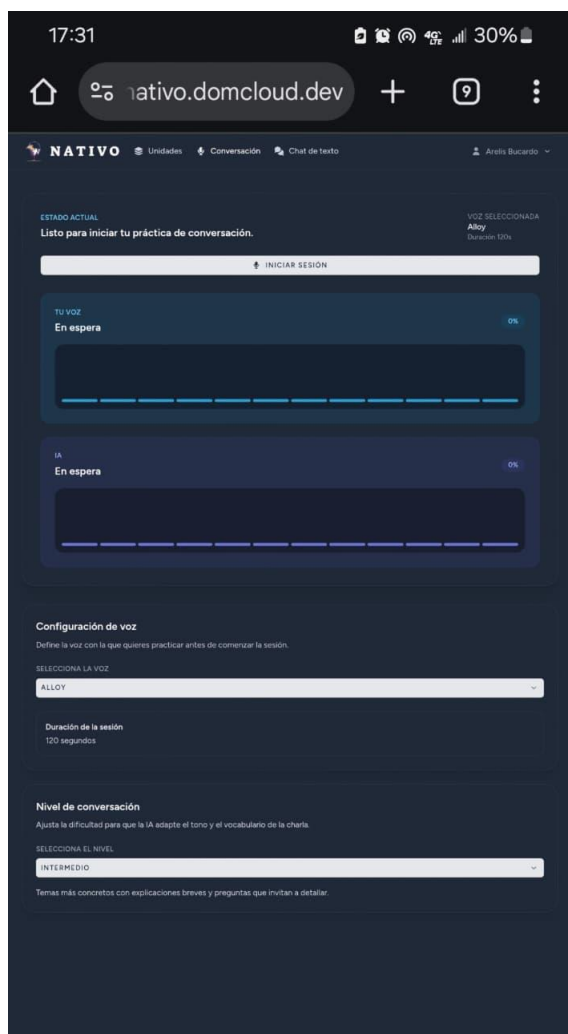
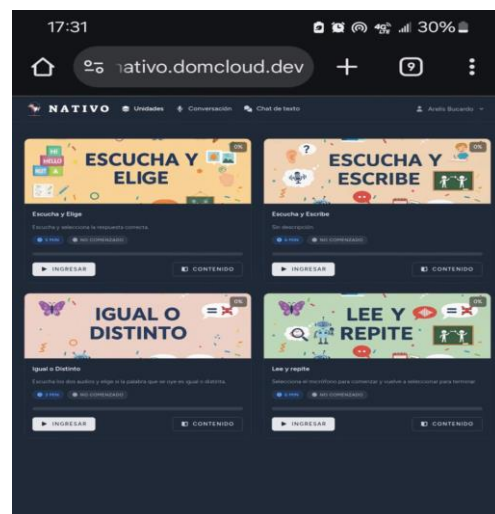
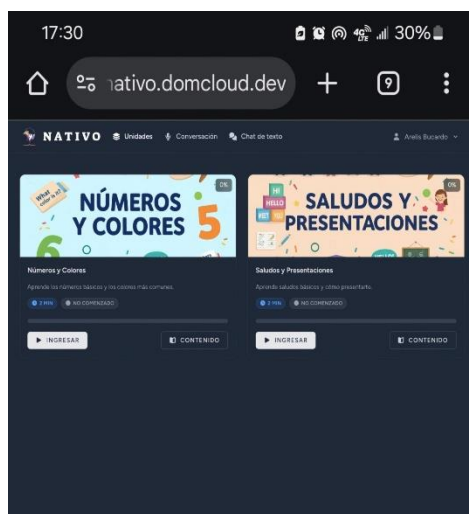
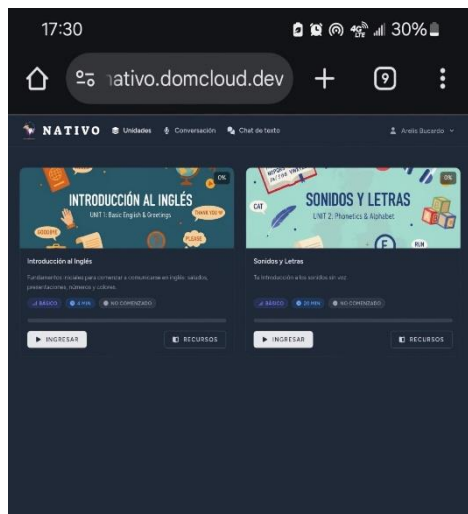


Photographic of interaction with the ChatGPT tool.





Digital tools proposed on a website.





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