



**TECHNOLOGY IN ENGLISH AS A FOREIGN LANGUAGE: TEACHING
PRONUNCIATION OF INTERDENTAL FRICATIVES**

Trabajo de Titulación como requisito previo para la obtención del título de:

Magister en Pedagogía del Inglés como Lengua Extranjera

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FACULTAD DE COMUNICACIÓN, LINGÜÍSTICA Y LITERATURA

MAESTRÍA EN PEDAGOGÍA DEL INGLÉS COMO LENGUA EXTRANJERA

**TECHNOLOGY IN ENGLISH AS A FOREIGN LANGUAGE: TEACHING
PRONUNCIATION OF INTERDENTAL FRICATIVES**

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April 8, 2022

RESUMEN

El presente proyecto responde a la pregunta “¿Cuáles son los efectos en la pronunciación fricativa de los estudiantes al trabajar en un sitio web especializado?”. Este estudio tiene como objetivo analizar los efectos de la tecnología en la percepción y producción de fricativos en estudiantes de inglés. Este estudio es relevante para instituciones de inglés como lengua extranjera, profesores y estudiantes interesados en mejorar la enseñanza y el aprendizaje de la pronunciación, ya que ayuda a desarrollar la pronunciación estándar de los fricativos con un impacto sociolingüístico positivo. El objetivo de este proyecto es crear un conjunto de actividades para mejorar la pronunciación con la ayuda de la tecnología interactiva en línea. Seis adultos jóvenes estudiantes de inglés en el nivel B2 fueron seleccionados por conveniencia para participar en este experimento metodológico diseñado para medir el progreso en la pronunciación de fricativos interdentes. Los resultados de percepción y producción se analizaron por separado. Los resultados llegaron como se esperaba. El sitio web metodológico tuvo un impacto positivo en los educandos. Todos los estudiantes mejoraron sus habilidades de percepción de la pronunciación. Los casos más

significativos son el Alumno 1 y el Alumno 4. El Alumno 1 pasó de un 75% en el pretest de percepción a un 85% en el postest de percepción, registrando un 10% de aumento de habilidad. Sin embargo, dos estudiantes empeoraron su producción de pronunciación. Esto puede ser debido a la ansiedad o falta de concentración en la tarea. Otra posible causa podría ser problemas técnicos al grabar sus muestras de audio. En conclusión, Internet ofrece varias herramientas tecnológicas para estudiantes y docentes, pero es necesario que los docentes desarrollen varias habilidades adicionales para aprovechar al máximo la tecnología. Estas habilidades adicionales están relacionadas con el diseño gráfico, el diseño de sitios web y la producción multimedia, entre otros. Es recomendable aplicar este proyecto a otros contextos educativos para estudiar otros posibles resultados. Los estudiantes también deben ser lo suficientemente competentes con la tecnología para obtener lo mejor de las herramientas en línea. Los efectos positivos de este estudio se han medido a corto plazo. Para verificar el impacto del proyecto a largo plazo se deben realizar varias pruebas posteriores, en un marco de tiempo más largo.

Palabras clave: pronunciación fricativa, sitio web, EFL, metodología, tecnología.

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ABSTRACT

The present project answers the question “What are the effects on fricative pronunciation in students when working on a specialized website?”. This study aims to analyze the effects of technology on fricatives perception and production in EFL students. This study is relevant for EFL institutions, teachers, learners interested in improving pronunciation teaching and pronunciation learning since it helps develop standard pronunciation of fricatives, which has a positive sociolinguistic impact. The objective of this project is to create a set of activities to improve pronunciation with the aid of online interactive technology. Six young adult English learners in level B2 were selected out of convenience to participate in this methodological experiment designed to measure the progress in pronunciation of fricatives. Perception and production results were analyzed separately. Results came as expected. The methodological website had a positive impact in learners. All the students improved their pronunciation perception skills. The most significant cases are Student 1 and Student 4. Student 1 went

from 75% in the perception pretest to 85% in the perception posttest, registering a 10% of skill increase. Nevertheless, two students worsened their pronunciation production. This might be due to anxiety or lack of concentration in the task. Another possible cause could be technical problems while recording their audio samples. In conclusion, Internet offers several technological tools for learners and teachers, yet several additional skills are necessary for teachers to develop in order to take full advantage of technology. These additional skills are related to graphic design, website design and multimedia production among others. It is advisable to apply this project to other educational contexts to study other possible results. Students also need to be proficient enough with technology to obtain the best out of online tools. The positive effects of this study have been measured in the short term. To verify the long-term impact of the project, several posttests should be taken, in a longer time frame.

Key Words: Fricatives Pronunciation, Website, EFL, Methodology, Technology.

INTRODUCTION



Background:

The relationship between technology and education has been strengthened in the last decade. Particularly in the past couple of years, due to the Covid- 19 pandemic, computer technology became the pillar in online education. The field of language studies has also been impacted by this new reality. Nearly all English learning programs became virtual in the year 2020. Although several technological tools are now available in educational platforms and smart devices, teaching pronunciation still depends heavily on human interaction.

There is a rich amount of research in the field of fricatives pronunciation and although several studies have been developed in European, Asian and South American countries, only one study contains information about Ecuador. This is one of the reasons why my study will be conducted in Quito, Ecuador on a group of private English students who present challenges in English pronunciation.

The central aspect of my research is to determine technological strategies to improve interdental fricatives perception and production in the context of virtual and online education.

A proper methodology is required to effectively teach interdental fricatives. According to (Hattem, 2016), “the voiced and voiceless interdental fricatives /θ/ and /ð/ are one of the more unique features of the English phonological system.” Current literature on the subject suggests that teaching pronunciation has been historically relegated, as (Smith, 2013) states, “the voiceless dental fricative (IPA /θ/) and the voiced dental fricative (IPA /ð/) are relatively understudied in comparison to other sounds. They are perceptually weak and easily confusable with /f/ and /v/.” Therefore, this study is crucial to fill gaps in existing research to implement technological solutions. As such, it is my desire to implement a website to help students and teachers develop more accurate pronunciation in a way that minimizes the need of a teacher by providing online pronunciation exercises.

By the end of this study, I aim to provide a set of technological strategies to effectively improve interdental fricatives perception and production expressed on a website both for teachers and learners. Focusing only on production can be ineffective when perception is not addressed. Similarly, the practice of fricative perception and production is incomplete without a theoretical explanation to complement the training. My proposal aims to address all these elements on a specialized educational website.

Problem Statement:

So far, we know that the second language (L2) acquisition process follows the same pattern as the first language (L1). We also know that pronunciation problems in L2 are referred to as Substitution, meaning that the learner substitutes challenging sounds in L2 for similar easier ones found in L1. We also know that pronunciation involves several aspects such as production, perception and a mental catalog of sounds and if we want to improve pronunciation, we need to work on these three aspects and find potential problems in them. Also, we know that historically, pronunciation research and teaching has been relegated in general and even more in the field of technology applied to education, yet the tendency points to a deeper relationship of language pronunciation learning and virtual technology.

The present work aims to establish strategies to improve interdental fricative recognition and production through technology applied to education for young adult students. I will explore the elements involved in pronunciation such as perception, production, and the mental catalog of sounds to explain it to the learner. I will establish the best methodologies available to train these elements. We will determine what are the best technologies suitable for such methodologies. Technology is present in education more than ever before and virtual education will be the most predominant as technology continues to evolve in the future. Ignoring this can result in outdated teaching methods and ineffectiveness in both teachers and learners.

Research Question:

- What are the effects on fricative pronunciation in students when working on a specialized website?

General Objective:

- To create a set of activities to improve pronunciation of fricative sounds with the aid of online interactive technology.

Specific Objectives:

- To analyze students' fricative pronunciation.
- To have the learners analyze their own fricatives' pronunciation perception.
- To design a website with different interactive activities to improve perception and production of interdental fricatives.

Relevance and Importance:

The following study will provide an interactive methodology to improve English dental fricatives pronunciation, which will benefit English teaching institutions, EFL teachers, EFL learners as well as the researcher.

English teaching institutions will have the opportunity to update their current methodologies with a more updated tool to improve dental fricative pronunciation of the learners. Such improvement can have a positive impact on the reputation of the institution. This study will also provide access to up-to-date information in the field of Language Acquisition.

With the present study, EFL teachers will improve their efficiency. In most EFL classrooms, there is only one teacher and under these circumstances it becomes almost impossible to help students with their pronunciation, one by one. A specialized website in the improvement of dental fricatives will allow teachers to target their efforts to help students with effective practice outside the classroom.

English learners will benefit from this project by receiving tools to increase their understanding of elements involved in pronunciation, combined with effective and practical exercises for free. The learners will be able to manage their learning at their own pace without the pressure of time or the anxiety of graded evaluations.

Finally, the researcher will also be a beneficiary of the present study by acquiring useful data to both prove and improve current methodologies to develop dental fricatives.

LITERATURE REVIEW



Phonology:

According to Gussenhoven, C., & Jacobs (2016), Phonology as a linguistic science aims to explain how sound structures relate to language systems. The authors mention that although different languages may have fundamental differences in their structures, they present similar sound systems. These researchers state that more than 7,000 languages are spoken in the world currently. The writer informs that The International Phonetic Association (IPA) has assigned unique roman symbols written between brackets to represent sound segments, but such segments may not necessarily be equivalent to letters. Linguists and English learners use these symbols. This article contributes important data to the present research in the field of phonology to clarify how language systems relate to sound.

Also, according to Katamba (1989), Phonology studies the systematic use of sound to form words and utterances in language. The author says that although humans can produce a wide range of sounds and noises with the vocal system, not all these sounds are used in language. The researcher states that Phonetics is the study of the inventory of speech sounds humans can produce for language use. By so explaining, the author provides a clear criterion to differentiate human sounds used in verbal communication from other types of human sounds, which is a key concept in sound analysis.

Phonological Awareness:

According to Gussenhoven, C., & Jacobs (2016), Phonology studies particular elements of linguistics which is the sound structures (phonological structures) and not the written elements (morphosyntactic structures) The authors state that the morphosyntactic structures and the phonological structures are not isomorphic, which means that they are not equivalent. Although they collaborate to create meaning, they follow different rules of analysis. The writers mention that the sound elements in language are produced by several factors such as cognitive, phonetic, or social and it takes five years for a child to develop spoken language and although humans can master a language, it does not mean they understand the inner structures that language has. The researchers point out that some

languages have a sound system that has a regular relationship with written forms or letters, therefore children how are educated in those environments develop a phonologic awareness better and earlier. The authors conclude that children without literacy have problems developing phonetic awareness. The article is relevant to the present research because it provides guidelines on phonological awareness to set realistic goals and outcomes for the project.

Additionally, Kivistö-de Souza (2020) informs that L2 phonological awareness research is not abundant but rather evolving in early stages, but there are some principles by which such awareness develops through use and experience. The writer says that L2 phonetics teaching has better results when it is explicit. The author presents mentions the Noticing Hypothesis, which presents the idea that “L2 phonological awareness develops through conscious noticing and results in proceduralized knowledge about L2 pronunciation” The researcher also suggest that “the implicit learning mechanisms used in L1 learning are not likely to be available or optimal anymore in adult learning”, indicating that a methodology designed for children must be different from a methodology designed for adults, and therefore, young adults and adults require a pronunciation methodology strongly proceduralized that relays not only in explaining ways to produce sounds but also long-term exposure to the training. Since the present project is not aimed for children, these notions are extremely important to the present project so that the right approach is used for adult learning.

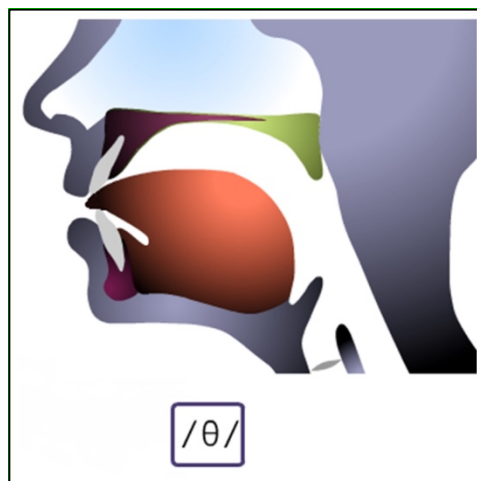
The value of pronunciation:

Gonet & Pietron (2006) explain that English pronunciation has a value beyond pure aesthetics and correct pronunciation allows the learner to access an English-speaking society with approval, which brings social and economic benefits added to communicative improvement. Therefore, it is necessary to develop an updated methodology to train production and perception, considering the natural order of language acquisition. The author states that languages have simultaneously a phonological structure and a morphosyntactic structure and because of this, EFL learners could confuse written orthography with sound systems in pronunciation. The article by Gonet & Pietron emphasizes the value of pronunciation, which is essential to the present project.

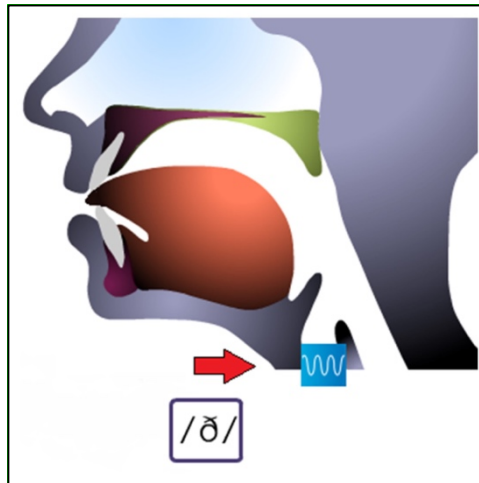
Definition of Interdental fricatives:

Gonet & Pietron (2006) explains some of the fricative sounds and mentions that the consonant /θ/ is pronounced with a voiceless and central air stream. The author explains that “a non-strident hiss is produced between the rim of the tongue and the back wall of the upper incisors” from which the name ‘dental’ comes. The writer goes on to define the /ð/ fricative by comparing it to the articulation of the Polish /d/. The author clarifies that “the front rim of the tongue does not come in contact with the incisors but is placed close to them.” By so doing, the researcher sets a clear reference for the pedagogical purposes of the present project.

Moreover, Katamba (1989) points that the interaction between the air-stream mechanism (air flow) and the vocal system produces speech sounds and consonant sounds happen when the air flow is obstructed either by the articulators (tongue, lips, or teeth). Such consonants can be voiceless or voiced. According to the author, a voiceless or unvoiced sound happens when vocal cords are apart and the air escapes unimpeded and a voiced sound happens when the vocal cords are closed, and the air blow makes them vibrate. The researcher concludes that a fricative sound happens when the articulators are present creating friction to the airflow to produce air turbulence, which is a solid reference for the visual analysis of sound in PRAAT done in this study.



Graphic No. 1: Voiceless dental fricative articulation representation



Graphic No. 2: Voiced dental fricative articulation representation

Perception and production problems:

Interdental fricatives are challenging to acquire (Smith, 2013). According to Metruk, (2017), one of the reasons for this difficulty is that “speakers typically replace vowels and consonants which do not exist in their native tongue”. Another author, Hattem (2016) suggests that one of the reasons for these phonemes not to be acquired properly both in native and non-native speakers is the level of difficulty and infrequency they have compared to other sounds. The writer concludes that poor pronunciation consists in sound substitution.

Nevertheless, Jekiel (2017), mentions that an incorrect pronunciation does not affect communication because “the distinction between /θ/ and /ð/ is virtually irrelevant in speech and a possible merger of these sounds would not cause much confusion”, which is supported by Gonet & Pietron (2006) who imply that the proper pronunciation of interdental fricatives has an esthetic and sociolinguistic factor that brings an approving impression among an English-speaking community.

Such views provide a proper perspective on pronunciation to understand the right value or standard pronunciation learning and the effort required on behalf of the learner.

Technology applied to education:

Technology has had a positive impact on Education and the use of technology is constantly increasing (Raja & Nagasubramani, 2018). The Covid-19 pandemic brought about

an exponential increase in the use of technology for educational purposes (Code et al., 2020). According to Rogerson-Revell (2021), technology allows to integrate existing audiovisual content online to provide optimal input, which enhances second language acquisition. The writer says that interdental fricative error rate has decreased in learners who have been exposed to computer assisted learning programs. The researcher mentions that technology can be used outside the classroom, where the student needs it the most, especially in the form of mobile devices. According to the author, the positive impact of technology in pronunciation improvement is undeniable but teachers still need to develop skills in technology because “educational technology is only as good as the humans behind it”. One of the most active providers of technologies for learning is the company Google according to Sari et al. (2020). The same author states that these tools are convenient because they reach different populations numbers and types at an exceptionally low cost and such tools are successful formative assessment tools that provide real time feedback providing significant improvement in students development. The researcher concludes that these applications are engaging and time saving in scoring processes. Such statements support online technologies such as Google online tools used in the present project. These authors validate the low-cost approach of the present study, which allows other teachers or researchers to replicate the project easily.

According to Khalil (2018), several audiovisual and multimedia internet tools from Google can aid EFL, such as Google Sites, Google Forms or YouTube because they are massively used around the world, allowing people to communicate and share information limitless. The author goes on to say that such tools have had a positive impact in curriculum design, pedagogical material, and collaborative work for both teachers and students. The researcher adds that Google applications require the students to create a Gmail account as an only requirement to later provide easy access to desktop or mobile devices regardless time or location. Google applications have had positive results in EFL learning making students eager to use it due to the corrective feedback it provides, according to the author. Google applications are an alternative to traditional methods in EFL, facilitating collaborative work and written feedback from the teacher as the writer points. The author supports the present research in the use of online tools applied to education regardless of the geographic location.

Another technology that is being used in EFL is the Text-to-Speech software which allows to transform text to synthetic audio to create listening materials, according to Oktalia & Drajeti (2018). This author says that Text-to-Speech technology has caught the attention of several researchers in recent years mainly because it solves the problem of lack of native speaker's audio materials providing a native speaker voice in a contextualized topic. Text-to-speech technologies provide flexibility, adaptability, and context according to students needs in a quite easy way, according to the author. Other researchers who have mentioned Text-to-Speech technology are Eksi & Yesilcinar (2016) who state that although this technology can be challenging for some teachers, it is effective to improve pronunciation. It can be used to transform text to audio with both short and long texts, and speech flow is still appreciated. This author validates the use of Text-to-Speech technology used in the present study to create audio samples for the pronunciation perception pretest and posttest.

Authors such as Parkes & Adlington (2017) say that mobile technology has introduced instant messaging applications such as WhatsApp in EFL. In 2017, WhatsApp was already being used by billions of users in more than 180 countries around the world, mainly because it is a free cross-platform. Bensalem (2018) adds that WhatsApp is popular among students and several researchers are exploring the educational potential of these tools in language learning. available for any device such as iPhone, Android. These authors provide solid support for the use of WhatsApp as a tool to collect audio samples of pronunciation in the present study.

According to Said Mustafa El-Garawany (2021), another useful computational tool for language analysis and language learning is the software called Praat, which means “speech” in Dutch, developed at the University of Amsterdam by Paul Boersma and David Weenink. The article mentions that Praat allows to record diverse types of sound files, in several formats such as AIFC, AIFF, FLAC, NIST, but WAV and MP3. According to the authors, Praat “provides an acoustic analysis of the speech signal, usually in the form of a visualization of the speech waveform, spectrogram, and pitch contour”. Gorjian et al., (2013) support this idea by stating that the software Praat allows visualizing segmental and

suprasegmental pronunciation elements and measuring them. By such statements, it is possible to determine that the software Praat is completely reliable for the purposes of the present project.

METHODOLOGY

This research aimed to gain an understanding of the underlying reasons for non-standard interdental fricative pronunciation. This research was experimental, quantitative, and interpretative. The researcher attempted to determine a relationship between a specialized methodological website and the improvement of fricative pronunciation in EFL students. The goal was to determine whether a causal relationship existed between variables and, if so, the strength of that relationship. The results of the experiment were quantified by carrying out an analysis to measure the improvement of interdental fricatives perception and production in EFL learners. There was a small number of representative cases, six in total. Numerical data was required to measure progress and improvement. A complementary part was implemented as qualitative research which came from interviews in which the test takers expressed their views on the experience. This qualitative information will have an interpretative rather than statistical analysis.

To establish the variables, the following research question was established: What are the effects on fricative pronunciation in students when working on a specialized website?

-Independent Variable:

A specialized website.

-Dependent Variable:

Fricative pronunciation in students

-Constants:

English Level B1

Study Methodology

Amount of studying time

High level of familiarity with online studying

Participants:

The present project was conducted at a private online language school in Quito-Ecuador, South America, in March 2022. Six test takers were selected out of convenience. The test takers were online students at B1 level. The entire methodology proposal was online. The following is a deeper description of each test taker.

Student 1: This was a male young adult candidate. This student was a young professional who had been to Europe and had contact with Asian English accents. This student needed English for Specific Purposes (ESP), English for Academic Purposes (EAP) and English for Occupational Purposes (EOP).

Student 2: This was a male young adult candidate. He was a young adult who was studying, working and looking for chances to become an English teacher. This candidate studied his senior year of high school in the United States (US) a couple of years prior to this project. This student was looking to develop social skills and wanted an EAP course.

Student 3: This was a female young adult candidate. This was an adult student who also worked as an English teacher for kids. This student had never been abroad. The student was looking to develop a career as an EFL teacher and wanted to improve pronunciation skills.

Student 4: This was a female young adult student in the last year of an engineering career. This student had never been abroad. The student was looking to develop English for social skills and for occupational purposes.

Student 5: This was a male young adult who worked for a religious organization with branches worldwide. The student had spent a couple of years in the US as a child. The student wanted to develop oral skills for presentations, dissertations and social volunteering.

Student 6: This was a female young adult who worked as a professional in the field of telecommunications. The student had been to Asia and used English as lingua franca yet had never been to the US. This student needed EOP and ESP.

Each one of the test takers was an English student and had previously signed a consent form, indicating that they were willingly and voluntarily participating in the project. Among the similarities between test takers was their personal interest in American standard pronunciation development. They not only wanted to communicate but also desired to acquire a standard sound for sociolinguistic reasons such as prestige, subordination or income.

On the other hand, one of the differences between test takers was the amount of exposure they had to authentic language.



Materials:

The following materials were used in this methodology:

- **Google Forms:** An online tool to create questionnaires, quizzes and surveys.
- **A perception pretest:** It was a diagnostic test generated after establishing desired results. It was applied to the students before they are exposed to the methodology.
- **A perception posttest:** A diagnostic test generated after establishing desired results. It was applied to the students after they were exposed to the methodology. Its results were contrasted with the pretest results for further analysis.
- **A production pretest:** Before exposed to the methodology, students send voice notes recordings containing fricatives.
- **A production posttest:** After exposed to the methodology, students send voice notes recordings containing the same fricatives as in the production pretest.
- **Praat Audio Analysis Software:** It was used to analyze audio files and obtain an indicator called “Fraction of locally unvoiced frames” which showed how much percentage of vocal cords vibration was present in a segment of sound in fricatives obtained via WhatsApp voice notes in the pretest and the posttest.

Pedagogical Design:

Website design and development:

The experimental website was developed by the researcher. To create such a website, the researcher applied personal skills and previous knowledge of graphic design, digital marketing and web design. The process of developing the website started by establishing the goal and desired results of the tool. Several drafts were analyzed to choose the best functional layout and web map of links the site would have. The digital online tool called Google Sites was chosen to develop the website. Google Sites had an interactive interface, easy to access and completely affordable. Then graphic design was implemented aiming to generate visitors pleasant and memorable experience. This specialized website had 3 sections called Sessions to learn about pronunciation perception and production of interdental fricatives. The language and terminology were not technical but rather colloquial.

The website had the following pages:



Home Page

Page 1: The Mouth

Page 2: Listening

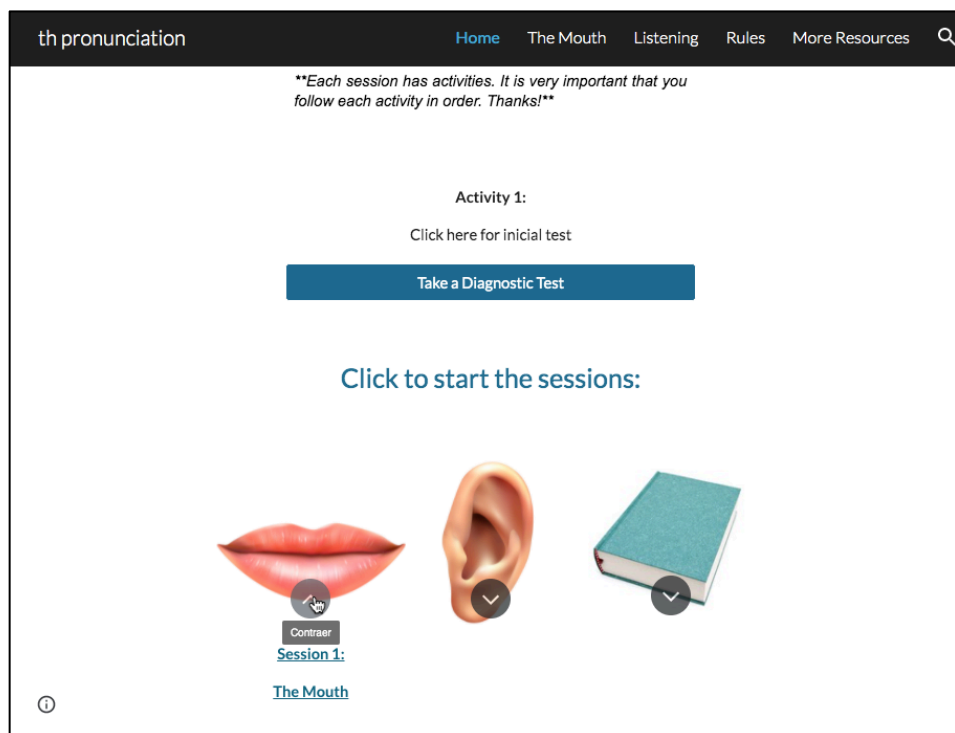
Page 3: Rules

Page 4: More Resources

Each page contained a class in video, online exercises, interactive games and quizzes. The student followed the content in order of presentation. The website can be visited at this link:

[https://sites.google.com/view/th-pronunciation/home?authuser=0.](https://sites.google.com/view/th-pronunciation/home?authuser=0)

Home Page



Picture 1: Methodological Website Homepage

Screenshots of the entire website can be seen in Annex 1 at the end of the document.

Lesson Plan:

The lesson plan is embedded in the web design so that students can effortlessly go through the e-learning in an intuitive way. Nevertheless, here it is possible to see the lesson plan the project follows:

Topic: Dental Fricatives

Teacher: David Basantes Fierro

Number of Students: 6

Date: March 3, 2022

Objective: To develop fricatives pronunciation skills both receptive and productive through a methodological website.

Stage	Activity	Materials
Warm Up: Students get introduced to the methodology.	Students enter the homepage of the methodological website and watch an introductory video and text.	Video: https://www.youtube.com/watch?v=skS8I8hrY2c
Diagnostic: Students are evaluated to assess their initial condition regarding skills and knowledge.	Students take a Pretest.	Google Form: https://docs.google.com/forms/d/e/1FAIpQLScROuPRiu-EBSajIfMtdQGKJqPPvjY6HobWzPphmTP83F65Gw/viewform
Part 1: Pronunciation Production Students learn about fricatives phonology and develop pronunciation production skills.	Activity 1: Students send a WhatsApp voice note reading a text containing fricatives. Activity 2: Students watch an educational video on fricatives. Activity 3: Students recognize the symbols and elements of fricatives in a comparative graphic.	Website: https://sites.google.com/view/th-pronunciation/the-mouth?authuser=0 Video: https://www.youtube.com/watch?v=zSfeg2yAZJc
Part 2: Pronunciation Perception Students learn about fricatives phonemic awareness and develop	Activity 1: Students watch an educational video on fricatives based on minimal pairs contrast.	Website: https://sites.google.com/view/th-pronunciation/listening?authuser=0

<p>fricatives perception skills.</p>	<p>Activity 2: Students play a Kahoot game to recognize fricative minimal pairs.</p>	<p>Video: https://www.youtube.com/watch?v=D3kwyJPPJQ4</p>
<p>Part 3: Pronunciation rules Students learn reading related skills to recognize fricatives standard pronunciation from text.</p>	<p>Activity 1: Students watch an educational video on the rules for fricatives.</p> <p>Activity 2: Students display an interactive tool to display and remember the rules for fricatives.</p> <p>Activity 3: Students play a Kahoot game to remember the rules for fricatives previously learned.</p> <p>Activity 4: Students send a WhatsApp voice note reading a text that contains fricatives.</p>	<p>Website: https://sites.google.com/view/th-pronunciation/rules?authuser=0</p> <p>Video: https://www.youtube.com/watch?v=r8Ys113aP28</p>
<p>Assessment: Students are evaluated a second time to assess their progress regarding fricatives perception and production skills and knowledge.</p>	<p>Students take a Posttest:</p>	<p>Google forms https://docs.google.com/forms/d/e/1FAIpQLScROuPRiu-EBSajIfMtdQGKJqPPvjY6HobWzPphmTP83F65Gw/viewform</p>

DATA ANALYSIS



Perception and production results were analyzed separately. Improvement is expressed in percentage by comparing pretest and posttest results.

The perception pretest and posttest consisted of a multiple-choice questionnaire of eleven questions, which represent 100%. For this reason, rubric was not needed to assess performance. Such results are presented in the following table:

Multiple-Choice Perception Test Results

	<i>PRETEST</i>	<i>POSTTEST</i>	<i>INCREASE</i>	<i>IMPROVEMENT</i>
<i>Student 1</i>	75.00%	85.00%	10.00%	10.00%
<i>Student 2</i>	50.00%	70.00%	20.00%	20.00%
<i>Student 3</i>	50.00%	85.00%	35.00%	35.00%
<i>Student 4</i>	55.00%	100.00%	45.00%	45.00%
<i>Student 5</i>	65.00%	80.00%	15.00%	15.00%
<i>Student 6</i>	70.00%	100.00%	30.00%	30.00%

Chart 1 by Erbin David Basantes, 2022

The production test was divided into voiceless and voiced items. It consisted of recordings of students reading aloud two paragraphs containing dental fricatives. The words analyzed were the following:

Voiceless Fricatives:

- *THAD*
- *FITH*
- *THUMTACKS*
- *THICKENER*
- *PYTHON*
- *THERMOSTAT*
- *MOUTHWASH*

Voiced Fricatives

- *MOTHER*
- *NEITHER*
- *BROTHER*
- *FATHER*

- *BOTHERED*
- *EITHER*
- *TOGETHER*

These audios were analyzed in the software Praat to obtain an indicator called Fraction of Locally Unvoiced Frames. For this reason, rubric was not needed to assess performance. The following table presents the results:

Voiceless Production Test Results

	Average Voiceless Augment (Fraction of locally unvoiced frames)			
	Before	After	Increasing	Improvement
<i>Student 1</i>	72.26%	74.00%	1.74%	1.74%
<i>Student 2</i>	69.56%	59.95%	-9.61%	-9.61%
<i>Student 3</i>	48.27%	62.22%	13.96%	13.96%
<i>Student 4</i>	77.33%	78.00%	0.67%	0.67%
<i>Student 5</i>	77.80%	66.03%	-11.77%	-11.77%
<i>Student 6</i>	74.10%	82.54%	8.43%	8.43%

Chart 2 by Erbin David Basantes, 2022

Voiced Production Test Results

	Voiced (Average Fraction of locally unvoiced frames Reduction)			
	Before	After	Decrease	Improvement
<i>Student 1</i>	29.43%	26.92%	-2.51%	2.51%
<i>Student 2</i>	10.20%	22.89%	12.69%	-12.69%
<i>Student 3</i>	82.01%	22.79%	-59.22%	59.22%
<i>Student 4</i>	33.16%	27.32%	-5.84%	5.84%
<i>Student 5</i>	33.19%	33.37%	0.18%	-0.18%
<i>Student 6</i>	50.28%	45.71%	4.57%	-4.57%

Chart 3 by Erbin David Basantes, 2022

The final Production Improvement is the average of voiceless and voiced improvement.

Overall Perception and Production Improvement Chart



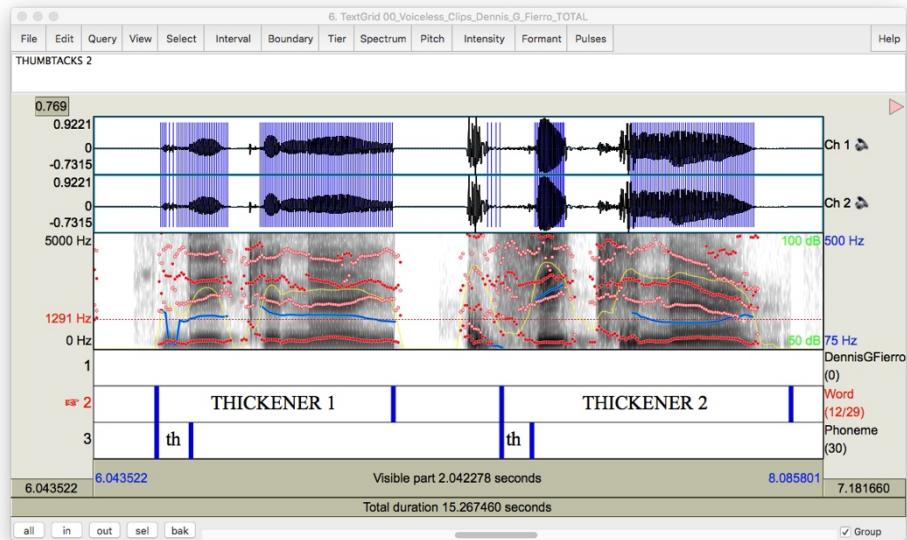
	Perception Improvement	Production Improvement	Average Perception & Production Improvement
<i>Student 1</i>	10.00%	2.13%	6.06%
<i>Student 2</i>	20.00%	-11.15%	4.43%
<i>Student 3</i>	35.00%	36.59%	35.79%
<i>Student 4</i>	45.00%	3.25%	24.13%
<i>Student 5</i>	15.00%	-5.98%	4.51%
<i>Student 6</i>	30.00%	1.93%	15.97%
Average	25.83%	4.46%	15.15%

Chart 4 by Erbin David Basantes, 2022

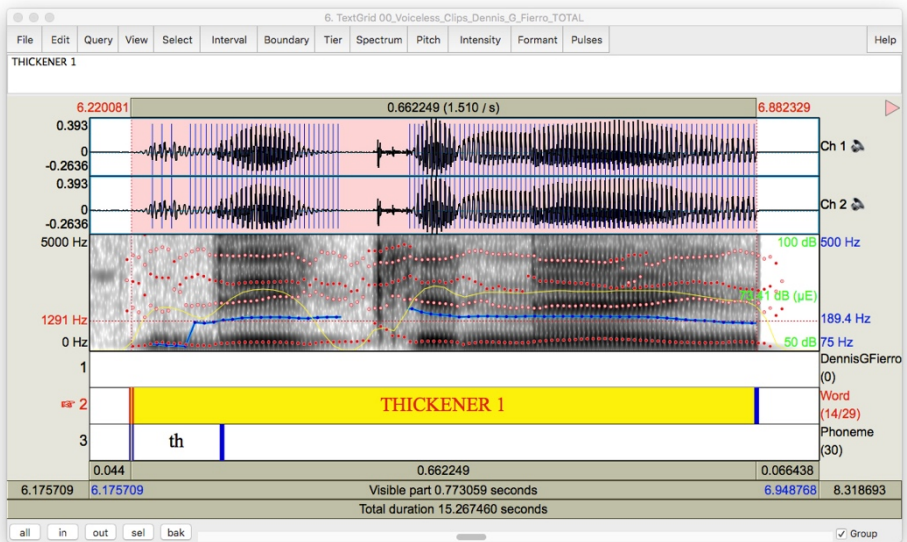
There was a general improvement of fricatives perception in all six students, being 10% the least of the indicators, corresponding to Student 1 and 45% the highest, corresponding to Student 4.

Regarding production improvement, the highest indicator belongs to Student 3, with 36.59%. It is noticeable that Student 2 and Student 5 decreased their performance in the posttest. Student 2 decreased 11% and Student 5 decreased 6%. This decrease in production performance could be due to a variety of factors which will be discussed later in the document.

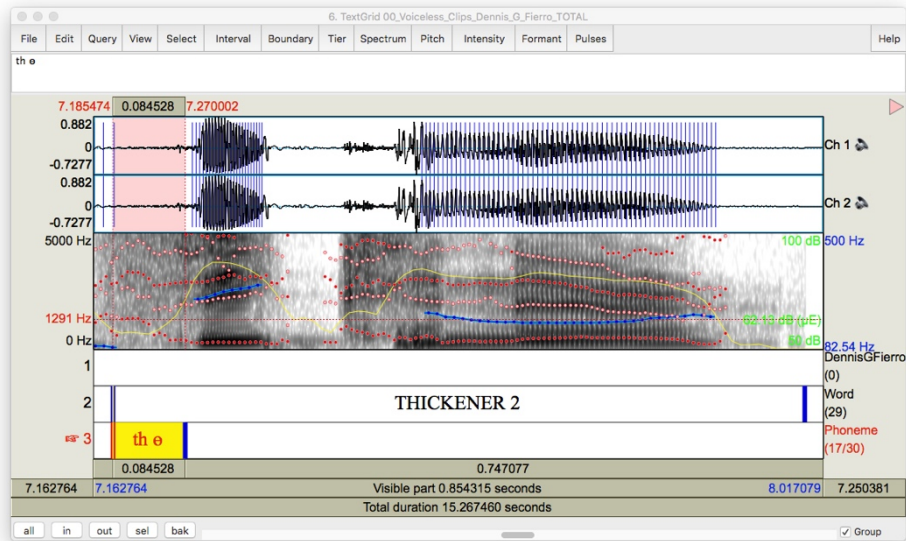
Student 3 was the case that presented the most dramatic improvement in both perception (35%) and production (36.9%). Here is one of the items tested for this student in the software Praat, the word THICKENER:



Picture 2: Sample of the word THICKENER before (THICKENER 1) and after (THICKENER 2).



Picture 3: Voice report Voicing: Fraction of locally unvoiced frames: 10.000% (1 / 10)



Picture 4: Voice report. Voicing: Fraction of locally unvoiced frames: 62.500% (5 / 8)

Findings:

Although the positive results came as expected, two findings stood out: two students worsened their pronunciation production in the posttest. This is the case for students 2 and 5. Student 2 decreased the performance by 11.15%. Similar is the case of Student 5, who also decreased the performance by 5%, being worse than in the beginning. Although these two students do not know each other, they share a common factor: both have spent some time in the US. The posttest audio recordings from these two students showed dithering and lack of clarity in pronunciation. This might be due to anxiety or lack of concentration in the task. A possible cause of anxiety could be excessive self-awareness or too high self-expectations. The students might have expected perfection in their own pronunciation, leading them to be fearful. Another possible cause could be technical problems while recording.

DISCUSSION



This study aimed to answer the question “what are the effects on fricative pronunciation in students when working on a specialized website?” The data analysis demonstrated that the specialized website had a positive impact on students. The improvement in perception and production was confirmed. The effects must be understood in perception and production separately.

All the participants in the study improved their perception skills. The most significant cases are Student 1 and Student 4. Student 1 went from 75% in the perception pretest to 85% in the perception posttest, registering a 10% of skill increase. This is the student with the least amount of improvement. Student 4 went from 55% in the perception pretest to 100% in the perception posttest, registering a 45% improvement, which was the highest in the study.

Regarding production skills, three students showed improvement and two students worsened their pronunciation. Student 3 is the case that showed a 36.50% improvement, which is the highest in the study. On the other hand, Student 2 and Student 5 registered a pronunciation loss in the posttest.

Limitations of the study:

In the present study, at least three limitations must be acknowledged because some shortcomings may have occurred due to the design of the research, evaluation criteria or background knowledge. Another limitation could be related to environmental characteristics.

The test takers were chosen out of convenience and closeness so the application of different criteria might have resulted in different results. This is not such a negative element because the study focused precisely on online private English students. In order to apply this study to English Schools with group classes, several adaptations may have been made.

Limited background in technological tools for acoustic analysis and speech recognition was another limitation. Although speech analysis software was indeed intricate to operate and manage, the results were far from complicated to understand. Skills in computer coding could have helped in adapting speech analysis software to more types of experiments. Nevertheless, the type of research conducted did not require skills too different from the basic ones needed to operate any software.

A third limitation may have been the controlled environment of the research. It may have encouraged participants to act abnormally and may have produced artificial results but due to

the criteria used to select the test takers, confidence and relaxation is guaranteed. These test takers were used to working with technology in a one-on-one environment. With proper introduction, it was possible to get the students to act normally.

In future research, it is advisable to repeat the experiment with a different criterion to select the test takers to verify results. Also, computer experts may be invited to participate and adapt speech recognition software to fit new situations. It would be useful to adapt the present research to other realities as well.

CONCLUSION

The present work aimed to establish strategies to improve interdental fricative recognition and production through technology applied to education for young adult students. Elements involved in pronunciation such as perception and production were explored. A methodology was implemented to train these skills. Educational technologies were researched, developed and applied to answer the research questions: What are the effects on fricative pronunciation in students when working on a specialized website? A set of activities was created to improve pronunciation of fricative sounds with the aid of technology. A methodological website was designed. The results were analyzed and the research question was answered to a full extent. A specialized website can increase the perception skills in a range between ten percent to one hundred percent. In the case of production, it is highly important to pay attention to the interactive elements of the website and computer equipment such as microphones, audio recording and editing software. These elements could impede a proper learning process if they are not properly functioning.

Working on this project has given me the unique opportunity to apply my skills in methodological design, graphic design and technological tools. Working with existing or low budget resources is part of the vocational aspect of being a teacher. Taking the time to think of an effective methodology and then present it to the students with an appealing visual design can be challenging, especially for teachers who do not have the required skills. Nevertheless, technology is becoming increasingly friendly to teachers. With self-patience and research teachers can produce wonderful, creative, and fresh solutions for EFL learners. Working with this methodology has certainly made me more aware of the many tools available online.

RECOMMENDATIONS



The present study has been developed in the specific context of a private language school, with young adult students who take online lessons. To broaden the understanding of the phenomenon here analyzed, several recommendations are provided for future researchers.

The audios taken from students were sent via WhatsApp. Each student used a different mobile phone, with different characteristics such as microphones, software or internet speed connection. To standardize the audio samples, it is recommendable to take audio samples using the same equipment. All students should use the same phone to send the audio files or else, a computer language lab with a desktop computer and microphone should be used to record the audio samples.

To verify the long-term impact of the project, several posttests should be taken, in a longer time frame, to measure if the positive effects are lasting. Several factors could hinder pronunciation achievements in the mid and long term. Students could either forget or acquire pronunciation errors and such phenomenon should be monitored. It is also important to check if by repeating the methodology on the same students, the effects become more permanent. Any future adaptation of the present project is both welcome and advised, because EFL happens in other contexts as well.

Gonet & Pietron (2006) have mentioned that a standard pronunciation in EFL learners generates positive perception reception among the native speakers, which supposes a sociolinguistic advantage for the learners. It would be interesting to replicate the present research with an emphasis on the attitude of native speakers to the pronunciation of EFL learners to confirm if results would be coherent with the findings of the abovementioned authors.

REFERENCES



- Code, J., Ralph, R., & Forde, K. (2020). Pandemic designs for the future: perspectives of technology education teachers during COVID-19. *Information and Learning Science*, 121(5–6), 409–421. <https://doi.org/10.1108/ILS-04-2020-0112>
- Deterding, D. (2000). Three or tree? Dental fricatives in the speech of educated Singaporeans. *The English Language in Singapore: Research on Pronunciation*, 76–83.
- Gonet, W., & Pietron, G. (2006). English interdental fricatives in the speech of Polish learners of English. *Dydaktyka Fonetyki Języka Obcego. Neofilologia*, 8, 73–86.
- Haryadi, S, H., & Aprianoto, A. (2020). Integrating “English Pronunciation” App Into Pronunciation Teaching: How It Affects Students’ Participation and Learning. *Journal of Languages and Language Teaching*, 8(2), 202. <https://doi.org/10.33394/jollt.v8i2.2551>
- Hattem, D. (2016). *Substitution Patterns for English Inter-Dental Fricatives by L1 Latin American Substitution Patterns for English Inter-Dental Fricatives by L1 Latin American Spanish-Speakers David J. Hattem University of Massachusetts-Boston. November.*
- Jekiel, M. (2017). *The evolution of English dental fricatives: variation and change. January*, 2–86.
- Kivistö-de Souza, H. (2020). *Hanna Kivistö-de Souza.*
- Metruk, R. (2017). Pronunciation of English Dental Fricatives by Slovak University EFL Students. *International Journal of English Linguistics*, 7(3), 11. <https://doi.org/10.5539/ijel.v7n3p11>
- Raja, R., & Nagasubramani, P. C. (2018). Impact of modern technology in education. *Journal of Applied and Advanced Research*, S33–S35. <https://doi.org/10.21839/jaar.2018.v3is1.165>
- Rogerson-Revell, P. M. (2021). Computer-Assisted Pronunciation Training (CAPT): Current Issues and Future Directions. *RELC Journal*, 52(1), 189–205. <https://doi.org/10.1177/0033688220977406>
- Smith, B. (2013). An acoustic analysis of voicing in American English dental fricatives. *Osuwpl*, 60, 117–128.

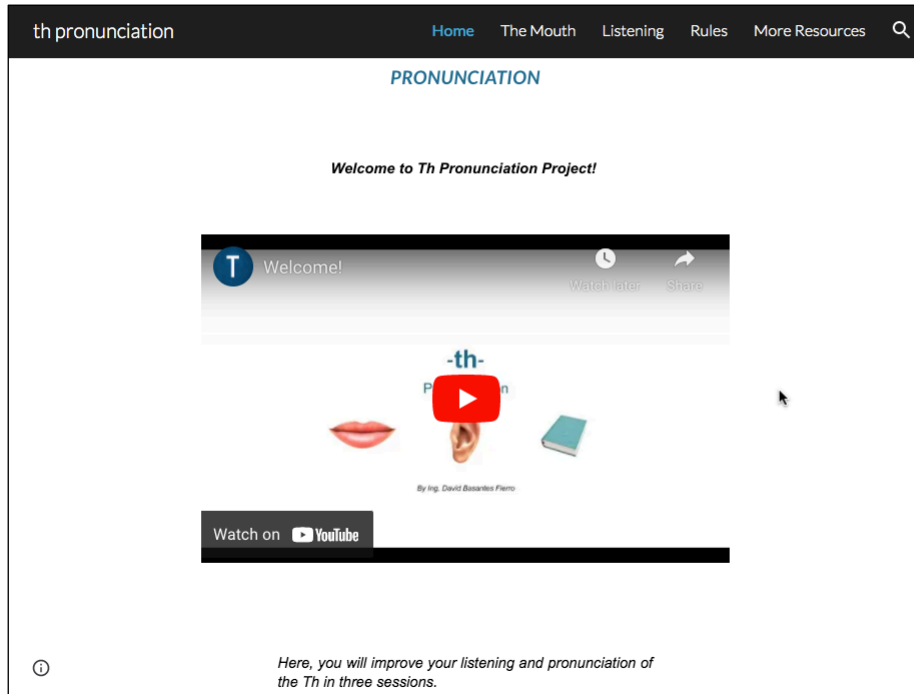
- Susanto, R., Rachmadtullah, R., & Rachbini, W. (2020). Technological and pedagogical models: Analysis of factors and measurement of learning outcomes in education. *Journal of Ethnic and Cultural Studies*, 7(2), 1–14. <https://doi.org/10.29333/ejecs/311>
- Bensalem, E. (2018). The Impact of WhatsApp on EFL students' Vocabulary Learning. *Arab World English Journal*, 9(1), 23–38. <https://doi.org/10.24093/awej/vol9no1.2>
- Eksi, G. Y., & Yesilcinar, S. (2016). An Investigation of the Effectiveness of Online Text-to-Speech Tools in Improving EFL Teacher Trainees' Pronunciation. *English Language Teaching*, 9(2), 205. <https://doi.org/10.5539/elt.v9n2p205>
- Gorjian, B., Hayati, A., & Pourkhoni, P. (2013). Using Praat Software in Teaching Prosodic Features to EFL Learners. *Procedia - Social and Behavioral Sciences*, 84(2005), 34–40. <https://doi.org/10.1016/j.sbspro.2013.06.505>
- Khalil, Z. M. (2018). EFL Students' Perceptions towards Using Google Docs and Google Classroom as Online Collaborative Tools in Learning Grammar. *Applied Linguistics Research Journal, December*. <https://doi.org/10.14744/alrj.2018.47955>
- Oktalia, D., & Drajadi, N. A. (2018). English teachers' perceptions of text to speech software and Google site in an EFL Classroom : What English teachers really think and know Dwi Oktalia and Nur Arifah Drajadi Universitas Sebelas Maret , Indonesia. *International Journal of Education and Development Using Information and Communication Technology (IJEDICT)*, 14(3), 183–192.
- Parkes, M., & Adlington, R. (2017). *Arab World English Journal (AWEJ) Volume.8 Number4 December 2017 Pp 68-84*. 8(December), 68–84.
- Said Mustafa El-Garawany, M. (2021). Using Praat to Develop English Majors' EFL Intonation Production. *Journal of Pedagogical Research*, 9(2), 125–131. <https://doi.org/10.21608/edusohag.2021.208708>
- Sari, A. B. P., Iswahyuni, D., Rejeki, S., & Sutanto, S. (2020). Google Forms As an Efl Assessment Tool: Positive Features and Limitations. *Premise: Journal of English Education*, 9(2), 231. <https://doi.org/10.24127/pj.v9i2.3037>
- Katamba, F. (1989). *An introduction to phonology* ((Vol. 48)). Longman.
- Gussenhoven, C., & Jacobs, H. (2016). *Understanding Phonology* (Vol. 4, Issue 1).

Annex 1

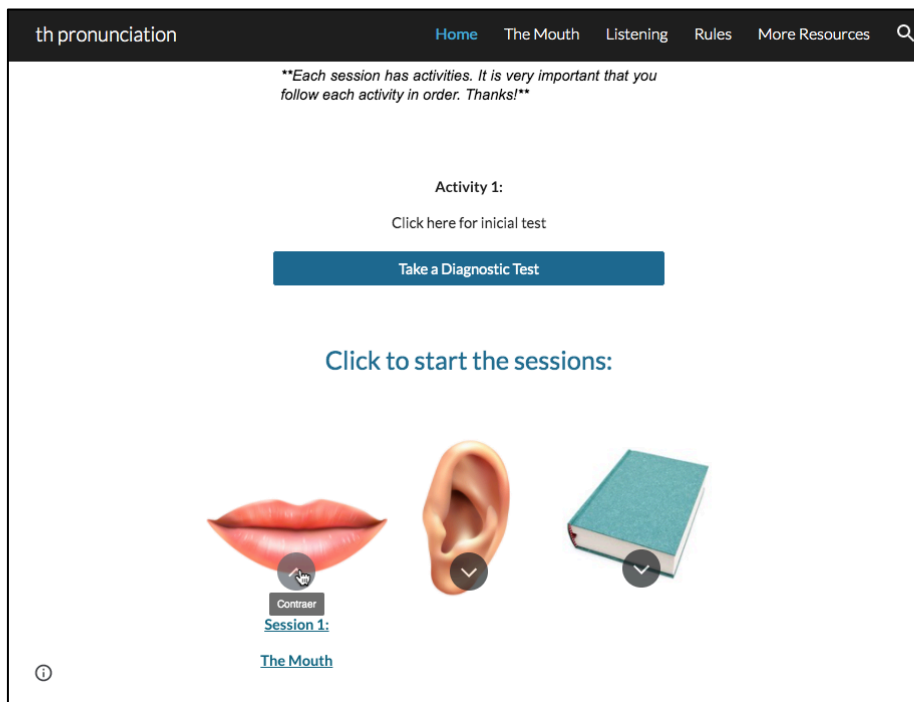
Website Screen shots



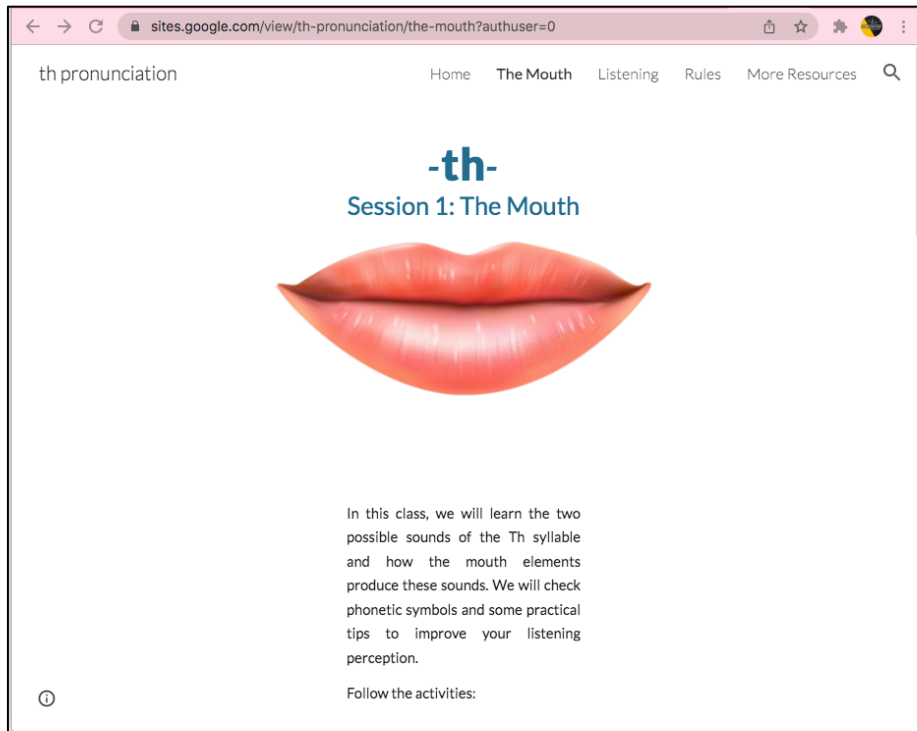
Home Page



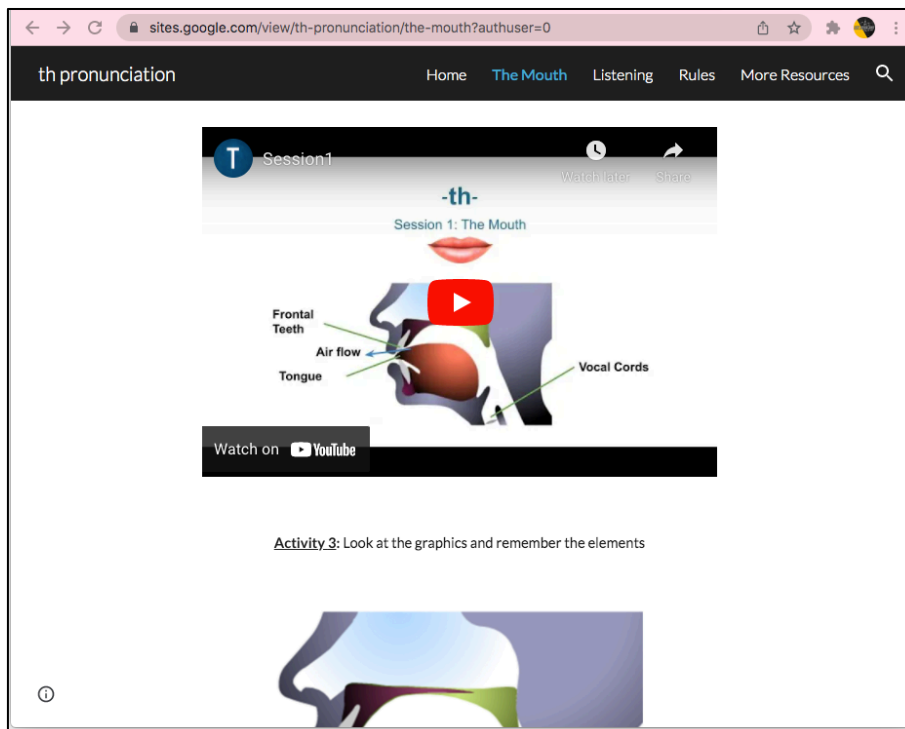
Picture 5



Picture 6

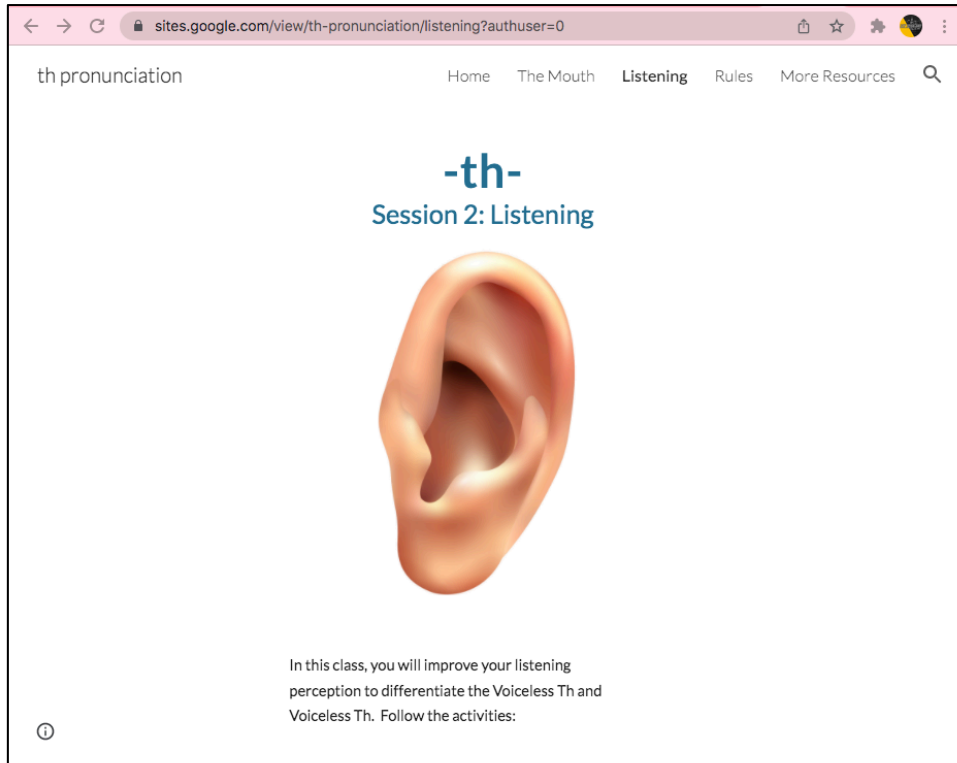


Picture 7



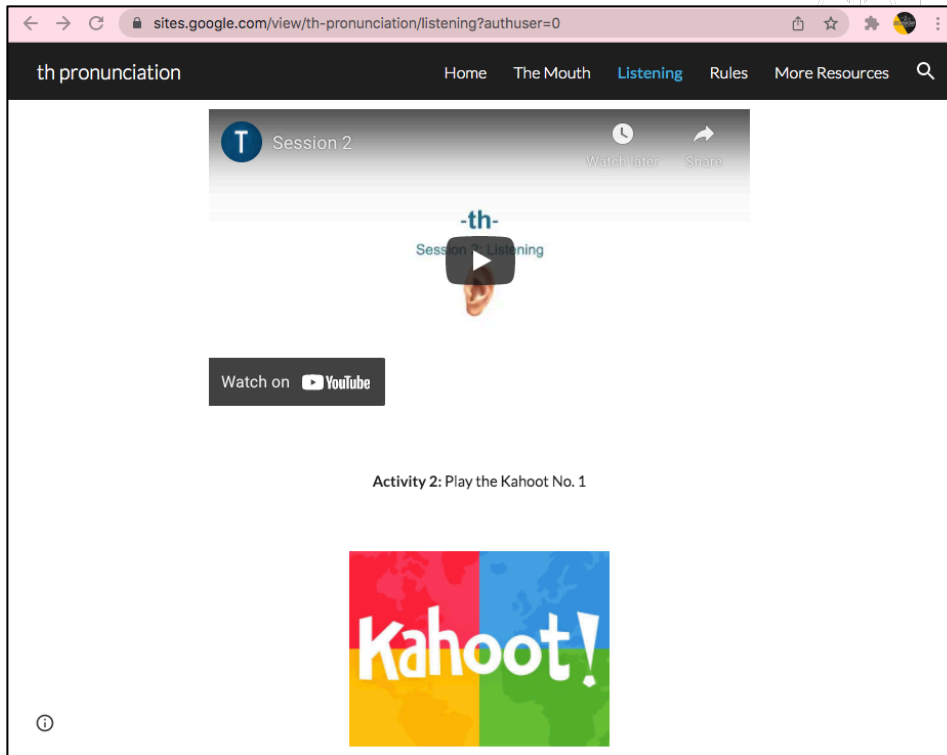
Picture 8

Page 2: Listening



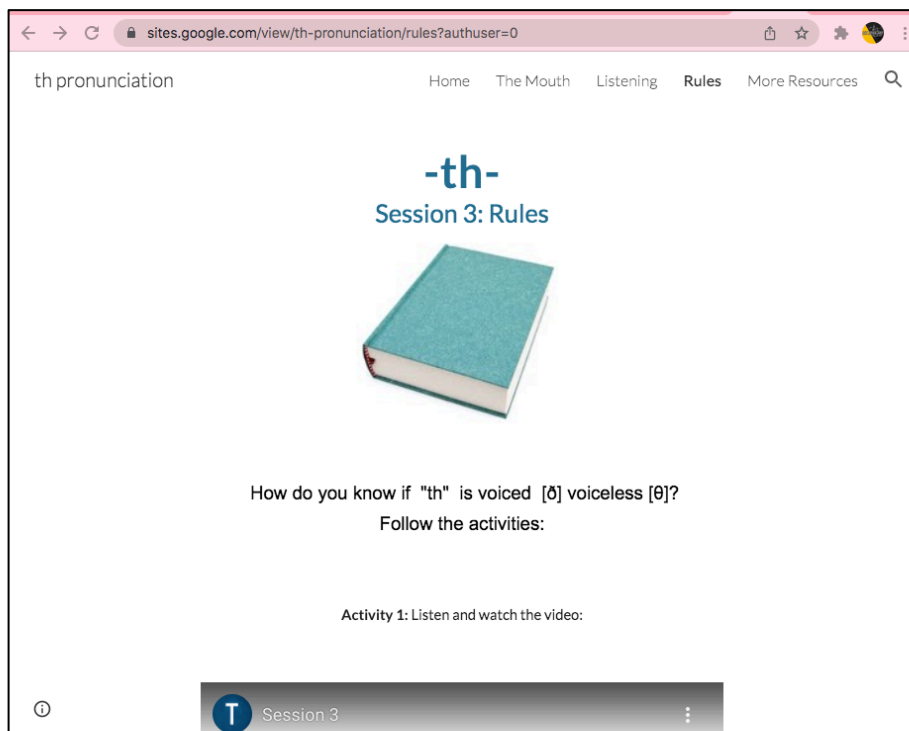
The screenshot shows a web browser window with the address bar displaying "sites.google.com/view/th-pronunciation/listening?authuser=0". The page title is "th pronunciation". The navigation menu includes "Home", "The Mouth", "Listening", "Rules", and "More Resources". The main content area features the text "-th- Session 2: Listening" in blue, followed by a large, realistic illustration of a human ear. Below the ear, the text reads: "In this class, you will improve your listening perception to differentiate the Voiceless Th and Voiceless Th. Follow the activities:". A small information icon is visible in the bottom left corner of the page content.

Picture 9



Picture 10

Page 3: Rules



Picture 11

th pronunciation

Home The Mouth Listening **Rules** More Resources

Session 3

-th-
Session 3 Rules

Activity 2: Remember the rules

Th can happen in 3 cases:
Beginning, Middle, End of the words.

Click to learn each case!

Picture 12

th pronunciation


Home The Mouth Listening **Rules** More Resources

Th pronunciation

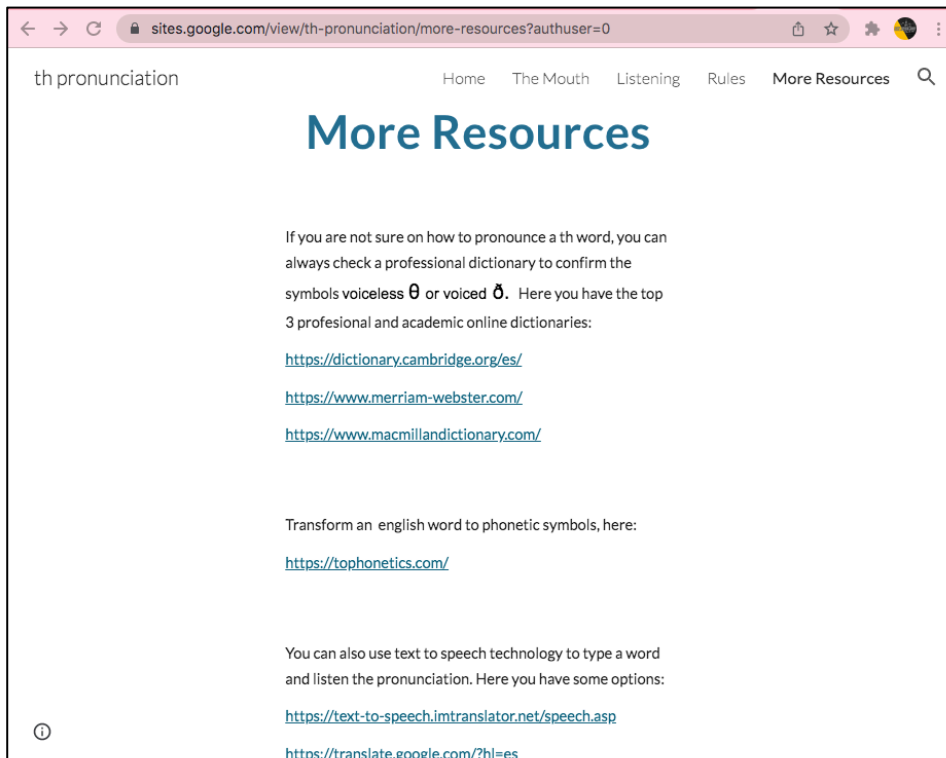
Voiceless θ vs. Voiced ð

"Th" Position	Beginning		Middle			End all, except "with"	
	Content Word	Function Word	Before Consonant	Between 2 Vowels			
Type				(+ r)	(+ e)	(+ ing)	
Examples	-Nouns: <i>thought</i> , -Verbs: <i>think</i> -Adjectives: <i>thick</i> -Adverbs: <i>thankfully</i>	<i>this, that, these, those, then, them, they, them, they're, there, therefore</i>	- <i>bath</i> tub - <i>truth</i> ful - <i>tooth</i> pick	"vocalic R": <i>mother</i> <i>worthy</i> <i>worthy</i>	For Verbs: <i>bathe</i> <i>loathe</i>	<i>ti</i> thing <i>breath</i> ing <i>bat</i> hing	<i>Worth</i>
Pronunciation	θ	ð	θ	ð		θ	

Activity 3: Play de Kahoot No.2



Picture 13



Picture 14

Annex 2



Materials used in the methodological proposal

The following materials were used in this methodology:

- **A personal computer or laptop:** This item was used to type text needed in the project. It allowed the researcher to access the internet. It was also used to develop graphic design and multimedia production as well as to develop the website design and architecture.
- **An Artificial Intelligence (AI) speech generator (Speechelo):** This was a text to voice technology online that transformed any text to audio. It was used to generate word items in audio to be implemented in the pretest and posttest.
- **Google Docs:** It was an online word processor to type documents such as reports or tests drafts.
- **Google Slides:** It was an online slides generator to create supporting visual aids for presentations.
- **Google Forms:** An online tool to create questionnaires, quizzes and surveys.
- **A pretest:** It was a diagnostic test generated after establishing desired results. It was applied to the students before they are exposed to the methodology.
- **A posttest:** A diagnostic test generated after establishing desired results. It was applied to the students after they were exposed to the methodology. Its results were contrasted with the pretest results for further analysis.
- **Google Sites:** A free online tool by Google to create and publish websites.
- **A YouTube channel:** A free online site to upload and share videos.
- **Computer microphones:** A recording device sometimes built into the computers and sometimes external that not only allows recording but also enhances the recollection of sound.
- **A Movie Editor Software:** The methodology consisted of 4 videoclips that were presented in a website. Theses videoclips were created and edited in two movie editor software: Adobe Premiere and iMovie, both in a Macintosh Operation System (Mac OS, Apple).
- **Zoom (online conferences software):** This was an online communication tool to hold conferences, online classes and meetings. It also allowed to record meetings to create educational videos.

- **Freepik (Free images stock):** It was a free website to download royalty free images for graphic design.
- **Logic Pro X:** It was an Audio Edition Software to curate and analyze audio files needed for the project.
- **Praat Audio Analysis Software:** It was used to analyze audio files and obtain an indicator called “Fraction of locally unvoiced frames” which showed how much % of vocal cords vibration was present in a segment of sound.
- **Consent Form:** A consent form was provided to the students to register their willingness to participate in the present research project.
- **WhatsApp:** A mobile instant messages application from Facebook-Meta for text, voice recording in audio and other multimedia files.