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**DEVELOPING PRONUNCIATION BY MEANS OF CALL IN 9TH
GRADE EFL STUDENTS: AN ACTION RESEARCH APPROACH**

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The image is a large, semi-transparent watermark of the University of Chile crest. It features a central yellow shield with a blue torch and a red flame. The shield is set against a blue background with white stars and a laurel wreath at the bottom. The text of the thesis is overlaid on this watermark.

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Dedicamos el fruto de nuestro trabajo a nuestras familias, que hicieron posible nuestro paso por la universidad, y a nuestras parejas, amigos y amigas, quienes nos acompañaron durante los buenos y malos momentos.

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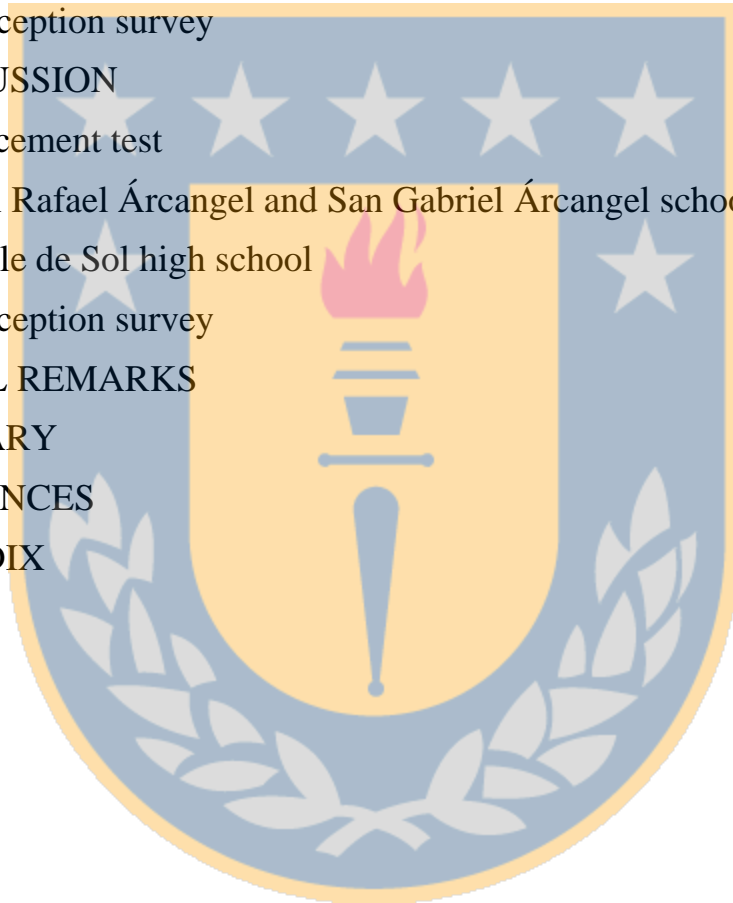
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ABSTRACT

The purpose of the following action-research project is to develop 9th grade students' pronunciation by means of technology. The participants of the study were 136 students from 3 different Chilean schools with different cultural and economic backgrounds. Students took part in 9 45-minute sessions in which they worked with the MyET software, a web-based application that uses voice recognition technology to aid in the development of stress, tone, rhythm, and pronunciation. They completed a placement test, a pronunciation self-test within the application, and a total of 3 lessons and tests offered for free by the platform. To finalize the project, and evaluate its effectiveness, students took the first self-test again as well as a perception survey. The results showed that the students who completed every lesson improved in terms of tone, rhythm, stress, and pronunciation. The perception survey results demonstrated that students appreciate the use of CALL, TELL, and AI applications and feel motivated and confident when doing lessons in these settings. The present AR study reiterates the importance of incorporating technology that meets the students' needs in the classroom.

INTRODUCTION

Due to the global pandemic of Covid-19, the lack of face-to-face interaction in classes has affected students' oral skills. This became apparent during our observation period in the schools where we were doing our teaching practicum. Students were only somewhat willing to participate and use the language, however, their pronunciation skills made it difficult for the students and teachers to understand. The main objective of this action research project is to develop 9th grade students' pronunciation through technology, which has been proved to foster the pronunciation teaching-learning process (Pennington & Rogerson-Revell, 2018).

Technology permeates students' lives greatly. It is present in their daily routines and has become an important part of their development (Li et al., 2015). Accordingly, teachers have tried to include various activities and resources in their plannings to cater to these needs, making the classroom more interesting for the students. Specifically in English as a Foreign Language (EFL) teaching, Computer-Assisted Language Learning (CALL)

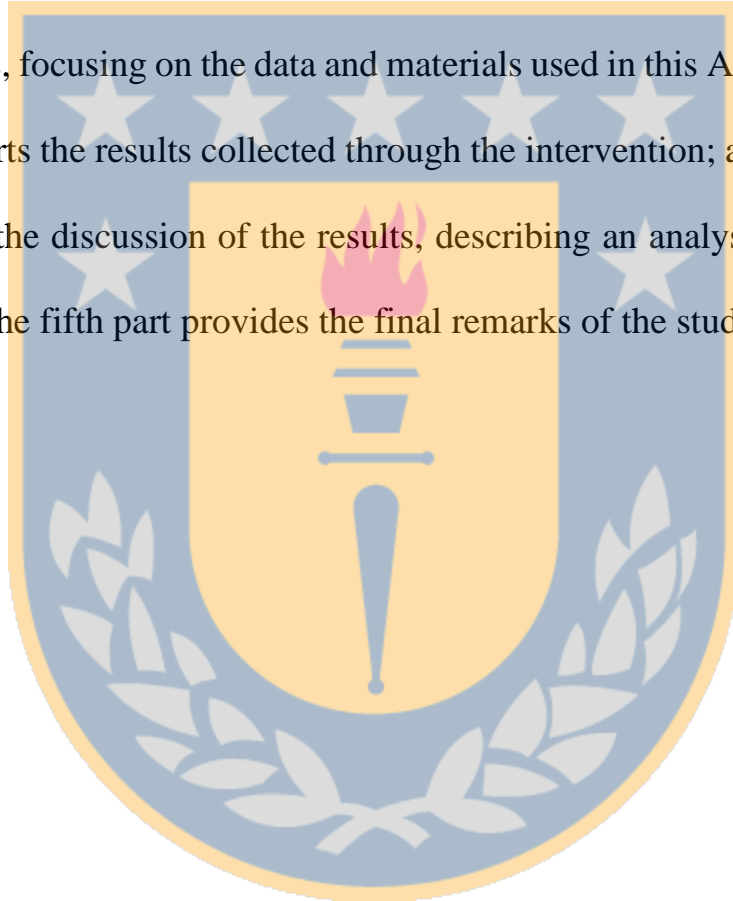
has occupied an important place when discussing methodologies (Tafazoli et al., 2019).

In Chile, according to Jaramillo and Chávez (2015), Technology-Enhanced Language Learning (TELL) has proven to be successful in keeping students engaged and making classes more enjoyable. In the following project, applications of CALL and TELL were used in an effort to develop students' pronunciation.

For this AR project, the participating students worked with the voice recognition software of MyET (My English Tutor) platform, which, according to Lee (2008), has the function of recording students' voices and giving the learner immediate and detailed feedback of their performance in real time. Specific learning units, found within the application and aligned with those found in the national curriculum were used for a 45-minute class every week, for 6 weeks (of a total of 9 weeks), as part of the intervention for this action research study.

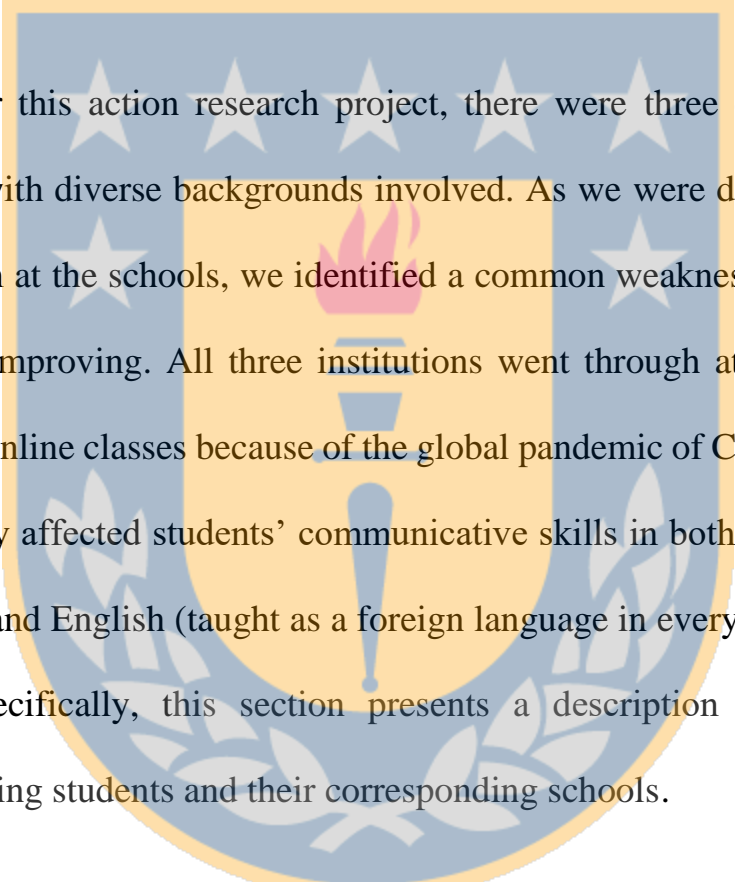
The present report is organized into five main parts. The first part consists of the school description, the context of every school where the units and lessons were implemented is thoroughly described. Also in this part, the

teaching problem is delimited, which specifies the nature of this project, and how it is linked to the global pandemic of Covid-19. The second part of this report describes the plan development; this section presents the objectives of this research, characterization of activities, and characterization of the project resources, focusing on the data and materials used in this AR study. The third part reports the results collected through the intervention; and the fourth part presents the discussion of the results, describing an analysis of the process. Finally, the fifth part provides the final remarks of the study.



1. SCHOOL CONTEXT

1.1. Description of the schools



For this action research project, there were three different Chilean schools with diverse backgrounds involved. As we were doing the teaching practicum at the schools, we identified a common weakness we could work towards improving. All three institutions went through at least two entire years of online classes because of the global pandemic of Covid-19. This has negatively affected students' communicative skills in both Spanish (mother tongue), and English (taught as a foreign language in every Chilean school). More specifically, this section presents a description of the project's participating students and their corresponding schools.

1.1.1. Bicentenario Valle de Sol High School

The Bicentenario Valle de Sol High School is located in Quilaco, a small town in the Biobío province, in the 8th region. It was built in 1961 under the name “*Escuela F-1093*” and renamed Bicentenario Valle de Sol in 2001. Ever since its foundation, this public institution was a polytechnic high

school up to the year 2020 when it changed to the traditional system. The school has an educational approach built upon three main hallmarks, arts and sports, cultural and natural environment awareness, and integral development.

The school has around 450 students. Including pre-school (pre-kindergarten and kindergarten), primary school (1st to 8th grade) and secondary school (9th to 12th grade). Every level has only one form of about 35 students, and only 7th, 8th and 9th grades have approximately 44 students. Regarding classrooms, each classroom is equipped with a whiteboard, data projector and internet connection.

This institution includes different facilities such as one library, one science laboratory, and one computer laboratory. Moreover, they have a courtyard and an outdoor playground. Also, the school infrastructure allows students to have access to a wide variety of extra-curricular activities such as art workshops, creative writing workshops, music and band activities and sports workshops like basketball, football, and volleyball.

Students are supported by means of various professionals such as psychopedagogues, counselors, psychologists, speech therapists, special

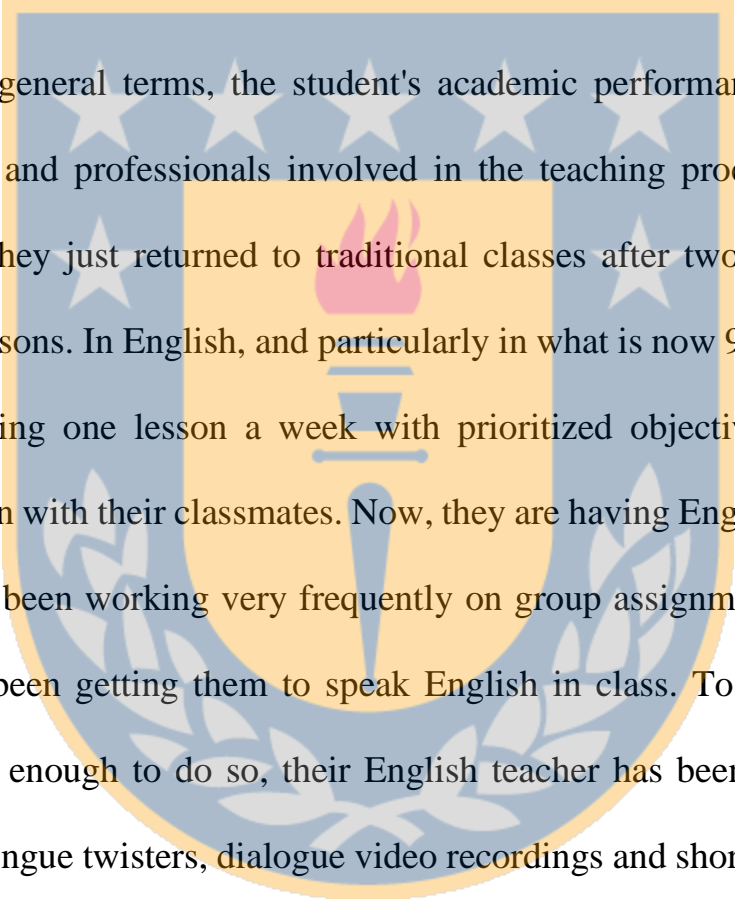
education teachers and social workers. There are also healthcare experts, such as nurses and dentists, constantly assessing the students' health conditions.

In terms of organization, the school is run by the principal. The second highest position is the Academic Department Head, of which there are two, one in charge of primary and pre-school levels, and one for the secondary levels. There are 35 teachers from different departments, and 24 educational assistants.

The students come from both rural and urban areas. Those who commute from rural areas have buses provided by the municipality. The school has a predominantly poor population in terms of culture and economy. A large number of parents, whose children study at this school, have not completed their high school education. Because of this, some students still feel like they do not need to finish high school to lead successful lives in the future. Even more so, a lot of them do not realize the importance of learning English in this day and age, and do not actively participate in classes.

English classes at the Bicentenario Valle de Sol high school start at pre-school. They get two 45-minute classes every week, as well as 1st to 4th grades. Students from 5th to 8th grade have three 45-minute classes per week.

Lastly, 9th to 12th grades have four 45-minute classes every week. They have had the opportunity to work with native speakers in the past and the only other activity in which they are exposed to the language is the English Week organized by the English department every year.



In general terms, the student's academic performance has suffered. Teachers and professionals involved in the teaching process believe it is because they just returned to traditional classes after two years of having online lessons. In English, and particularly in what is now 9th grade, students were having one lesson a week with prioritized objectives and minimal interaction with their classmates. Now, they are having English twice a week and have been working very frequently on group assignments. The hardest part has been getting them to speak English in class. To ensure they feel confident enough to do so, their English teacher has been doing activities such as tongue twisters, dialogue video recordings and short presentations in front of the class. Gradually, students have started to feel less nervous and more open to using the target language. However, their pronunciation and grammar are still in need of improvement to reach the expected level.

Their English teacher has been using a communicative approach in which she prioritizes their ability to get their ideas across, regardless of their accuracy. Having stated this, their pronunciation often interferes and makes it difficult to understand them. It has been challenging for the teacher to work on pronunciation and oral expression with this class because of how many students there are in the classroom and the students' disciplinary issues.

1.1.2. San Rafael Arcángel school

San Rafael Arcángel School is located in the capital city of the Biobío province in the 8th region. The institution is a subsidized school, sheltered by the Juan XXIII non-profit foundation for more than 93 years. It has an educational approach focused on the socio-constructivist paradigm, with the purpose of a constant integral and inclusive formation, providing permanent support, both spiritually and socially. Also, the school aids students to discover and develop their abilities, in order to be an active part of society, serving the community and church. Moreover, the school has about 1300 students, including pre-school (pre-kindergarten and kindergarten), primary school (1st to 7th grade) and secondary school (9th to 12th grade). There are

about 2 forms for each level, A and B; except for 12th level in secondary education, which has 4 of them, all of which have 44 students per classroom.

In terms of infrastructure, the school comprises a large number of facilities such as libraries, computer and science laboratories, and multi-purpose rooms. In addition, they have a large, roofed courtyard, and a spacious school canteen where students can go buy food and socialize. Due to the school's vast infrastructure, students can participate in extracurricular activities like debate, sports, arts, literature, music, ICTs, and science workshops.

The school is constantly monitoring their students through many professionals including speech therapists, kinesiologists, counselors, psychopedagogues, psychologists and special education teachers. All its professionals have offices and especially dedicated rooms for student services, such as the Integration and Counselling rooms.

Regarding organization, the principal is the main authority, the second authority is the Academic Department Head, one assistant principal for primary and secondary education, and a chaplain, who is a very important

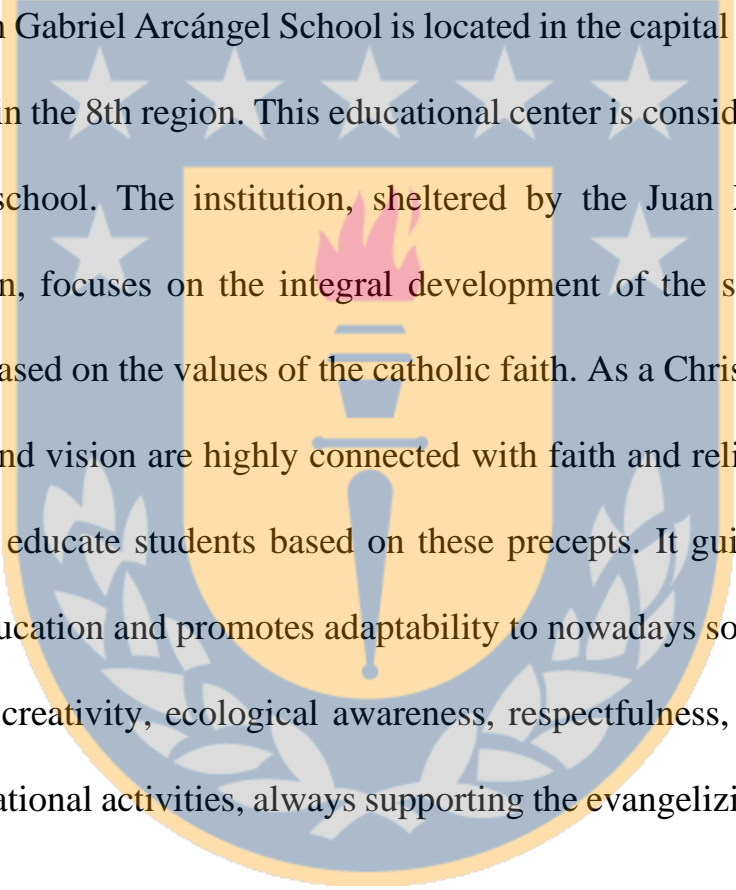
figure since it is a Catholic school. Moreover, there are around 70 teachers belonging to different departments.

Each classroom is equipped with an air conditioner, whiteboard, data projector, and a computer with internet connection, which facilitates the use of classroom technologies, in order to make the lessons more interactive and participative. English classes start from primary school, with two 90-minute classes per week for 1st and 2nd levels; and five 45-minute classes from 3rd to 12th levels. In these classes, there are some students who come from different schools, which means they have diverse backgrounds and proficiency levels, so a proper leveling is needed before starting to follow the national curriculum given by the Ministry of Education.

Academically speaking, students are willing to learn new content and participate in classes, but their grades do not reflect that enthusiasm, especially due to the lack of study at home. In the case of English classes, students have a very basic command of the language. In those classes, the teacher tries to teach students elementary content, so they can get familiar with the language. Listening and repetition activities are also incorporated

into the lessons, so they can practice their listening skills and pronunciation skills.

1.1.3. San Gabriel Arcángel school



San Gabriel Arcángel School is located in the capital city of the Biobío province in the 8th region. This educational center is considered a subsidized catholic school. The institution, sheltered by the Juan XXIII non-profit foundation, focuses on the integral development of the students as future citizens based on the values of the catholic faith. As a Christian school, their mission and vision are highly connected with faith and religion. The school strives to educate students based on these precepts. It guides students into higher education and promotes adaptability to nowadays society, originality, freedom, creativity, ecological awareness, respectfulness, diversity, sports, and recreational activities, always supporting the evangelizing mission of the church.

The school has over 2,500 students and it is the largest school in the Biobío province. This center provides educational services from pre-school (pre-kindergarten and kindergarten), primary school (1st to 8th grade) and secondary school (9th to 12th grade). For each level there are 4 forms A, B,

C, and D, all of which have 45 students per classroom. Each classroom is equipped with a whiteboard, air conditioning, speakers, and a data projector.

Regarding the school infrastructure, it has two computer rooms, one English laboratory, two libraries, one science laboratory, one multi-purpose room, two canteens, one gymnasium and a big courtyard. These facilities provide the opportunity to develop numerous extra-curricular activities such as football, athleticism, basketball, theater, literature, music, ballet, and arts.

From the point of view of organization, the school's highest position is the principal. The second highest position is the Academic Department Head, then two assistant principals, one for primary level and another for secondary level. There are also 7 members in the management team, 97 teachers from different departments, and 74 educational assistants.

The demand for professionals in the school is high due to the number of students and departments needed to fulfill the requirements that students, parents and teachers have. The institution is supported by a variety of professionals such as special education teachers, psychologists, counselors and psychopedagogues, as well as additional teachers for tutoring the students with difficulties in any subject.

Most of the students live in Los Angeles or areas surrounding the city. The school does not provide transportation for the students. The students' economic background can be considered medium-high, most of the parents have finished their studies and have professional or technical degrees. Consequently, most of the students pursue a professional path and their efforts go towards getting satisfactory results in the university entrance exams. In contrast with this idea, there exists a global understanding that learning English is not relevant for their future, which leads them to avoid participating in the classes or doing the tasks given by the teacher.

In terms of the academic performance of the students, they are performing well in comparison with the other classes, but this does not mean they do not need improvement. The general view of professionals who work with the class is that the lack of face-to-face interaction has led them to have problems returning to traditional classes, they have a delay of almost two years. In 9th grade, regarding the subject of English, the teachers work with the prioritized objectives with little or even no interaction among the students, further encouraging the idea that English is not as important as other subjects. Due to this delay in content and skills development, the school has decided to minimize the evaluations and contents asking them to perform the

bare minimum. This lack of interaction and production in English is because they feel ashamed of speaking in another language. Because of this, the teacher-researchers have been trying to read aloud and giving feedback, however, most of them refuse to do this type of activity.

English classes at the school begin at pre-school. They have two 45-minute classes per week, the same for 1st to 4th grade. Then, from 5th to 8th grade, students have three 45-minute lessons a week. In secondary school, from 9th to 12th grade, they have five 45-minute classes every week. Apart from the regular classes, students, especially low-performing students, can attend reinforcement classes, which occurs after the regular schedule.

According to the teachers, English has been intended to be taught communicatively, focusing on interaction, and trying to teach them how to express their thoughts and ideas clearly instead of their grammar accuracy. However, this has been extremely difficult due to the students' lack of basic vocabulary and grammar necessary to communicate. As a result, students' pronunciation is considered poor, due to the little exposure and limited oral production. Many tend to pronounce words as they are written or as they would read them in Spanish.

1.2. Teaching-learning problem

Pronunciation is a fundamental part of learning any language. After two years of online classes, Chilean students' ability to use English, especially their pronunciation, was greatly affected. Students started getting less and less exposure to the language as learning objectives were prioritized and classes were cut shorter. As they started their face-to-face school year, there were clear gaps in the content they should have known, and speaking activities were incredibly hard to carry out.

To help understand this problem further, a discussion as to how the problem was identified, how it is currently addressed by the schools, and how it affects the English learning process is presented here. Additionally, concepts relevant to pronunciation such as intelligibility and comprehensibility, voice recognition as a tool of Artificial Intelligence (AI), and Computed Assisted Language Learning (CALL), will be introduced.

Pronunciation, according to Pourhosein (2016), is the production of sounds. It can be learned by the constant repetition of sounds and appropriate correction when produced inaccurately. It has an important role in the

communication process (Adityarini et al., 2021), being one key element in speech for meaningful communication.

In Chile, according to Calisto-Miranda and Ortiz-Navarrete (2019), pronunciation is regarded as one essential part of learning English. Students, however, do not want to use the language until they have correct pronunciation. This creates a dangerous paradox in which students do not practice but anyway expect to gain knowledge and skills.

Statistics provided by Education First (EF) through their English Proficiency Index (EPI) show that Chile has improved in terms of proficiency. The country, currently placed 47th out of 112 countries, went from a low level of English (Education First, 2017), to a medium level of English proficiency in the same study last year (Education First, 2021). However, during 2017, the youngest group, people whose ages ranged from 18 to 20 years old, scored the highest in comparison to the rest of the participants, in 2021 however, the same group scored the lowest.

The teacher-researchers of this AR project strongly believe 2 years of online classes have contributed to this adverse reality. The problem became apparent ever since the practicum started. Students were reluctant to speak in

English, even when reading directly from a script or text. With time, they started reacting more favorably and gradually using the language more actively. When doing so, it became noticeable that most of the students were reading phonetically. In other words, and as Wren (2001) explained, they were "sounding out" words the way they are written or writing words the way they sound.

Their intelligibility and comprehensibility were also very much compromised. According to Hodge and Whitehill (2010), intelligibility is the extent to which speech is actually understood by another person; it is also a functional indicator of communication competence. On the other hand, comprehensibility is defined by Barefoot et. al. (1993) as the effort a listener makes to understand utterances produced by a speaker. Both instances require a face-to-face communication process in which utterances are produced by a speaker and processed by a listener.

The first steps into the detection of this problem began at the observation phase of the professional practicum. During this period, the opportunity to observe the students and the modality of the classes was given. Students were rarely asked to speak out loud in English. Even less so, if they

were asked to talk using the L2, they refused because they were not confident enough and did not trust their pronunciation.

An important factor for the students' low command of English is the importance the schools give to the English subject. Students miss some classes due to other activities planned by the school, so instead of using the time to learn the language more effectively, they occasionally spend it doing unrelated activities. Additionally, the lack of constant study from students is another important factor, they do not practice the language outside the classroom, so constant exposure to English is not present.

Regarding classes, the teacher uses attractive visual aids and designs catchy activities, so students can pay attention to the lessons and enjoy the learning tasks. In spite of this, students generally struggle to understand some basic concepts or are afraid of participating while checking the activities.

As time went by, there were several occasions when students had to read aloud and most of the students had problems regarding fossilization of certain basic words. Moreover, they did not use rhythm and stress patterns appropriately according to the text intentions and they were not accustomed to using inflections. When doing speaking activities with the students,

especially dialogues and presentations, the English teachers went through a great deal of trouble to understand what the students were saying, even when they had the scripts.

This shows that even when students knew grammar and structure, both intelligibility and comprehensibility were compromised because of their poor pronunciation skills. After careful consideration and conversations with the teachers in charge of the practicum, it was decided this was the problem that should be tackled. The activities had to be appealing for the students to actively participate in pronunciation learning tasks. To this end, it was decided to include technology.

Technology in the form of audio, video and electronic resources is changing what is available for language teachers and students in terms of content delivery and instruction (Pennington, 2021). More specifically, these new technologies can greatly aid in the teaching of pronunciation.

1.2.1 Intelligibility and comprehensibility

According to Doloh and Chanyoo (2022), lack of familiarity with different accents and little concern for intelligibility will cause difficulties when students try to establish an English conversation with a non-native

speaker. Considering we live in a globalized world; this is what most authentic communicative situations entail nowadays.

Derwing and Munro (1997) believe that suprasegmental features, such as stress and intonation, are what make the accent of the speaker. The accent makes an important contribution to the speakers' intelligibility and comprehensibility. In this action-research project students developed intelligibility, meaning it was not striving for a native-like accent, instead, striving to be able to make themselves understood in an authentic setting. According to Levis (2018), this is possible; he also claims that foreign-accented speech is mostly intelligible, especially for those familiar with foreign accents.

1.2.2. Technology Enhanced Language Learning (TELL)

Another relevant and recent concept for the following project is Technology Enhanced Language Learning (TELL). TELL is the study of the use of technological applications in language teaching and learning. In other words, TELL is the use of technologies that improve and facilitate educational learning, in this specific case, of English as a foreign language (Golshan & Tafazoli, 2014).

According to Pennington and Rogerson-Revell (2018), there are several benefits to technology-based teaching and learning. These include the motivational effect created by the use of laptops or smartphones, the availability of multimodal resources, the endless opportunities for repetition and the access to individualized, self-paced learning.

1.2.3. Computer Assisted Language Learning (CALL)

Computer Assisted Language Learning, or CALL, refers to the use of computers as a support for learning in the educational area, which is more accessible and storable (Ratnaningsih et al., 2019). During the global pandemic, the necessity to continue teaching and learning, despite self-isolation, emerged. Online classes appeared to be the perfect solution, students connected through their phones or computers from home to the lessons being carried out by the teacher (Bailey & Lee, 2020).

These difficult circumstances allowed everyone to see the benefits of using technology as a tool for learning. Accordingly, the use of computers and other technological devices seem to be the way of advancing new methodologies, especially regarding teaching a foreign language.

Rahnavard & Mashhadi (2017), developed a study in a Language Institute in Rasht, in which there were two groups of 30 participants, treatment and control groups. The control group was taught through conventional classes, which were teacher-centered, and the treatment group participated in 12 sessions using CALL. These sessions involved working with a website, English Pronunciation Practice (ManyThings.org), which included quizzes to practice sounds using minimal pairs, sentence rhythm and intonation. The results were indisputable, the experimental group proved significant progress in their pronunciation in comparison with the control group.

1.2.3.1 Mobile Assisted Language Learning (MALL)

According to McKim (2016), Mobile Assisted Language Learning (MALL) has been around for at least 20 years. However, it has become an integral part of language teaching and learning recently. Nowadays, with the development of technology and easier access to it with portable technological tools, such as mobile phones and tablets, technology can be successfully integrated into the language curriculum.

MALL has numerous benefits and advantages, including quicker access to information, the possibility of collaborative learning and easier interaction with course materials (Chuang, 2016). Another benefit, noted by Ahmad-Zaki and Md-Yunus (2015), is privacy. They point out that students feel much more comfortable using the language when they are by themselves.

Lastly, Metruk (2019) concludes that regardless of the many advantages MALL proposes, there are certain drawbacks. The most important one being screen addiction. This can be overcome by appropriate preparation of the class materials and lesson objectives.

1.2.4 Artificial Intelligence (AI)

Artificial intelligence (AI), according to Zakiyyah et al. (2022) is an intelligence which is given to technology, whether it is a computer or another technological device. AI has the ability to benefit and help humans through a system which facilitates their own work, and it was made with that purpose. This type of intelligence has a variety of uses, including teaching and learning. Some examples are “ELSA Speak: English Learning App”, “EPA (English Pronunciation Application)”, and “MyET (My English Tutor)”.

1.2.4.1 Speech Recognition Software

In the work of Pennington and Rogerson-Revell (2018), Automatic Speech Recognition (ASR) is defined as a way to convert speech signals into words. They mention ASR as an active area of linguistics, specifically phonological research, as well as for the development of practical tools. In addition, speech analysis enables the acoustic analysis of a speech signal, usually visualized as a waveform.

Moreover, an application of AI is the Automatic Speech Analysis System (ASAS), which is a tool of natural speech processing, being capable of analyzing learners' English speech, and providing detailed feedback on how to improve specific sounds in pronunciation. This voice analysis technology has been designed by L Labs (n.d.) with the main purpose of language learning.

1.2.5. Gamification

According to Luo (2021), the term gamification refers to the usage of components or systems designed for gaming within non-gaming contexts encouraging certain attitudes. The analysis of 44 selected articles led him to

the conclusion that there are indicators for measuring the effectiveness of educational gamification, the level of engagement being the key factor. Affective engagement, behavioral engagement, and cognitive engagement also play an important role.

In the work of Dehghanzadeh et al. (2021), after the systematic review of publications made from 2008 to 2019 in relation to gamification, they were led to the conclusion that the use of gamification for learning English as a second language was beneficial, especially in terms of the learners' experiences. Moreover, among all included publications, 13 articles reported that the learning experiences were considered 'positive'.

These studies used five describing words for gamification in these contexts, the most used were 'enjoyable', 'fun', 'attractive', 'interactive', and 'interesting'. The remaining studies did not make use of words such as 'positive', 'neutral' or 'negative', implying that there are no studies with negative findings for the usage of gamification in learning English as a second language.

Tejedor-García et al. (2016) implemented a three-week test experiment, in which 100 Spanish and Chinese native students of English as

a second language were supposed to train their pronunciation with a minimal-pair serious game called “TipTopTalk!”. This mobile application was based on Text-To-Speech (TTS) and Automatic Speech Recognition technology, including gamification features with the purpose of encouraging constant exposure, discrimination, and production of sounds.

Unmistakably, the results showed that the users improved their performance, nevertheless, the ones who had a lower performance at the first stages, in comparison with the rest, made more progress. Also, according to this study it would be best to incorporate individual and specific feedback for the students, avoiding the drop of their interest after protracted use.

This feature is incorporated in the platform MyET (L. Labs, n.d), where students can study the language while having fun and see their progress, in real time, on the application. The platform uses gaming-like components so English learners can engage more. These include giving students the opportunity to make friends, participate in contests around the world as a group, as well as individually competing internationally with their own results. Also, the application provides game-like incentives for learners,

namely virtual money, to use on the application, leveling up and earning points.



2. IMPLEMENTATION OF THE ACTION RESEARCH PLAN

2.1. General Objectives

The two main objectives of this project are a) to determine the effectiveness of the teaching proposal, which consists of a technology-based pronunciation intervention, by means of an Action Research (AR) approach in 9th grade students; and b) to explore the students' perceptions towards this pedagogic innovation and the implemented activities, which involved the use of CALL, TELL, and AI applications to enhance pronunciation.

2.1.1. Specific objectives

In order to achieve these goals, we will:

- Ascertain the students' level of English in terms of general proficiency through a placement test.
- Determine the students' level of English pronunciation by means of a pronunciation self-test.

Additionally, we will:

- Analyze the pronunciation self-assessment reports implemented throughout the intervention, more specifically, suprasegmental features, such as stress, rhythm and tone (Kang & Johnson, 2018), as well as pronunciation of sounds.

- Examine the perception survey results to better inform the reflection process.

2.2 Action research in education

Action research (AR), as Tripp (2005) stated, is a method that can be applied in a different way depending on the applications. In this case, being used for educational research, according to Clark et al. (2020), AR is seen as a process to improve and support educators' pedagogical practices by gathering information, in order to implement changes in the future. In this way, teachers keep constantly working on upgrading their teaching styles and strategies used to help students' learning process and engagement.

This methodology entails the implementation of one research cycle. A research cycle consists of 4 stages, which may vary according to the model or author being used. These stages are planning, which consists of the identification of a classroom problem and the development of research

questions; action, during which the researcher will initiate the intervention over a set period of time; observation, which consists of readjusting and reviewing the actions based on the evidence gathered during the action stage; and reflection, during which the evidence and resulting outcomes are impartially analyzed (Burns, 2015). This is the model under use in the AR project, therefore, the different stages of this thesis project will be introduced or explained in these terms.

2.3 Participants

The participants of this study were 9th grade students from two semiprivate or subsidized schools, with a medium-high economic background, and one public school, with a low economic background, in Chile. At the beginning of the project, there were 136 participants, however, due to absences from classes and students who left the schools, only 74 participants successfully completed the intervention.

2.4. Materials

The activities and materials used for data collection in this AR study consisted of a placement test, a pronunciation self-test provided by the MyET platform, which was taken at the beginning and end of the project; weekly

pronunciation self-assessment reports after finishing each unit, and a perception survey.

2.4.1. Placement test

At the beginning stage of this study, students sat a placement test. According to the school of humanities and science at Stanford University (n.d.), the purpose of a placement test is to “assess students' current language abilities in order to match them to the language courses most suitable for their level.”

The placement test that was used in this study, developed by Cambridge University, is a quick and free online test (35 minutes), meant for schools, which provides information regarding the students' approximate level of English. It is made up of 5 sections of 5 written questions each in which students must choose the best option out of the 3 or 4 available answers to complete the given conversational context or sentence. In each section, they had to complete all 5 before moving forward to the following section. When finished, the test reports the results and provides feedback on each question. The results are given in the form of number of correct answers and approximate level of English proficiency as seen in Table 2.1.

Table 2.1

Cambridge Placement Test results

Correct Answers	English Level
0 to 9	A1
10 to 15	A2
16 to 18	B1
19 to 22	B2
23 to 25	C1

2.4.2. Pronunciation self-test

On week 2 of the study, students sat a self-test from MyET platform, regarding proficiency in terms of pronunciation of sounds, tone, pitch, rhythm, speed, and overall performance. The test is from the unit “Practical English Conversation 1A (1)” on the lesson 1 ‘Meeting a new friend’, which is a dialogue between two people, Sofia and Alex, who are getting to know each other.

Students had about 15 minutes to repeat what the speakers said, and a limited amount of time after each utterance. They received feedback from the self-test regarding each aspect of it, giving them an overall score at the end.

The evaluation scale goes from 0% to 100% of accuracy in terms of segmental and suprasegmental features, ranking them internationally with other people who also use this platform to practice their pronunciation.

2.4.3. Self-assessment tasks

Throughout the intervention, students worked with different units found on the MyET platform. These units were chosen considering what the national curriculum requests from the students, which is to produce clear utterances when talking about different topics. For this study, students were assessed using speech recognition technology in the form of an Automatic Speech Analysis System (ASAS) developed by L Labs Inc. (n.d.)

Said software gave the students feedback and detailed information about their pronunciation of sounds, pitch, timing, and emphasis. Students worked with each lesson for two weeks for a total of two 45-minute classes. They practiced during the first and second class of each lesson, and they took the self-assessment test at the end of the second class.

The unit used for the first round of practice and self-assessment was “Practical English Conversation 1A”, lesson “Meeting a new friend”. During the following two weeks they worked on the unit “Survival English”, and the

lesson “Introducing yourself”. During the last two weeks, they continued working within the same unit but with the lesson “Meeting someone at the airport”.

2.4.4. Perception survey

Once students finished working with the 3 lessons, they were asked to complete a perception survey, the purpose of which was to know about their work and how they felt throughout the project, the intervention itself, namely the use of CALL during the study, and their own ability to produce utterances while pronouncing correctly. The questionnaire consisted of 15 closed-ended questions in the form of a 5-point Likert-type scale and 1 open-ended question. Students had an extra 45-minute session to answer the survey.

The perception survey was written in Spanish as it is not a tool to measure the students’ level of English, but rather, it is intended to know their thoughts on the project. By taking the survey in English, students’ answers might be compromised because of the language barrier. By using Spanish, the students can understand clearly what they have been asked in order to properly answer the survey without any possible misinterpretations.

This survey was devised on Google forms. It consisted of three dimensions, affective, pedagogical, and linguistic. The first dimension aimed to know whether students perceived the intervention as a useful resource for them in terms of developing confidence, a better perception of the language, and motivation with items like *“El trabajar semanalmente con la aplicación MyET me ha motivado a seguir mejorando mi pronunciación”*.

The second dimension aimed to establish whether the features of the intervention contributed to their English learning process and, more specifically, the development of pronunciation skills with items like *“El feedback inmediato y privado entregado por la aplicación MyET me hizo reflexionar sobre mis habilidades en pronunciación”*.

Lastly, the third dimension aimed to get information on whether the students developed their pronunciation skills, and suprasegmental features during the project with items such as *“Estas actividades me han permitido tomar conciencia de aspectos prosódicos del habla (stress, rhythm, pitch and tone) al hablar en inglés”*.

Said questionnaire was validated by means of the expert judgment methodology. A group of experts in the field of English language teaching

and learning was asked to revise and score the questions in terms of clarity, coherence and relevance of the statements as seen in Figure 1. After the comments and scores were received by the teacher-researchers, the statements were once again revised and modified accordingly.

Figure 1

Expert judgment form

Ítem 2: “El trabajar semanalmente con la aplicación MyET me ha motivado a seguir mejorando mi pronunciación”. *

	1	2	3	4
Claridad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coherencia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Relevancia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

After the final revision, the form was completed with the formal aspects. These included an introduction to the questionnaire, the informed assent students needed to agree to, a section for them to identify themselves, and an example of the statements and answering format. When it was time for

the students to answer, the form was shared using different means (Google Classroom, WhatsApp groups, and Instagram).

2.5. Characterization of the classroom project

In the schools under study, teachers expect to work with a communicative approach. However, this is hard when considering the students' current level of English. Throughout the study, students worked with pronunciation activities, in the form of dialogues, that provided them with skills and knowledge to ensure they have the necessary skills to successfully work with the communicative approach in the future.

The implementation of this action research proposal has two parts, the first one which consisted in a two-month observation and planning stage, that took place at the beginning of our practicum, and the second part, which started during the second academic semester, included an action-plan that was developed for 6 weeks and the reflection stage.

The action-plan or intervention consisted of 9 sessions. The first 2 sessions were aimed at measuring the students' proficiency by means of a placement test, and a pronunciation self-test provided by the platform students used throughout the study. The following 6 sessions were devoted

to practicing 3 different lessons from the MyET software. Students worked with each lesson for a total of 2 sessions each, and they took a self-test at the end of each lesson. The final session was used to self-test the students sat at the beginning of the study. Students also completed a perception survey about the project they took part in. A description of the sessions is presented below.

Table 2.2

Action-plan calendar

Week	National Curriculum Unit	MyET Unit	Procedure	Time
1 August	Introductory session	Introductory session	Placement test. Students individually take an online test provided by Cambridge. They are invigilated by the teacher-researchers.	Total: 45 minutes. Classroom preparation: 10 minutes. Placement test: 30 minutes. Closing: 5 minutes.
2 August	Unit: Days Gone By Lesson: Going places	Unit: Practical English Conversation 1A. Lesson: Meeting a new friend	Students are introduced to the project. They are informed about the purpose of the study. Students familiarize themselves with the app they use throughout the project by browsing it and learning how to use it. Students take a self-test from the lesson: Meeting a new friend.	Total: 45 minutes. Classroom preparation: 10 minutes. Introduction: 15 minutes. Self-test: 15 minutes. Closing: 5 minutes.
3 September	Unit: Days Gone By Lesson: Going places	Unit: Practical English Conversation 1A.	Students start the first unit "Practical English Conversation 1A". Lesson: Meeting a new friend. They work with the	Total: 45 minutes. Preparation: 5 minutes.

		Lesson: Meeting a new friend	script and audio recording during their work with the sentences section. After, they only work with the script, repeating the dialogue. Lastly, they use the role-play section available to practice.	1° Sentences: 10 minutes. 2° Repeat (Subtitles): 15 minutes. 3° Role-play (One character): 15 minutes.
4 September	Unit: Days Gone By Lesson: Going places	Unit: Practical English Conversation 1A. Lesson: Meeting a new friend	Students finish the first unit. They work with the audio recording and repetition. After, they work with the role play activity. At the end of the class, students do the self-test and record their performance.	Total: 45 min. Preparation 5 mins 1° Repeat (Without subtitles): 10 min. 2° Role-play (Two characters): 15 min. 3° Self-test: 15 min.
5 September	Unit: The people around us	Unit: Survival English Lesson: Introducing yourself	Students start the second unit "Survival English". Lesson: Introducing yourself. They work with the script and audio recording during their work with the sentences section. After, they only work with the script, repeating the dialogue. Lastly, they use the role-play section available to practice.	Total: 45 minutes. Preparation: 5 minutes. 1° Sentences: 10 minutes. 2° Repeat (Subtitles): 15 minutes. 3° Role-play (One character): 15 minutes.
6 September	Unit: The people around us	Unit: Survival English Lesson: Introducing yourself	Students finish the second unit. They work with the audio recording and repetition. After, they work with the role play activity. At the end of the class, students do the self-test and record their performance.	Total: 45 minutes. Preparation: 5 minutes. 1° Repeat (Without subtitles): 10 minutes. 2° Role-play (Two characters): 15 minutes. 3° Self-test: 15 minutes.
7 October	Unit: The people around us	Unit: Survival English Lesson: Meeting someone at the airport	Students start the third unit "Survival English". Lesson: Meeting someone at the airport. They work with the script and audio recording during their work with the sentences section. After, they only work with the script, repeating the dialogue. Lastly, they use the role-play section available to practice.	Total: 45 minutes. Preparation: 5 minutes. 1° Sentences: 10 minutes. 2° Repeat (Subtitles): 15 minutes. 3° Role-play: 15 minutes.

8 October	Unit: The people around us	Unit: Survival English Lesson: Meeting someone at the airport	Students finish the third unit. They work with the audio recording and repetition. After, they work with the role play activity. At the end of the class, students do the self-test and record their performance.	Total: 45 minutes. Preparation: 5 minutes. 1° Repeat (Without subtitles): 10 minutes. 2° Role-play (Two characters): 15 minutes. 3° Self-test: 15 minutes.
9 October	Closing session	Closing session	Students take the self-test again from the lesson: Meeting a new friend. Students take the perception survey.	Total: 90 minutes. Preparation: 15 minutes. Self-test: 30 minutes. Survey: 30 minutes. Closing: 15 minutes.

2.6. Resources

The resources of this project were the computer laboratories, equipment, and internet access available in the 3 schools that were part of the study, and MyET platform, with different units, lessons, and self-assessments for students to improve their pronunciation.

2.6.1 Computer laboratories

As previously mentioned, 3 different schools were involved. The pedagogical intervention was implemented in the computer laboratories,

therefore, the infrastructure, equipment, and internet access available in each school was an integral part of our AR research project.

First, Bicentenario Valle de Sol high school has a computer laboratory, which students can use for learning and recreation purposes. It is equipped with internet access for 28 desktop computers, 14 pairs of headsets and a data projector, as well as air conditioning. In case the computer laboratory is not available, there are 45 laptops with internet access that can be brought to the classrooms.

Secondly, San Rafael Arcángel school has a computer laboratory, which students can use for learning purposes; it has an interactive white board, a projector and 47 desktop computers, 45 available for students, one for the teacher, and the other one for the person in charge of the classroom. Moreover, each of them has a headset, being useful for English lessons and incentivizing the usage of technologies while teaching.

Lastly, the San Gabriel Arcángel school has a computer laboratory with 15 headsets. Students were asked to bring their own to make sure there were enough. The laboratory has 46 computers, a projector, air conditioning and 47 seats. There are also 30 tablets and one laptop per class for the teacher

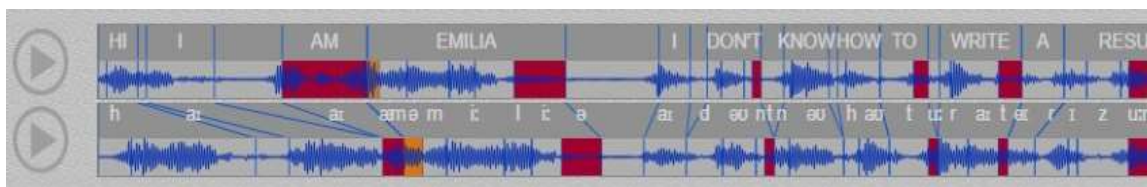
to use. In terms of internet access, all computers, tablets, and laptops have access to the internet to perform any activity that may demand downloading content or researching.

2.6.2 MyET

In Lee's (2008) study, she describes MyET as an internet-based program with correction feedback. It is a web-based application that uses voice recognition technology. The software gives feedback in real time and tells students their mistakes. The learners' pronunciation skills are assessed by recording them and comparing them to the native speaker production. While doing so, the learners can see the waveform, spectrum, and some other indications on the screen (See appendix 2). They can also choose from a variety of native speakers from different English-speaking countries to follow as their model (Figure 2).

Figure 2

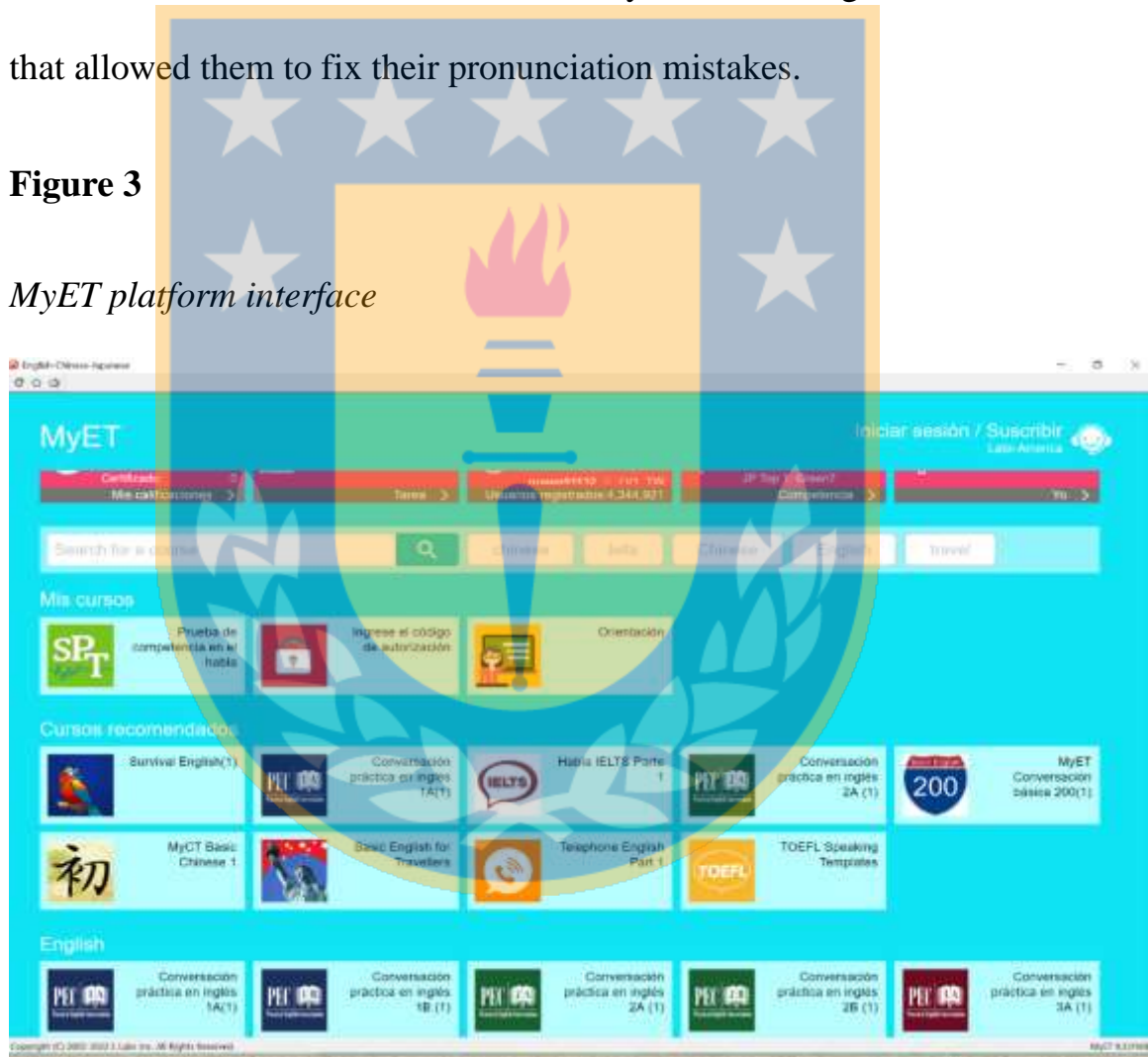
Comparative learner spectrum



According to the participants in the study, there were several benefits associated with the platform. The ones mentioned by most students included that it really helped them learn and improve their pronunciation, the platform is convenient and can be accessed from anywhere, and it gave exact feedback that allowed them to fix their pronunciation mistakes.

Figure 3

MyET platform interface



2.7. Evaluation of the implementation

The teacher-researchers used a variety of instruments with the purpose of collecting data about the level of proficiency of the students at the end of the project and their perceptions about the intervention.

After the two-month observation phase, the students individually took a placement test, which consists of 25 questions, during a 45-minute class. These results indicated their level of English based on the number of correct answers. After that, students took the pronunciation self-test from MyET. During the six-week intervention process, periodically every two weeks the students did the self-assessment section from the lesson that they worked on, sending the teacher-researchers an email with their results at the end of the class. These self-tests evaluated the students on 4 different features of the language including stress, tone, rhythm, and pronunciation.

By the end of the interventions, students took the pronunciation self-test from MyET again. These results presented here will be compared to the previous ones to determine if students did in fact develop their pronunciation skills as predicted.

To finish this process, students answered a perception survey on their thoughts about the interventions. This survey has 15 questions divided into three dimensions: affective dimension, pedagogical dimension, and linguistic dimension, as well as one open-ended question.



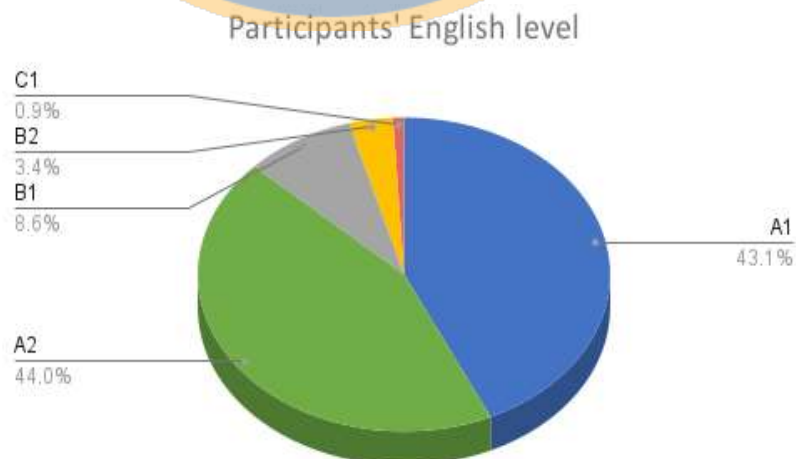
3. RESULTS

3.1 Placement test

The placement test was taken by 116 students out of the 136 participants of this study. On this test students were placed among the different English levels according to the number of correct answers they got. This placement test was applied in order to know what their current proficiency level was. According to the Education Quality Agency (2019), after analyzing the SIMCE test results of 2017, 7 out of 10 twelfth grade students did not achieve the expected learning outcome for 8th graders in the English subject, which is A2.

Figure 4

Participants' level of English

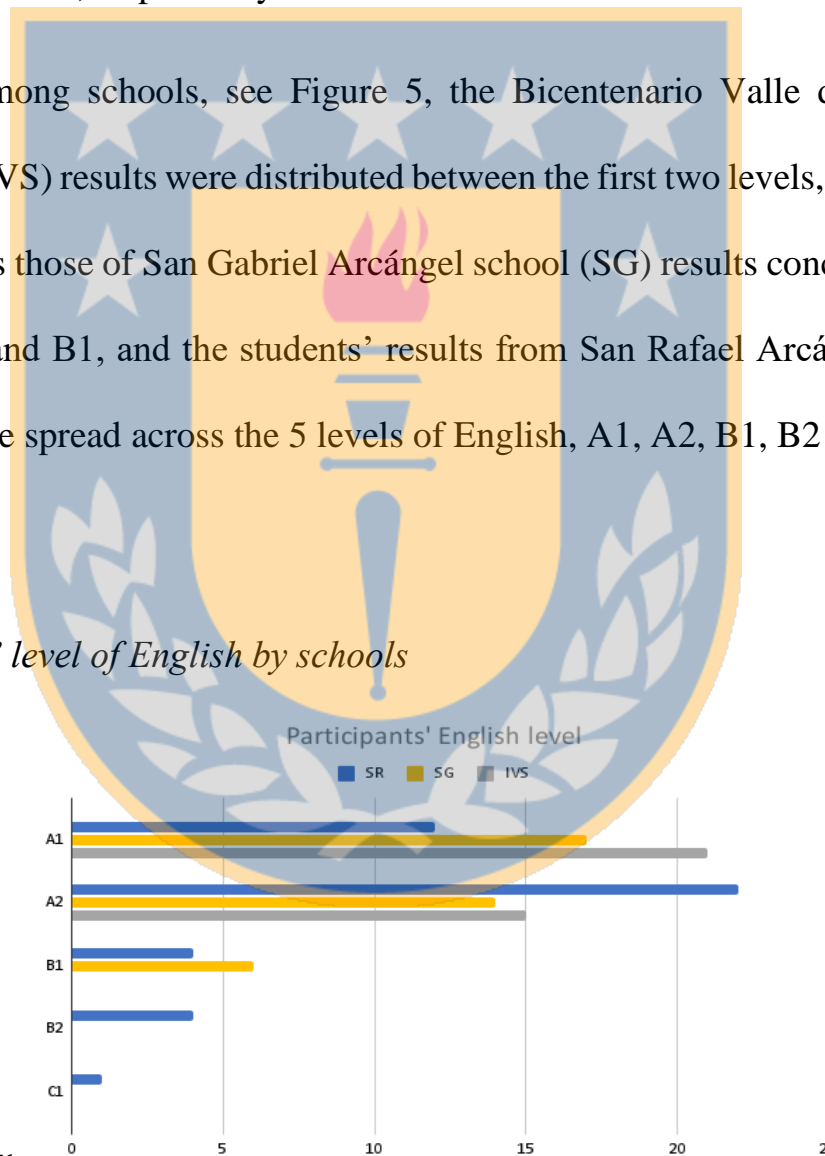


The placement test results, as shown in Figure 4, were focused on the A2 level, with 51 students, followed by the second highest being A1, with 50. The remaining 15 students are divided into B1, B2, and C1 with 10, 4, and 1 students, respectively.

Among schools, see Figure 5, the Bicentenario Valle de Sol high school (IVS) results were distributed between the first two levels, A1 and A2; as well as those of San Gabriel Arcángel school (SG) results concentrated on A1, A2 and B1, and the students' results from San Rafael Arcángel school (SR) were spread across the 5 levels of English, A1, A2, B1, B2 and C1.

Figure 5

Students' level of English by schools



3.2 Self-tests

Out of the 136 participants of this project, 74 successfully completed the pedagogic intervention (action-plan). Students, in general, showed a mean increase of 11.14 points when comparing the first and last self-test results. Likewise, there was a median growth of 7.24 points. Lastly, scores fell within a standard deviation of 7.57 points from the mean value during the last intervention, showing a decrease of 8.59 points when compared to the first self-test, in which the standard deviation was 16.17 points.

Figure 6

Results from the first self-test

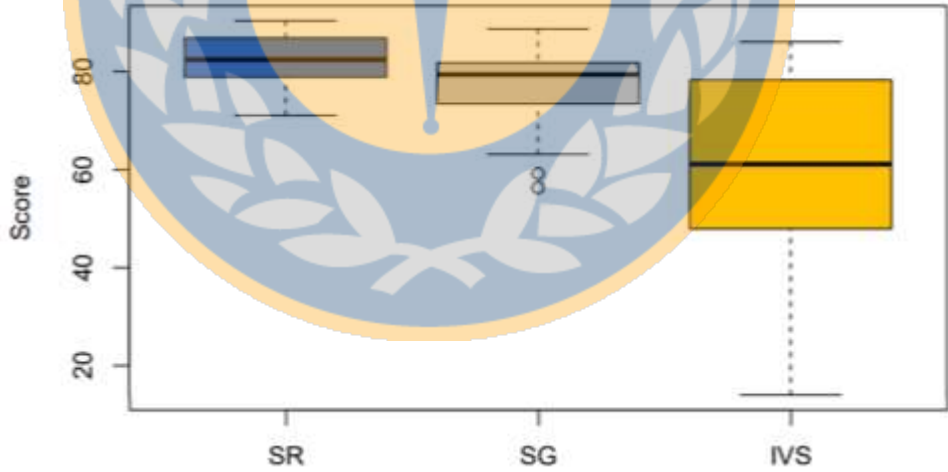
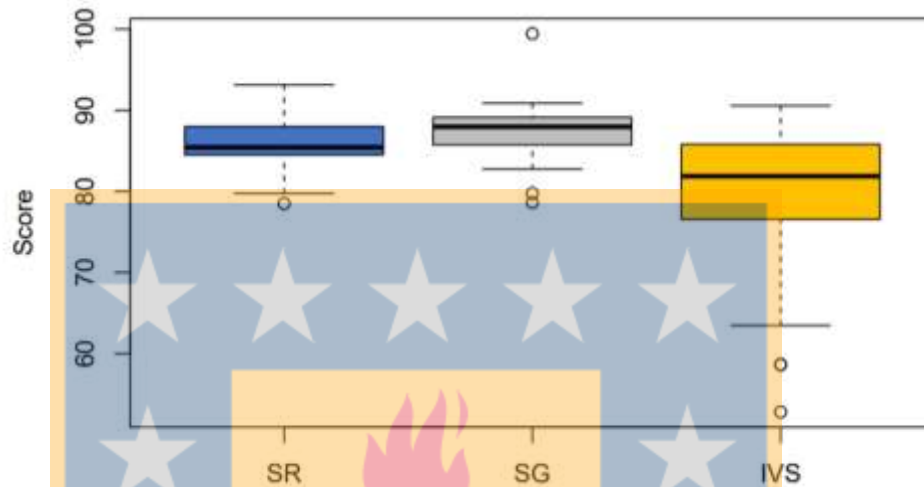


Figure 7

Results from the second self-test



3.2.1 Bicentenario Valle de Sol high school

At the Bicentenario Valle de Sol high school, out of 45 students, 23 successfully completed every lesson. After the first self-test, which they took without previous practice, the students recorded a mean value of 59.33 points. The median was 61.13 total points, and the scores fell within a standard deviation (S.D.) of 21.44 points from the mean value.

After practicing different lessons, across the span of 6 sessions, the students took the self-test again. The results showed an increased mean value of 78.69 points. The median recorded 81.88 points, and the scores fell within a standard deviation of 10.52 points from the mean value.

The group of students showed a mean increase of 19.36 points when comparing the first and last self-test results. Likewise, there was a median growth of 20.75 points. Lastly, the standard deviation showed a decrease of 10.92 points.

Table 3.1

Bicentenario Valle de Sol high school results in pronunciation self-tests

	Self-test 1	Self-test 2	Dif.
Mean	59.33	78.69	19.36
Median	61.13	81.88	20.75
S.D.	21.44	10.52	-10.92

3.2.2 San Rafael Arcángel school

Out of the 45 students in San Rafael Arcángel school, 21 participants successfully completed the intervention process. The results from the first self-test that students took the first session were, a mean value of 82.31, a median of 82.45 points, and a standard deviation that falls within 5.26 from the mean value.

At the end of the study, students took the self-test from the beginning of the intervention again, and their results showed a mean value of 85.99 points, a median value of 85.44 points, and a standard deviation of 3.84 points from the mean value.

At the moment of comparing the results, the students showed a mean increase of 3.68 points. Moreover, the median growth was 2.99 points. Finally, the standard deviation showed a decrease of 1.42 points from the mean value.

Table 3.2

San Rafael Arcángel school results in pronunciation self-tests

	Self-test 1	Self-test 2	Dif.
Mean	82.31	85.99	3.68
Median	82.45	85.44	2.99
S.D.	5.26	3.84	-1.42

3.2.3 San Gabriel Arcángel school

Out of the 46 San Gabriel Arcángel school students, 30 completed every lesson and sat every self-test and self-assignment. Students scored a mean value of 77.14 points in the first self-test, a median value of 79.41 and a recorded standard deviation of 7.85 from the mean value.

Students went through the different lessons and the practice stage in order to take the self-test again and recorded a new mean value of 87.23 points. Also, they scored a median value of 87.97 points, and a standard deviation that falls within 3.79 points from the mean value.

The students' results showed a mean increase of 10.09 points regarding the overall pronunciation performance of the self-test applied at the beginning and end of the project. Furthermore, the median suffered a growth of 8.57 points. Additionally, the standard deviation decreased 4.06 points.

Table 3.3

San Gabriel Arcángel school results in pronunciation self-tests

	Self-test 1	Self-test 2	Dif.
Mean	77.14	87.23	10.09
Median	79.41	87.97	8.57
S.D.	7.85	3.79	-4.06

3.2.4 San Rafael Arcángel and San Gabriel Arcángel schools

After gathering the data throughout the study, a statistical analysis was performed. As shown in Table 3.4, it can be seen that there were no major differences between the San Rafael Arcángel (SR) and San Gabriel Arcángel (SG) schools, but there were differences between them and the Bicentenario Valle de Sol high school (IVS).

The hypothesis that both the San Gabriel Arcángel and San Rafael Arcángel schools could be considered as one group was taken into account. To find out if there were significant differences between the schools, the total scores of the first and second applications of the self-test were analyzed. The corresponding analysis of variance with a p -value < 0.05 , was conclusive,

and it can be said that, for the purposes of the results analysis, these two schools did not share significantly different scores.

Table 3.4

First self-test variance analysis

	Df	Sum	Mean	f value	Pr(>f)
Schools	2	6630.103	3315.0515	18.907	0.0000003
Residuals	71	12448.761	175.3347	NA	NA

Table 3.5

Second self-test variance analysis

	Df	Sum	Mean	f value	Pr(>f)
Schools	2	1039.903	519.95157	11.73201	0.0000396
Residuals	71	3146.653	44.31905	NA	NA

Furthermore, a Tukey's test was performed to analyze the mean value of the three schools, considering the total score from both self-tests. There was no evidence to affirm that the scores obtained by San Rafael Arcangel

and San Gabriel Arcangel schools were statistically different, and by comparing their means where the 0 was contained on the 95% family-wise confidence level. On the other hand, there were significant differences between these two schools and the Bicentenario Valle de Sol high school, where 0 was not contained when contrasting their means (with a significance value of $p < 0.05$).

Figure 8

Tukey's test from first self-test in all three schools

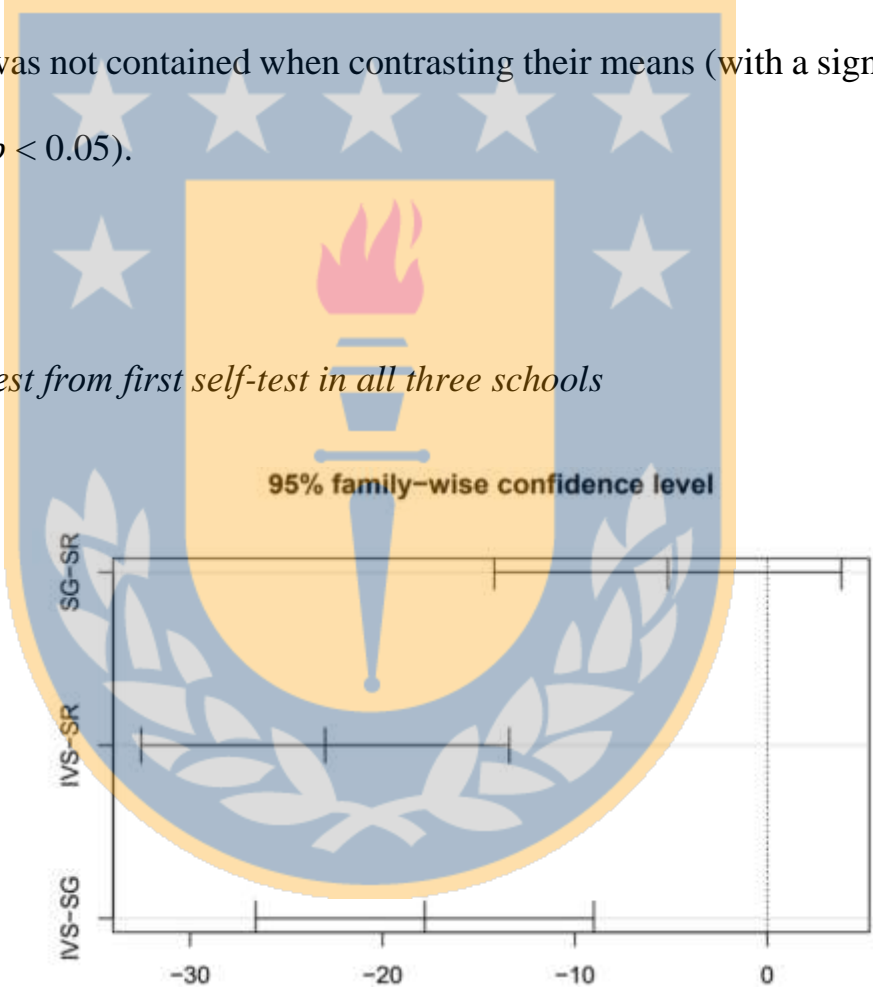


Table 3.6

First self-test comparison of all three schools

	Dif.	lwr	upr	<i>p</i> value
SG-SR	-5.172429	-14.19110	3.846240	0.3604627
IVS-SR	-22.977950	-32.54505	-13.410849	0.0000006
IVS-SG	-17.805522	-26.59051	-9.020537	0.0000207

Figure 9

Tukey's test from second self-test in all three schools

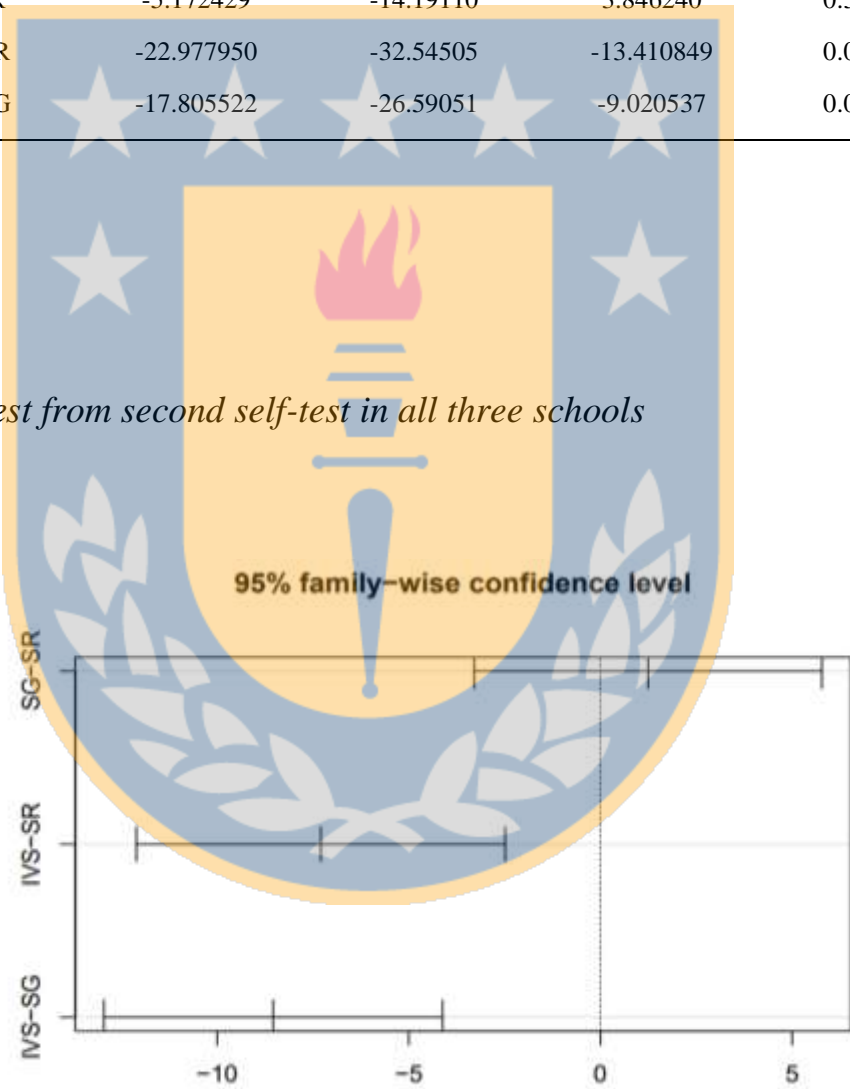


Table 3.7

Second self-test comparison of all three schools

	Dif.	Lwr	upr	<i>p</i> value
SG-SR	1.241333	-3.292899	5.775566	0.7899472
IVS-SR	-7.294928	-12.104891	-2.484964	0.0015207
IVS-SG	-8.536261	-12.95006	-4.119516	0.0000480

After the Tukey's test was conducted, both SG and SR schools are considered as only 1 group. Consequently, it was concluded that the conjoined mean in the first self-test was 79.27 points, in contrast with the second self-test, in which the mean was 86.72 points, with a difference of 7.45, increasing their mean. Regarding the standard deviation, in the first self-test it was 7.31, and in the second one it was 3.82, meaning this value decreased 3.48 points from the mean in the second application of the test.

3.2.4.1 Segmental features

3.2.4.1.1 Pronunciation of sounds for SR and SG

The mean in the first application was 72.61 points and in the second application it was 81.85 points, with a difference of 9.24 points, and a

resulting p-value < 0.05 after applying the paired t-test. This was clear evidence to reject the hypothesis that the average scores in their pronunciation of sounds were the same in both applications. As the mean increased, and differences were found, it can be affirmed that students in general improved their pronunciation ability. Furthermore, pronunciation of sounds was the most improved feature in these schools.

Figure 10

Pronunciation of sounds measures for SR-SG

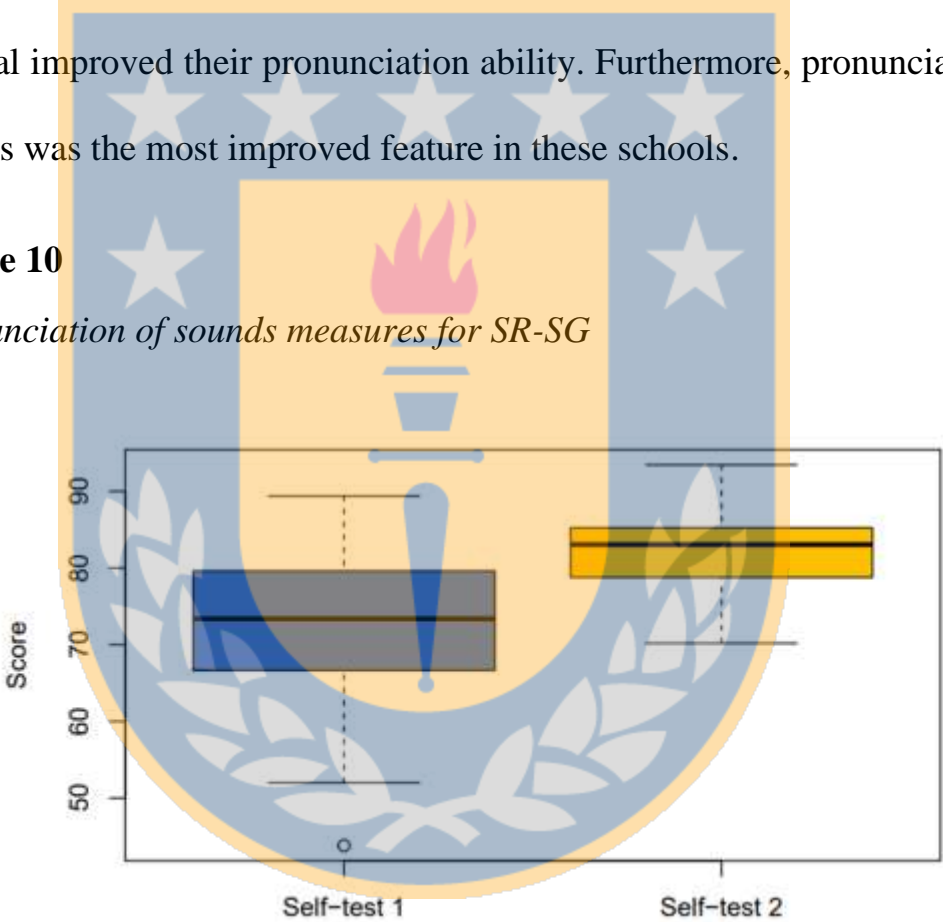


Table 3.8

Pronunciation of sounds results for SR-SG

Self-test 1		Self-test 2			Statistic	p value
Mean	S.D.	Mean	S.D.	Dif.		
72.61	9.13	81.85	4.95	9.24	-9.241176	< 0.001

3.2.4.2 Suprasegmental features for SR and SG

A paired t-test was conducted in order to analyze the suprasegmental features and to determine whether the mean difference between the two sets of observations was zero. In this case, the difference in scores of each suprasegmental feature from both self-tests was analyzed. Predominantly, within all dimensions, there were significant differences, with a significance value of $p < 0.05$, and an increase in their means. It can be concluded that there was a significant growth in the scores obtained in each of the dimensions analyzed.

3.2.4.2.1 Tone for SR and SG

The mean in tone in the first application was 92.28 and in the second one it was 81.85 points, with a 3.33 points difference, (significance value of $p < 0.05$) after applying the paired t-test. This means that the average scores in their tone were not the same in both applications of the self-test. As the mean increased and differences were found, it can be affirmed that students in general improved their tone.

Figure 11

Tone measures for SR-SG

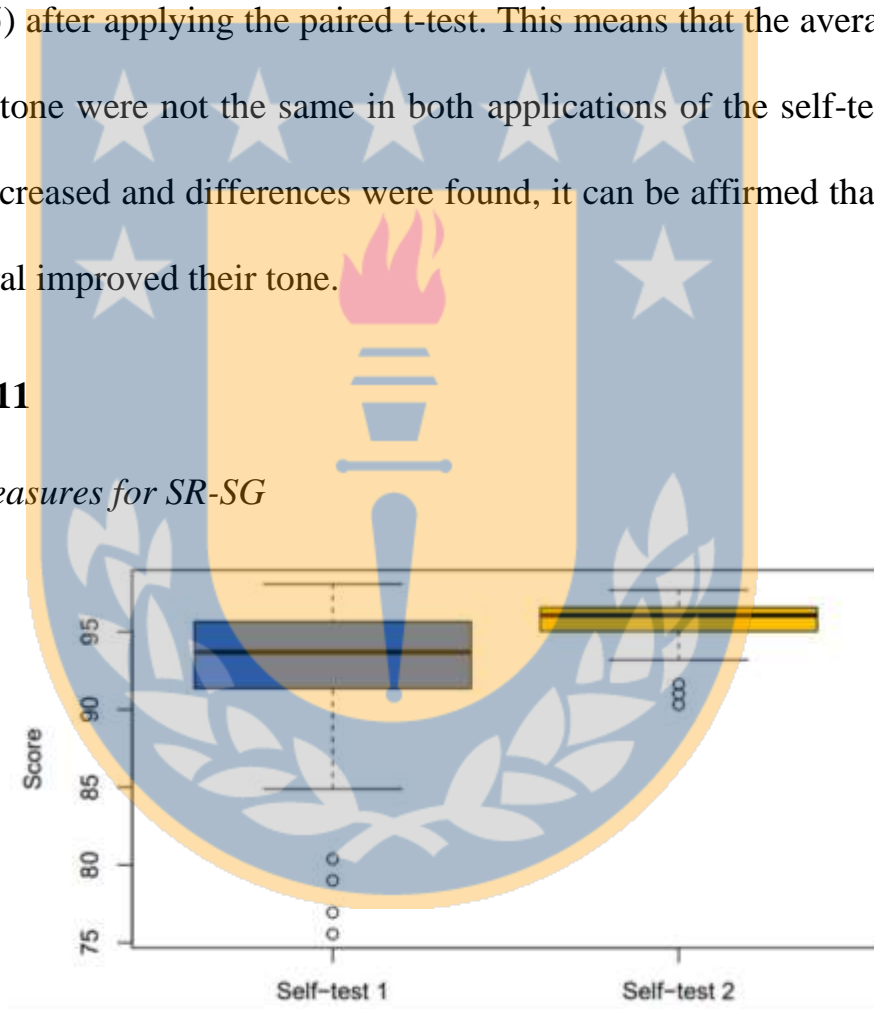


Table 3.9

Tone results for SR-SG

Self-test 1		Self-test 2			Statistic	p value
Mean	S.D.	Mean	S.D.	Dif.		
92.28	5.03	95.61	1.61	3.33	-3.32549	0.0000101

3.2.4.2.2 Rhythm for SR and SG

The mean in rhythm in the first self-test was 89.03 and in the second application it was 94.12 points, with a difference of 5.09 points (significance value of $p < 0.05$, after applying the paired t-test). Accordingly, the hypothesis that the average scores in their rhythm were the same in both applications was rejected. As differences were found and the mean increased, it can be affirmed that students' rhythm improved.

Figure 12

Rhythm measures for SR-SG

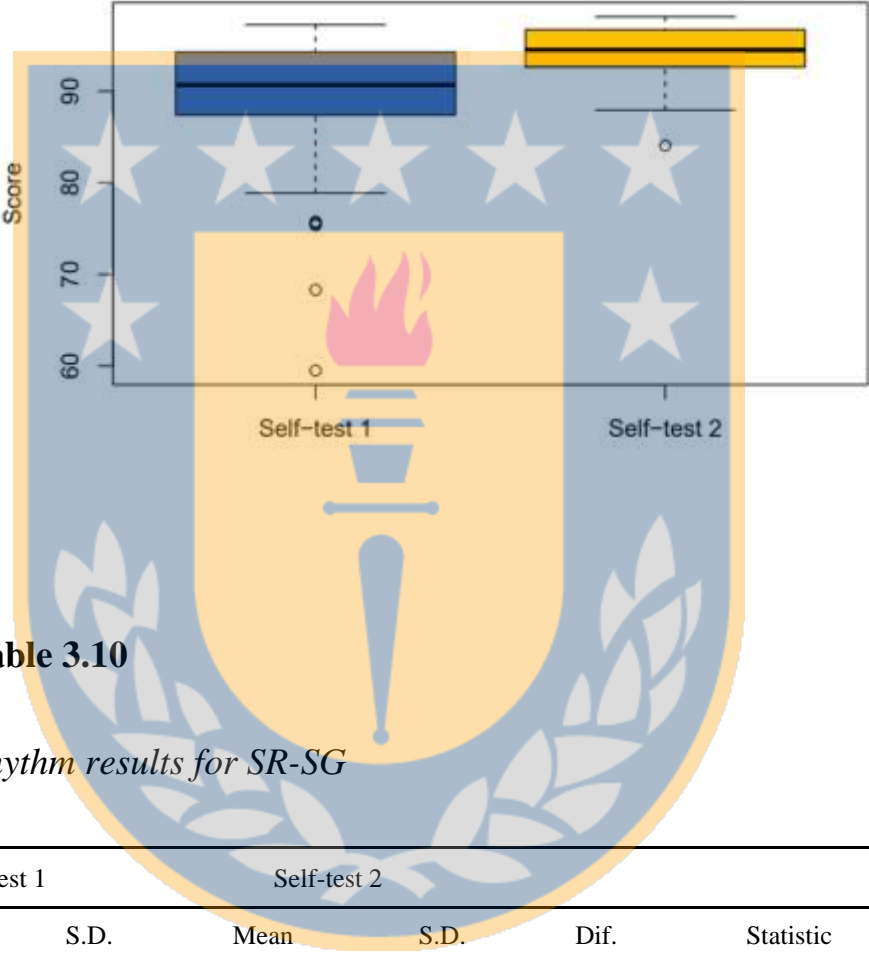


Table 3.10

Rhythm results for SR-SG

Self-test 1		Self-test 2		Dif.	Statistic	p value
Mean	S.D.	Mean	S.D.			
89.03	7.56	94.12	3.02	5.09	-5.087059	<0.001

3.2.4.2.3 Stress for SR and SG

Regarding stress, the mean during the first self-test was 88.65 and in the second application it was 91.14 points, with a 2.49 points difference (significance value of $p < 0.05$, after applying the paired t-test). Therefore, the hypothesis was rejected since the average scores in the stress feature were not the same in both applications. As the mean increased and statistically significant differences were found, it can be affirmed that students in general improved their ability to correctly stress certain syllables. With all, stress was the least improved ability at the schools.

Figure 13

Stress measures for SR-SG

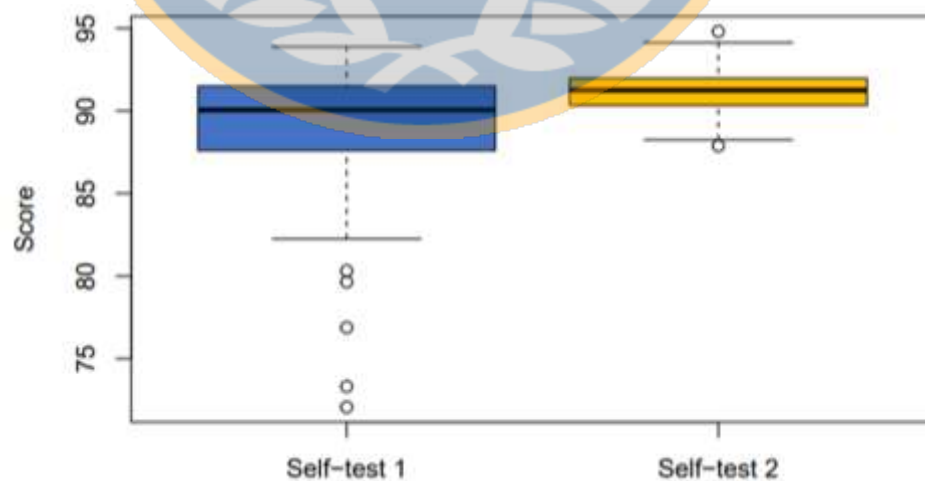


Table 3.11

Stress results for SR-SG

Self-test 1		Self-test 2		Dif.	Statistic	p value
Mean	S.D.	Mean	S.D.			
88.65	4.76	91.14	1.43	2.49	-2.487059	0.0009526

3.2.4.2.4 Total for SR and SG

The mean in the total score during the first application was 79.27 and in the second application, it was 86.72 points, with a difference of 7.45 points (significance value of $p < 0.05$, after applying the paired t-test of). This was evidence enough to reject the hypothesis that the average scores in the total category, which encompasses the segmental and suprasegmental aspects reported previously, were the same in both applications. As the mean increased and differences were found, it can be affirmed that students improved their overall pronunciation.

Figure 14

Total measures for SR-SG

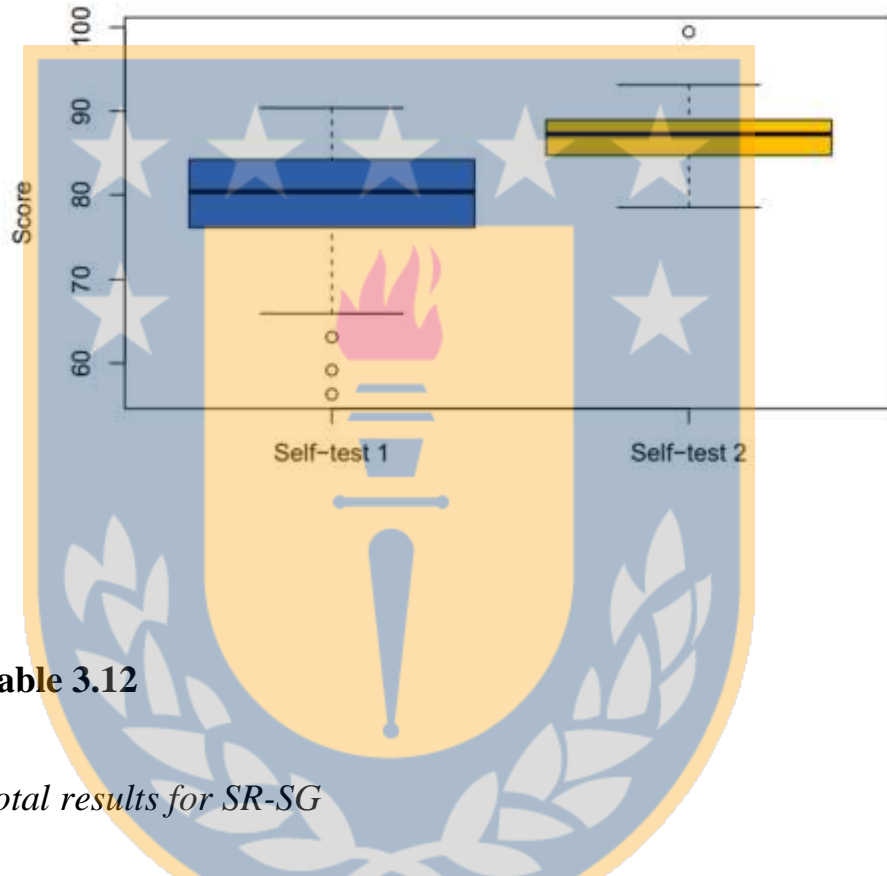


Table 3.12

Total results for SR-SG

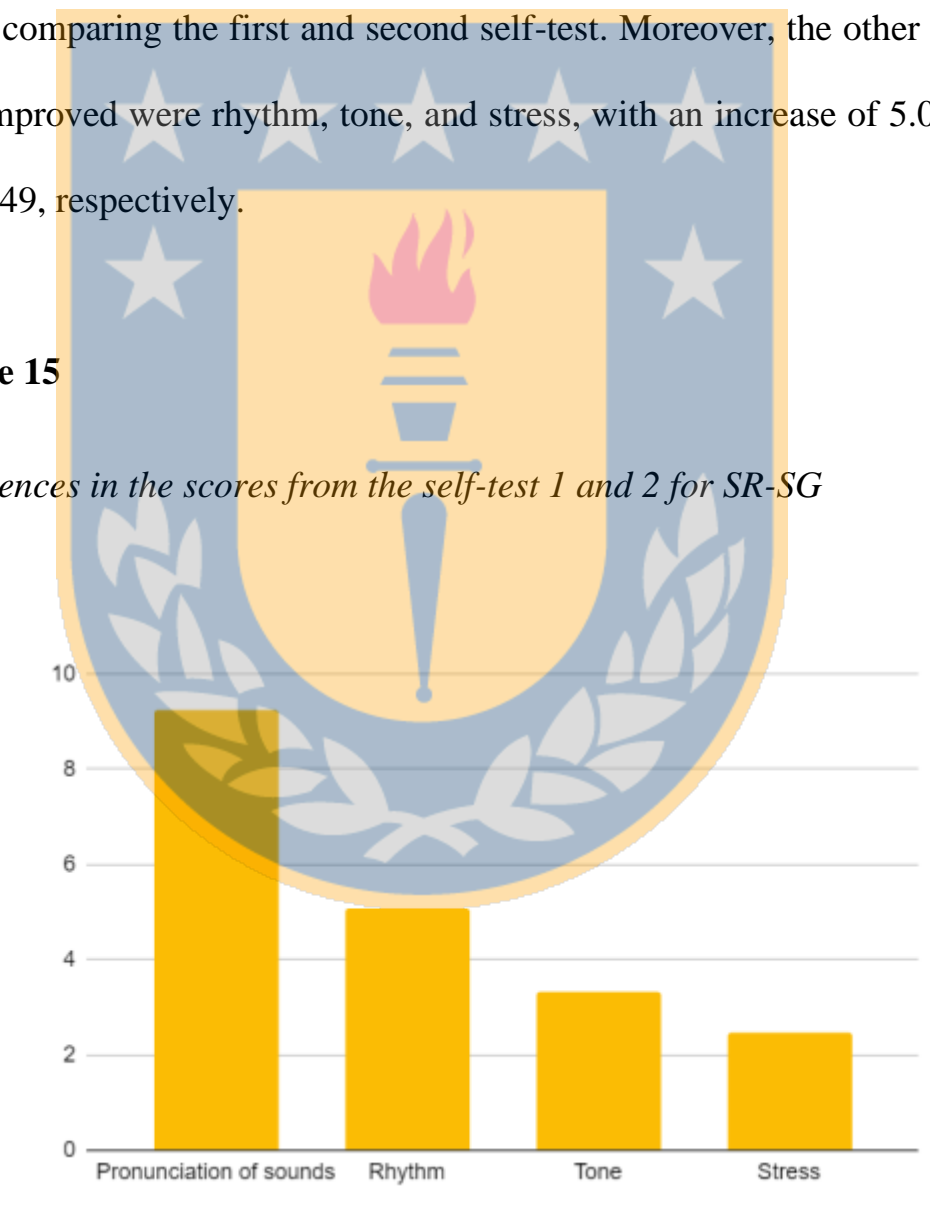
Self-test 1		Self-test 2		Dif.	Statistic	p value
Mean	S.D.	Mean	S.D.			
79.27	7.31	86.72	3.82	7.45	-7.448039	< 0.001

3.2.4.3 Differences in the features scores for SR-SG

The group of students from SR and SG schools improved the most in the pronunciation of sounds feature, increasing their score by 9.24 points, while comparing the first and second self-test. Moreover, the other features that improved were rhythm, tone, and stress, with an increase of 5.09, 3.33, and 2.49, respectively.

Figure 15

Differences in the scores from the self-test 1 and 2 for SR-SG



3.2.5 Bicentenario Valle de Sol high school results

3.2.5.1 Segmental features

3.2.5.1.1 Pronunciation of sounds in IVS

The mean in pronunciation of sounds in the first self-test was 52.65 and in the second application it was 73.76 points, with a difference of 21.11 points with a significance value of $p < 0.05$, after applying the paired t-test of. Consequently, the hypothesis that the average scores in their pronunciation were the same in both applications was rejected. As the mean increased and differences were found, it can be affirmed that students in general improved their pronunciation ability.

Figure 16

Pronunciation of sounds measures for IVS

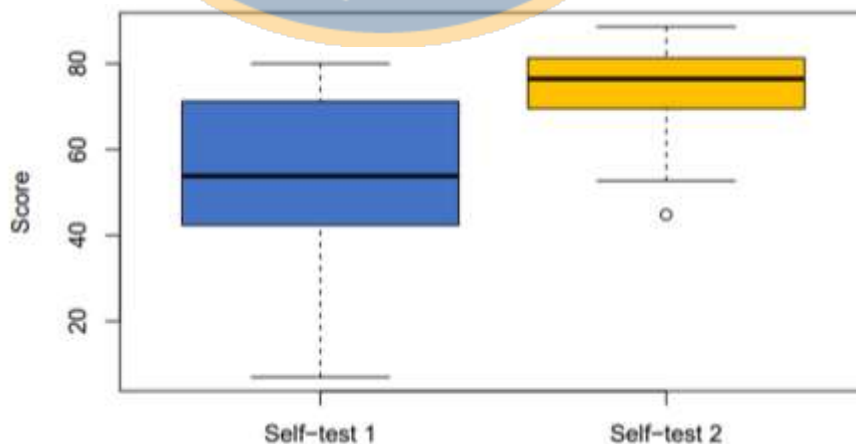


Table 3.13

Pronunciation of sounds results for IVS

Self-test 1		Self-test 2			Statistic	p value
Mean	S.D.	Mean	S.D.	Dif.		
52.65	22.07	73.76	11.09	21.11	-21.11478	0.0002559

3.2.5.2 Suprasegmental features

In order to analyze the suprasegmental features and determine the difference between the two applications of the self-tests, a paired t-test was conducted. In such manner, for each feature the scores' difference between the first and the second self-tests were examined. In general terms, in all areas, significant differences were found, including a mean increase with a significance value of $p < 0.05$. Therefore, it can be assumed that an important growth in the scores was accomplished.

3.2.5.2.1 Tone in IVS

The mean in tone in the first application was 77.25 and in the second, it was 92.98 points, with a difference of 15.73 points and a resulting p value

< 0.05 after applying the paired t-test. This was evidence enough to reject the hypothesis that the average scores in their tone were the same in both applications. As the mean increased and differences were found, it can be affirmed that students in general improved their ability in tone.

Figure 17

Tone measures for IVS

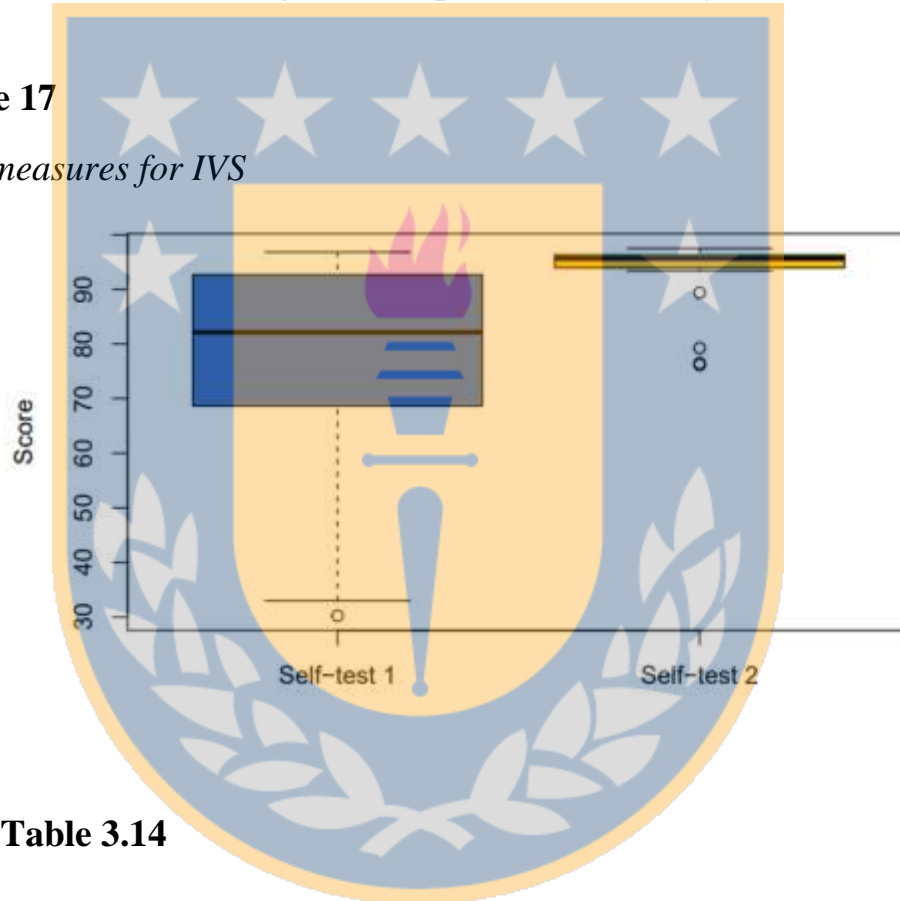


Table 3.14

Tone results for IVS

Self-test 1		Self-test 2		Dif.	Statistic	p value
Mean	S.D.	Mean	S.D.			
77.25	19.07	92.98	6.46	15.73	-15.72783	0.0009724

3.2.5.2.2 Rhythm in IVS

The mean in rhythm in the first self-test was 60.95 and in the second application was 85.95 points, with a difference of 25 points (significance value of $p < 0.05$, after applying the paired t-test of). Consequently, the hypothesis that the average scores in rhythm were the same in both applications can be rejected. As the mean increased and differences were found, it can be affirmed that students in general improved their rhythm when using the language.

Figure 18

Rhythm measures for IVS

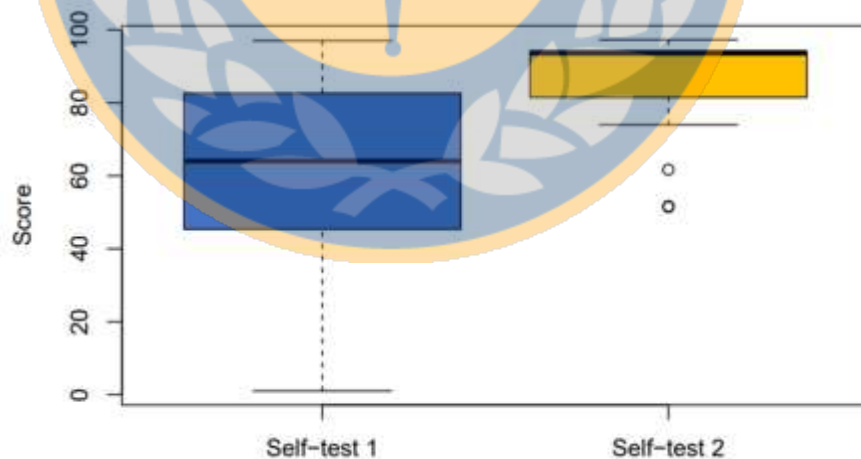


Table 3.15

Rhythm results for IVS

Self-test 1		Self-test 2		Dif.	Statistic	p value
Mean	S.D.	Mean	S.D.			
60.95	25.64	85.95	14.08	25	-25.00609	0.0003394

3.2.5.2.3 Stress in IVS

The mean in stress in the first application was 74.86 and in the second application was 88.57 points, with a difference of 13.71 points (significance value of $p < 0.05$, after applying the paired t-test of). Accordingly, the hypothesis that the average scores in their stress were the same in both applications can be rejected. Even if stress was the least improved feature, as the mean increased and differences were found, it can be affirmed that students improved their stress when speaking English.

Figure 19

Stress measures for IVS

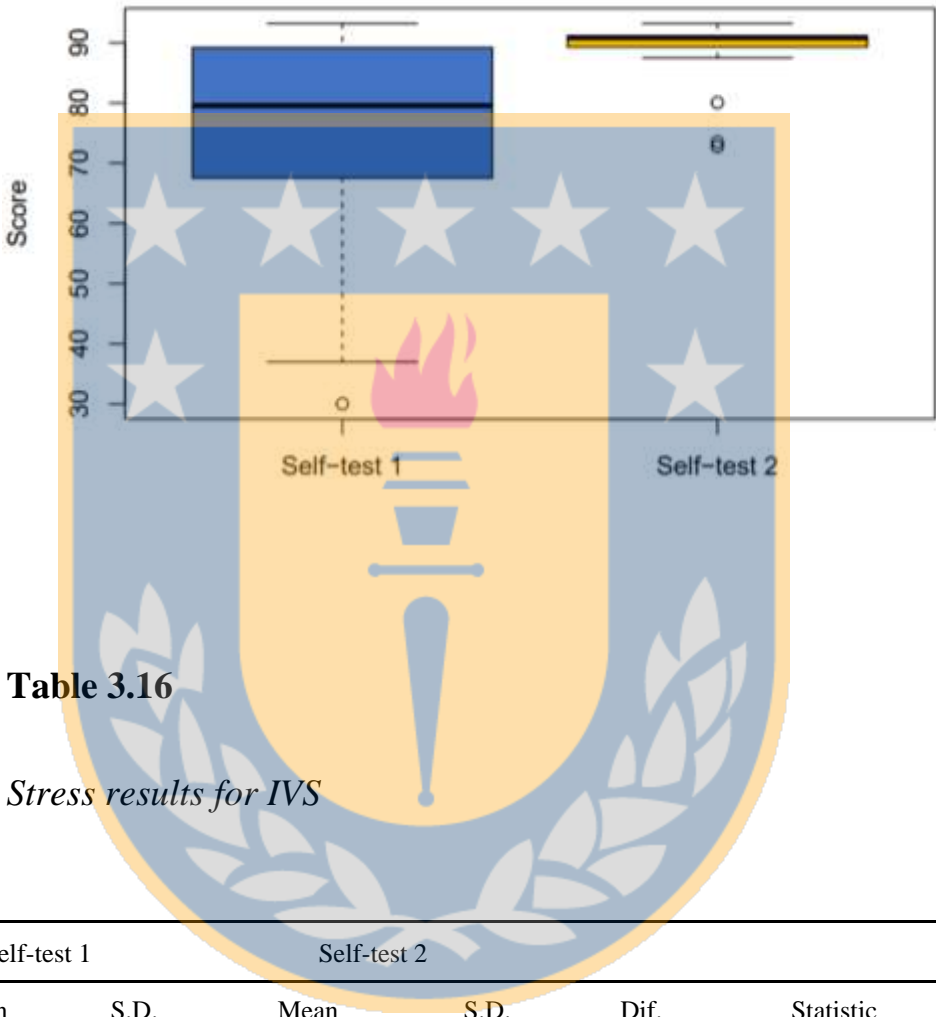


Table 3.16

Stress results for IVS

Self-test 1		Self-test 2		Dif.	Statistic	p value
Mean	S.D.	Mean	S.D.			
74.86	17.89	88.57	5.48	13.71	-13.70783	0.0014973

3.2.5.2.4 Total in IVS

In the first application, the mean in the total score was 59.33, and in the second one it was 78.69 points, with a difference of 19.36 points (significance value of $p < 0.05$, after applying the paired t-test of). This confirmed the rejection of the hypothesis, due to the average in their total scores being not the same in both applications. Students improved their overall pronunciation, as well as the mean, which increased, and differences were found.

Figure 20

Total measures for IVS

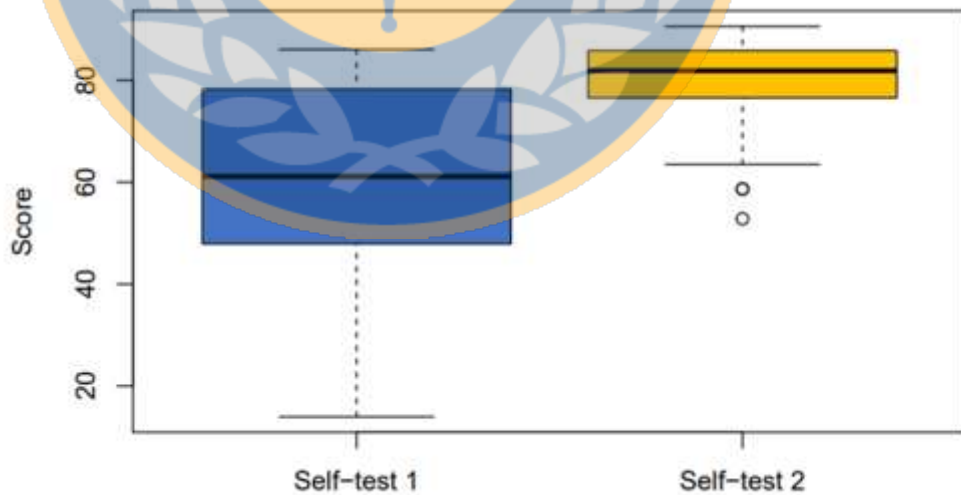


Table 3.17

Total results for IVS

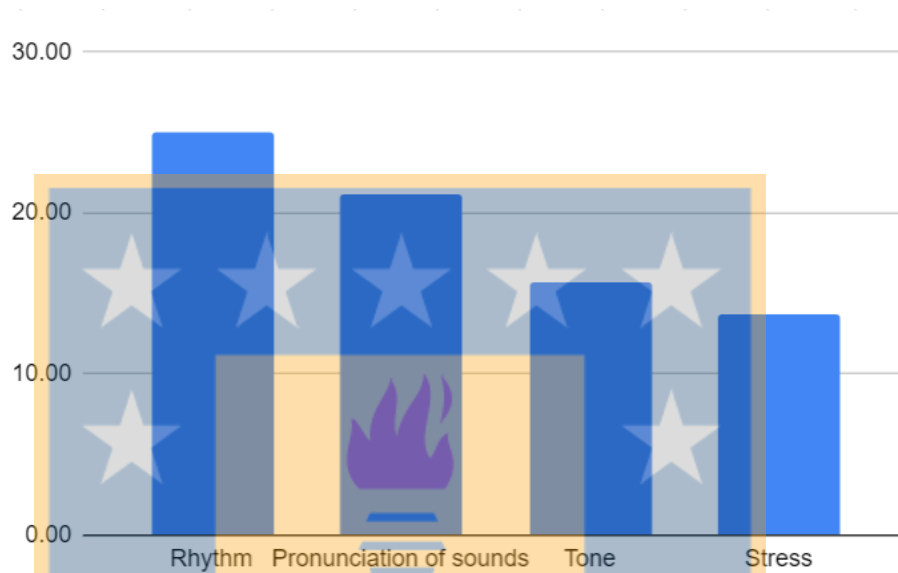
Self-test 1		Self-test 2			Statistic	p value
Mean	S.D.	Mean	S.D.	Dif.		
59.33	21.44	78.69	10.52	19.36	-19.35826	0.000682

3.2.5.3 Differences in the features scores for IVS

As seen in Figure 21, the students from IVS improved in all the features, but rhythm was the most improved one with an increase of 25.01 points, followed by pronunciation of sounds with 21.11, then tone with 15.73, and finally stress with 13.71 points.

Figure 21

Differences in the scores from the self-test 1 and 2 for IVS



3.2.6 Gender analysis results

A variance analysis was conducted to analyze both self-tests in order to know if the interaction between gender and school was significant, as well as to identify, through a *t*-test, if any statistically relevant differences in the scores when measured by gender can appear between female and male participants.

After the analysis it can be concluded that, with a *p* value >0.05 , interactions between the schools and gender were not statistically significant,

which leads the teacher-researchers to analyze the results in a gender-independent fashion.

It can be concluded that there were not statistically significant differences after analyzing the female and male participants' scores, at the significance value of $p < 0.05$.

Figure 22

Gender analysis results for self-test 1

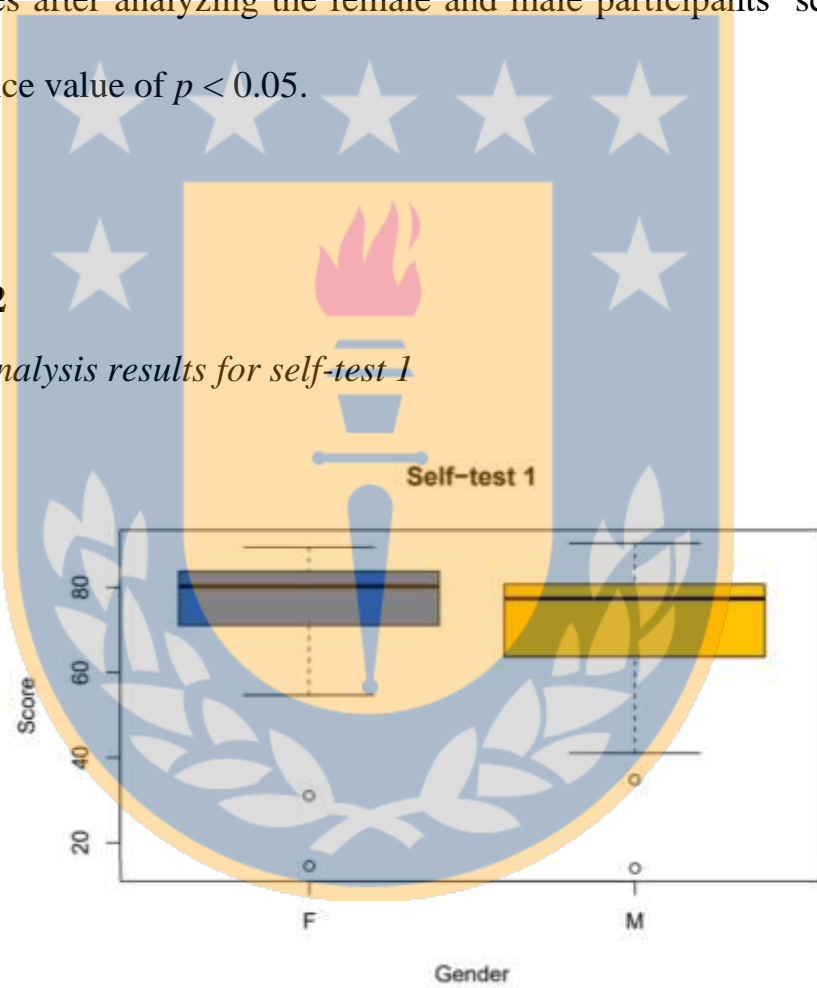
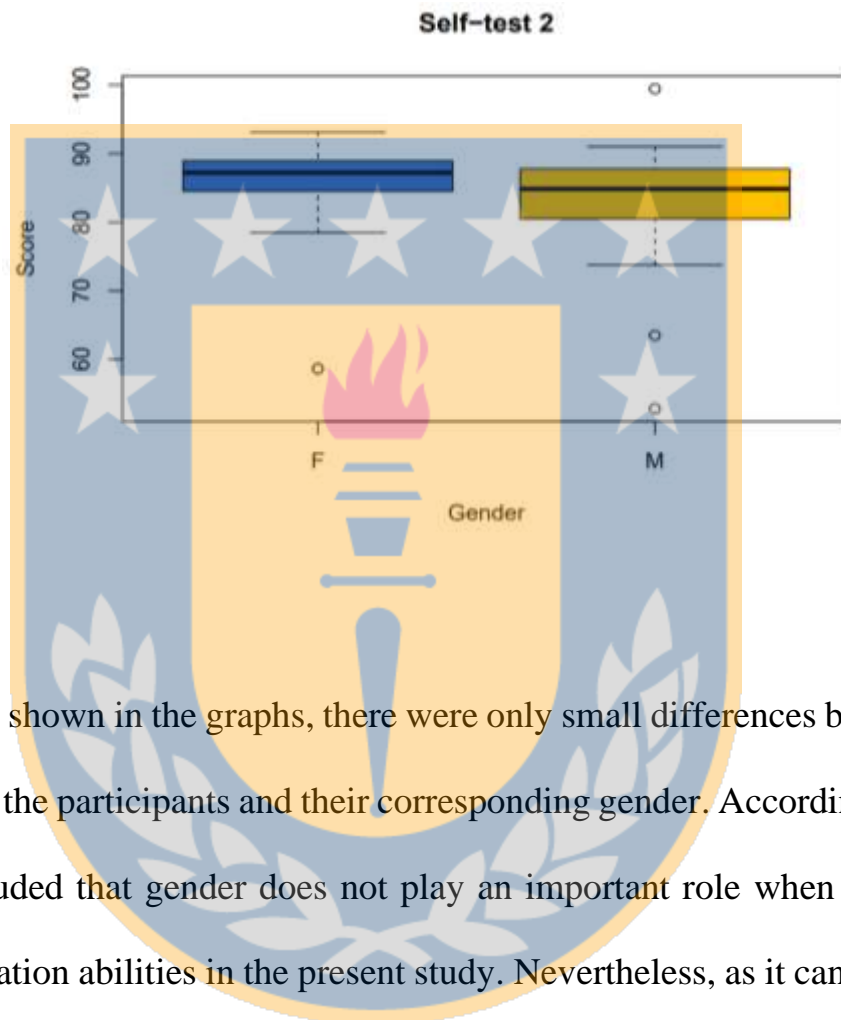


Figure 23

Gender analysis results for self-test 2



As shown in the graphs, there were only small differences between the scores of the participants and their corresponding gender. Accordingly, it can be concluded that gender does not play an important role when discussing pronunciation abilities in the present study. Nevertheless, as it can be seen in Figures 22 and 23, female participants had the tendency to have better scores than male participants in both applications of the self-test.

3.4 Perception survey

A questionnaire was used to gather information regarding the students' perceptions towards their development of different segmental and suprasegmental features, including tone, stress, rhythm, and pronunciation (linguistic dimension), how they felt during the project (affective dimension) and what they learnt (pedagogical dimension).

Figure 24 shows that the students' opinions towards the 3 dimensions were generally positive. Regarding the affective dimension more than 70% of the students declared to have developed confidence, motivation and satisfaction when learning English, as well as a good opinion towards the language, as shown in statements 1, 2, 3, and 4. Regarding the individual and private aspect of the intervention, 73% of the students declared to have felt confident and secure when working with the platform, as shown in statement number 5.

When discussing the pedagogical dimension, most students appreciated the variety of activities and lessons, as shown in assertion number 6. Regarding statement number 7, only 59% of students affirms to have used the strategies learnt while working in the platform in subjects other than

English, the rest decided to be neutral or to disagree. Following with assertions, 8, 9, and 10, more than 73% of students agree that the immediate feedback, the didactic aspects of the platform and the instructions given by the teacher-researchers helped develop their pronunciation skills and made it easier to use the platform correctly.

Concerning the linguistic dimension, more than 70% percent of students agree that the intervention and the work in the platform has helped them correctly use tone, stress, and rhythm patterns, as seen in assertions 11, 12, and 13. Lastly, more than 80% of students claim to have developed their fluidity and pronunciation skills in general as shown in statements 14, and 15.

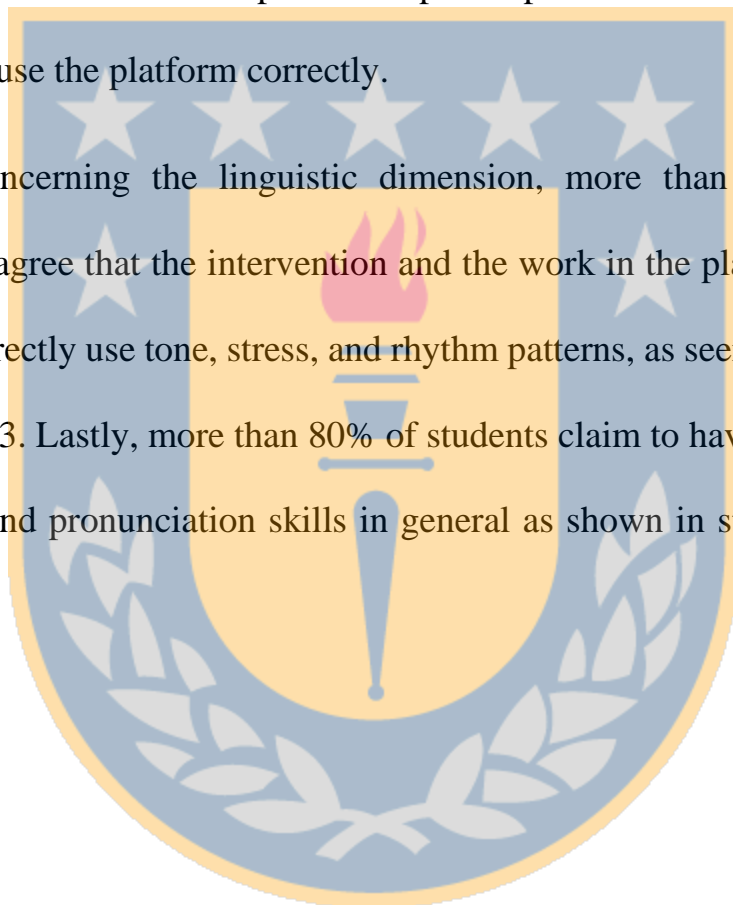
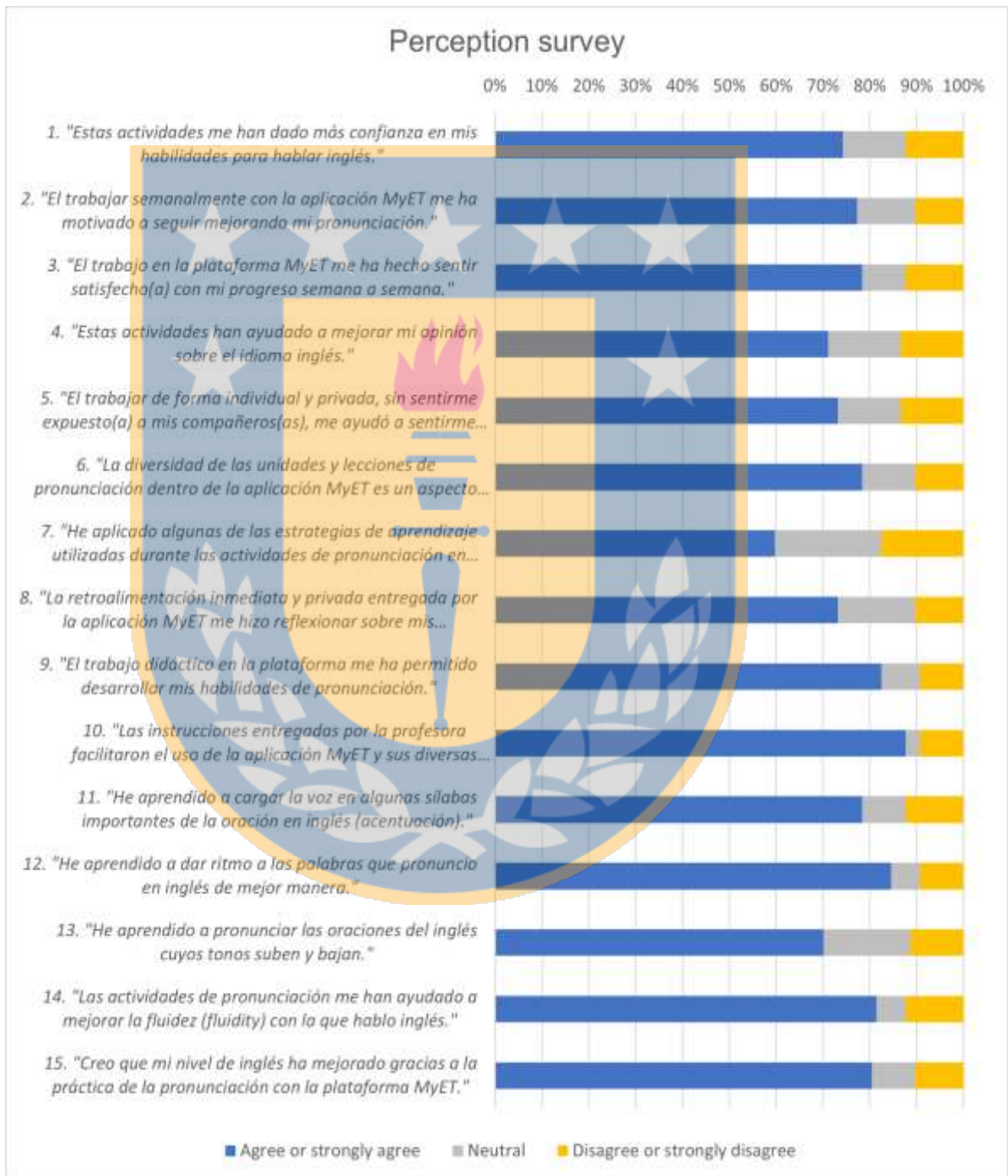


Figure 24

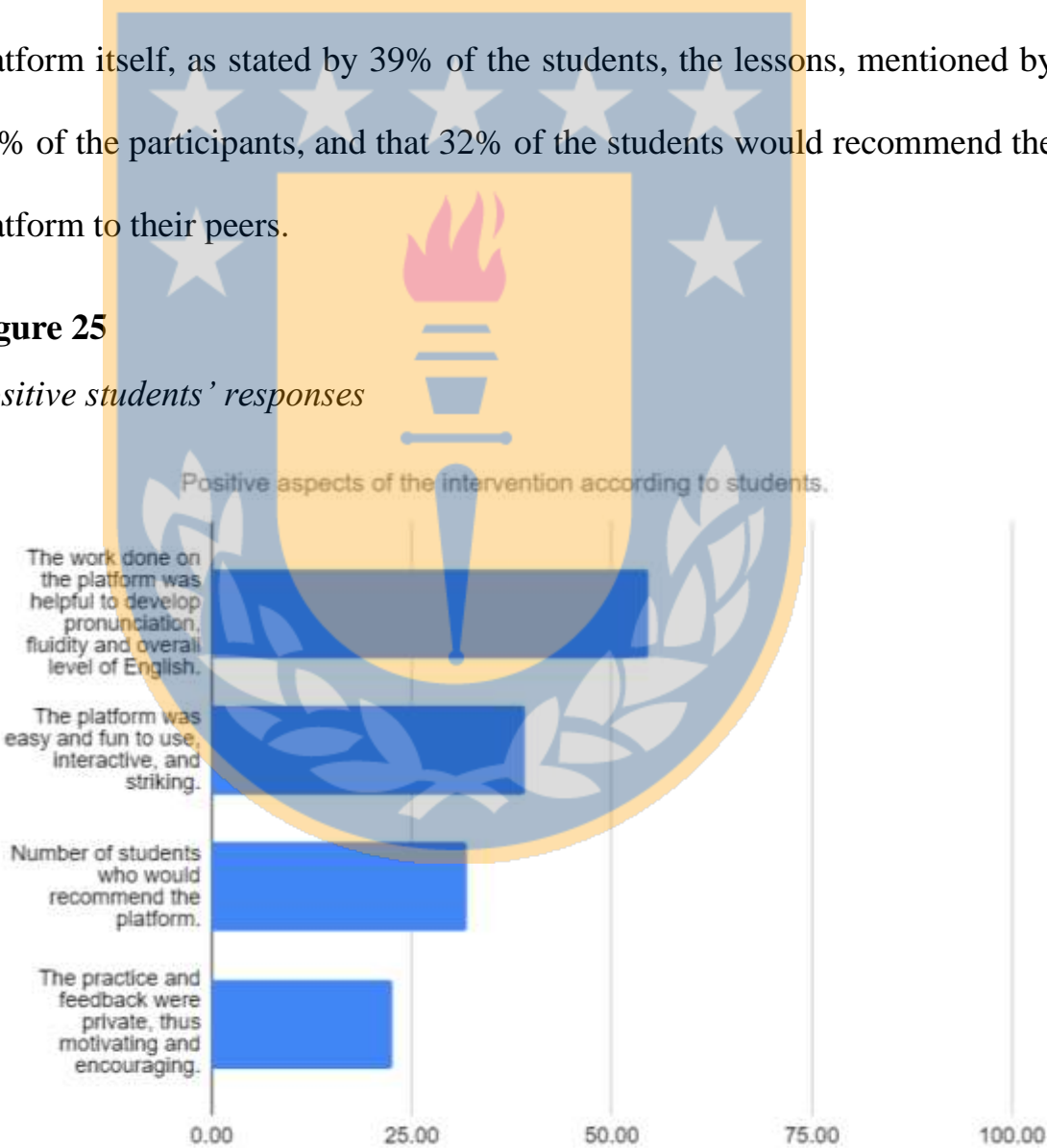
Students' perception survey responses



Regarding the open-ended question at the end of the survey, several keywords were found concerning positive and negative aspects of the intervention. As shown in Figure 25, the positive aspects include the usefulness of the work in the platform, recorded in 55% of the answers, the platform itself, as stated by 39% of the students, the lessons, mentioned by 23% of the participants, and that 32% of the students would recommend the platform to their peers.

Figure 25

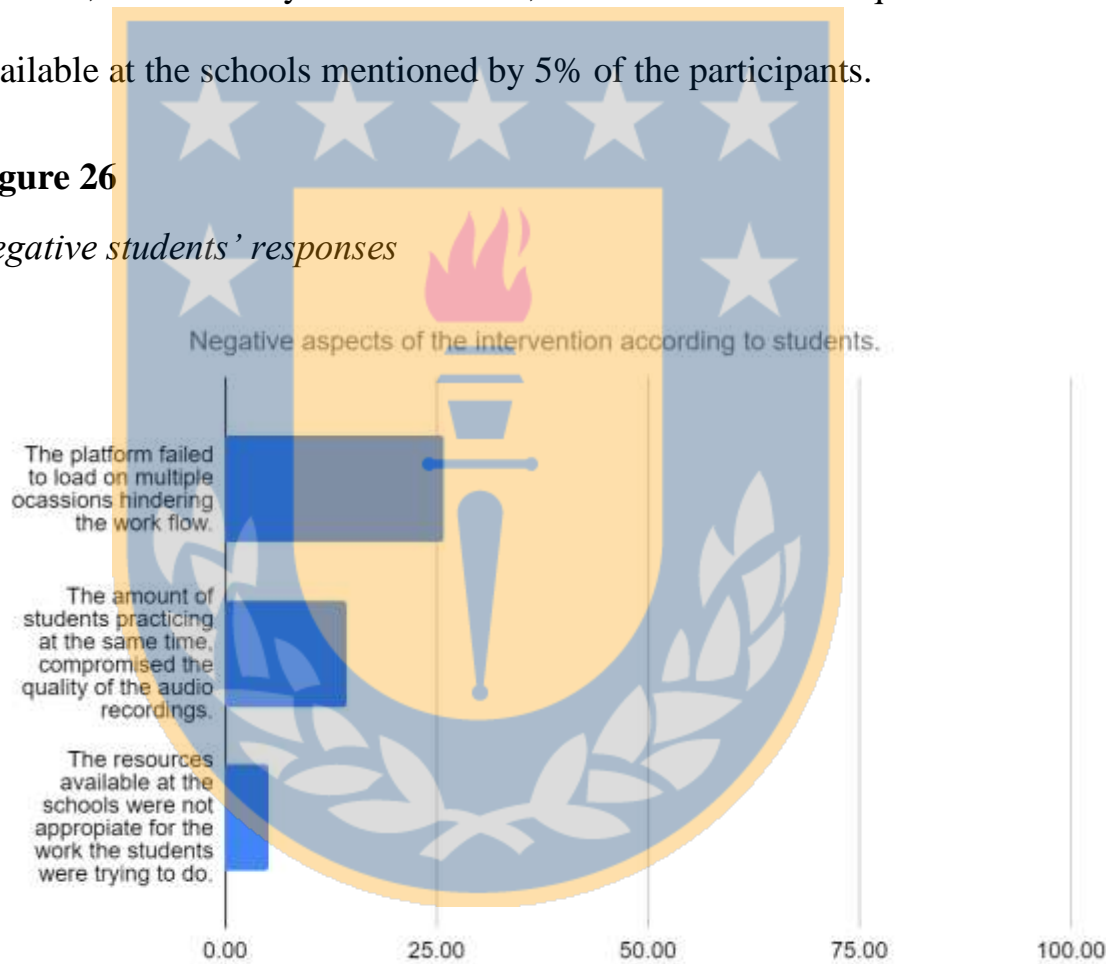
Positive students' responses



In contrast, the negative aspects highlighted in the students' answers, and shown in Figure 26, include problems with the app, experienced by 26% of the participants, the noise created by the students practice and recording sessions, as stated by 14% of them, and the lack of adequate resources available at the schools mentioned by 5% of the participants.

Figure 26

Negative students' responses



4. DISCUSSION

The results of this study have helped corroborate the hypothesis that pronunciation can be developed by means of CALL, TELL and AI, in concordance with Lee (2008) who conducted a similar study in Taiwan. In the present action-research project, every school showed important improvements in terms of the segmental and suprasegmental features of the English language, including pronunciation, tone, stress, and rhythm.

The biggest advantages of this study, and what contributed the most to getting successful results, were the private aspect of the lessons and the motivation students felt. One of the most notorious problems of the Chilean classroom is the reluctance students feel when asked to speak in public. By having them practice on their own throughout the study, they not only improved their pronunciation, but also, became motivated and confident to use the language.

4.1 Placement test

The results obtained from the placement test in the first stage of this study helped further corroborate the results from the SIMCE test. According

to the SIMCE results, most students from 12th grade do not reach the expected A2 level of English. Based on this information, the 3 lessons chosen for the students, were all in the A1 to A2 range of English proficiency.

The placement test served to make sure the lessons were appropriate. As most students, received an A1 or A2 level of English, it was decided that the lessons chosen for the participants were in accordance with the level of proficiency students had.

There were a small number of students who received a B1 or B2 level of English. Nonetheless, because the study was not striving to better their general proficiency in the language, completing level A1 and level A2 lessons was still a great way for them to practice their intelligibility, and segmental and suprasegmental features of English, while making improvements where needed.

4.2 San Rafael Arcangel and San Gabriel Arcangel schools

The results from the subsidized schools showed that both groups of students improved the segmental and suprasegmental features of the language measured by the platform, namely pronunciation of sounds, tone,

rhythm, and stress. Therefore, the main objective of the present study was fulfilled.

Both schools started with a mean of 79.27 points, and finished the study recording a mean of 86.72, which shows an increase of 7.45 points in the total score of the self-test. Whereas this result can seem less significant than that of the public school, it is still important as students managed to improve their pronunciation even while having a smaller room for improvement.

The schools showed statistically significant improvement in every single feature being measured in the platform. The most improved category was pronunciation of sounds, followed by rhythm, tone, and finishing with stress. Consequently, it can be said that this group of students had a somewhat developed sense of the suprasegmental features of the language, as they were already getting high scores. In contrast, the pronunciation of sounds was the most lacking category, yet the most improved, further confirming the hypothesis that applications of CALL, TELL, and AI can help develop the students' pronunciation skills.

Going further, after finishing the study and based solely on this, it can be said that schools with a semiprivate structure have more developed

pronunciation skills when compared to the public ones. Nevertheless, applications and platforms, such as the one used for this study, can still be beneficial and provide great results for the students and their teachers.

4.3 Valle de Sol high school

The public school results showed that students improved the segmental and suprasegmental features of the language evaluated by MyET, more specifically, they improved their pronunciation of sounds, tone, rhythm, and stress. Consequently, the study's main objective was achieved.

Students started with a mean of 59.33 points and finished the study recording a mean of 78.69 points, which shows an increase of 19.36 points in the total score of the self-tests. These results showed a substantial improvement when comparing them with the subsidized schools, as students got lower scores in the first self-test, meaning they had bigger room for improvement than the other group.

The Bicentenario Valle de Sol high school showed major improvements in every feature being measured by the platform. The most improved category was rhythm, followed by pronunciation of sounds, tone, and lastly, stress. Pronunciation of sounds was the most lacking category in

both applications, but with a difference of 21 points, it is the second most improved feature, consistent with the hypothesis that applications of CALL, TELL, and AI are effective and can help develop the students' pronunciation skills.

Furthermore, exclusively based on this study, it can be affirmed that public schools seem to have a lesser understanding of the segmental and suprasegmental features in general, when compared to the subsidized schools. However, because of that, students hugely benefited from the treatment and the platform as they recorded immensely higher scores during the second application of the self-test.

4.5 Perception survey

To comply with the second main objective of this study, a perception survey was applied for students to give their opinions towards the study. Regarding these opinions and using the 5-point Likert-type scale results, it can be said that more than 60% of the 97 participants who answered the form, strongly agreed, or agreed to the statements, which implies that students have a positive perception of the intervention and the different aspects of it, in concordance with Lee's study in 2008.

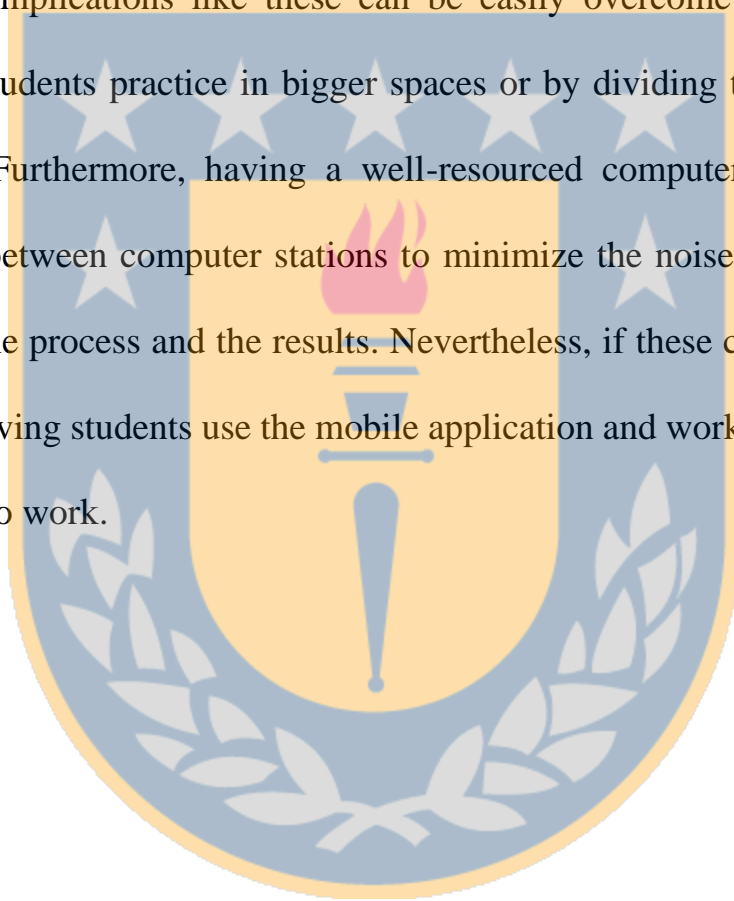
However, in question 7, there is a noticeable difference as more than 17% of the participants answered within the disagree and strongly disagree parameter. Although, as some students mentioned, they answered that way because they did not know what the question meant. In contrast, the most valued aspect of this study was the help students received from the teachers. Accordingly, it can be inferred that in the beginning stages of implementing applications of CALL and TELL, it would be better to do so under teachers' supervision so students become familiar with the platforms.

Moreover, this study was well received and qualified, leading to positive comments on the open-ended question, especially concerning their intelligibility, segmental and suprasegmental features, and confidence while speaking English. Also, a great number of participants would recommend the platform and would like to use it again in the future, highlighting the private feedback and individual aspects of the work done.

A small number of participants mentioned that there were a few problems regarding the equipment and the classrooms where they were working, such as poor internet connection, and the lack of headsets and working computers. Also, the application had problems with the layout and

features, failing to load properly on some occasions. Finally, the noise and background sounds from all students practicing at the same time caused disturbance to the sound detection feature of the application.

Complications like these can be easily overcome in the future by having students practice in bigger spaces or by dividing the class into two groups. Furthermore, having a well-resourced computer laboratory with screens between computer stations to minimize the noise would positively impact the process and the results. Nevertheless, if these changes cannot be made, having students use the mobile application and work in their free time could also work.



5. FINAL REMARKS

When comparing both groups, the San Rafael Arcangel and San Gabriel Arcangel schools with the Bicentenario Valle de Sol high school, the results showed that the study proved to be more impactful at the public high school, as they showed significant progress when compared to the semiprivate-subsidized schools. Nonetheless, this does not mean that lessons like the ones implemented in this study cannot be used again in the future as results were still significant and important at every school.

Moreover, it could be beneficial for students to start practicing pronunciation, in a private manner, in the early stages of the language learning process, using applications of CALL, TELL, and AI. Consequently, fostering their confidence to later participate in lessons with a communicative approach and be able to speak in front of the class successfully in the following years.

One of the biggest indicators of the success of the study, is the fact that some students were practicing by themselves at home, after they were done with classes for the day and on weekends. Most of them enjoyed seeing their

progress and strived towards getting better results each time. Some students actively asked how they could improve the different features they were lacking and showed real interest in the project itself.



GLOSSARY

Emphasis (*acento*): Stress, in phonetics, intensity given to a syllable of speech by special effort in utterance, resulting in relative loudness. In English, for example, stress differentiates the noun from the verb in the word “permit.” (Encyclopaedia Britannica, 1998).

Pitch (*tono*): Pitch is, in speech, the relative highness or lowness of a tone as perceived by the ear (Encyclopaedia Britannica, 1998).

Pronunciation: It is the production of sounds. It can be learned by the constant sounds’ repetition and appropriate correction when produced inaccurately. (Pourhosein, 2016).

Timing (*ritmo*): Rhythm is the relatively equal beat between stressed syllables (Roach, 1982).

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APPENDIX

Appendix 1. Cambridge placement test



Test your English

For the questions below, please choose the best option to complete the sentence or conversation.

Page 1 of 5

1 Could you tell me your surname?

Would you like me to spell it?

Do you like my family name?

How do I say that?

Test your English - Schools

Well done for completing the test!

Your score is 11 out of 25

[Review your answers](#)

Your score means you might be ready to prepare for **Cambridge English Qualifications for young learners** or **A2 Key for Schools**.

Appendix 2. MyET platform

English - Conversación práctica en inglés 1A(1)

Inicio sesión / Suscribirse

★★★★★ (4.9) Ver todos los detalles (curso de 2.7h)

PEU 1A
Práctica de idiomas

Inicio sesión / Suscribirse

Introducción
Este curso incluye conversaciones sobre la introducción personal, el séquito, la charla sobre los sentimientos. Los estudiantes aprenden vocabulario y frases utilizadas en la vida diaria, así como expresiones comunes.

Nivel de habilidad objetivo
Familiarizarse con varias introducciones personales simples, conversaciones y diálogos en inglés.

Dificultad
CEFR: A2 (TOEFL: 220-250)

Tiempo estimado
10 minutos al día, 3 días a la semana, y puedes terminar este curso en 4 meses.

Nivel de habilidad requerido
Puntuación 30 en SPY

Relacionado con este curso

Conversación práctica en inglés 1A(2) | Conversación práctica en inglés 1A(2)

Nivel de habilidad requerido
Nivel de habilidad objetivo
Ver: 'Introducción'

Conversación práctica en inglés 1A(1)/Meeting a New Friend

Sofia

Ains

Hello! My name is Sofia.
¡Hola! Mi nombre es Sofia.

1/18

Oraciones | Juego de rol | Refuerzo | Autoevaluación | Repetir

English-Chinese courses

Survival English(1) Inicio sesión / Suscribirse

★★★★★ (14.5) [Ver todas las reseñas](#) [Cursos de 1.500](#) LIBRE 1 MES

Introducción
Survival English is designed for beginner to intermediate English learners. It focuses on single word usage as well as conversational everyday English. Lessons include such practical topics as introducing yourself, meeting someone at the airport, going through customs and immigration, answering the phone and many more.

Nivel de habilidad objetivo
To survive in English speaking countries with basic knowledge of English.

Dificultad
Intermediaria

Tiempo estimado
Study 20 minutes a day, 3 days a week. You will finish this course in 1 month.

Nivel de habilidad requerido
1. LEFR A2.1 (B1 Beginner Level)


Relacionado con este curso

- Survival English(2)
- Survival English(3)

● Nivel de habilidad requerido
● Nivel de habilidad objetivo
WU: Intermediario

English-Chinese courses

Survival English(1)/Introducing Yourself (1)

Exchange Engineer  Marketing Manager

That's a nice place.
Ese es un lindo lugar.

2/18

Oraciones Juego de rol Refuerzo Autoevaluación Repaso

English-Chinese Apprentice

Survival English(1)/Introducing Yourself (1)

Marketing Manager

¿Quieres pasar a la siguiente oración?

No Si

29 Total

16 Pronunci.

45 Tono

40 Ritmo

36 Acento

English-Chinese Apprentice

Survival English(1)/Meeting Someone at The Airport

Exchange Engineer

Marketing Manager

Hello.
Hola.

1:00

Oraciones Juego de rol Refuerzo Autoevaluación Repetir

← Practical English Conversation 1A (1)/Meeting a New Friend

My Top Scores

	Pronun.	Pitch	Timing	Emphasis	Total Score
Hello! My name is Sofia.	22	41	3	37	24
What's your name?	3	54	1	54	10
I'm Alex.	11	54	16	52	18
Nice to meet you.	8	51	34	51	28
Nice to meet you, too.	28	52	0	50	29
Are you a student?	21	44	0	40	23
Yes, I am.	7	55	0	53	13
And you?	0	30	30	32	4
What do you do?	10	44	1	53	19
I work in a bookstore.	15	45	22	49	26
Where are you from?	17	46	46	47	32
I'm from Spain.	4	54	36	53	14
Average	11.94	46.06	14.25	48.19	19.26

RETRY GO BACK

11
Total

5
Pronun.

46
Pitch

44
Timing

43
Emphasis

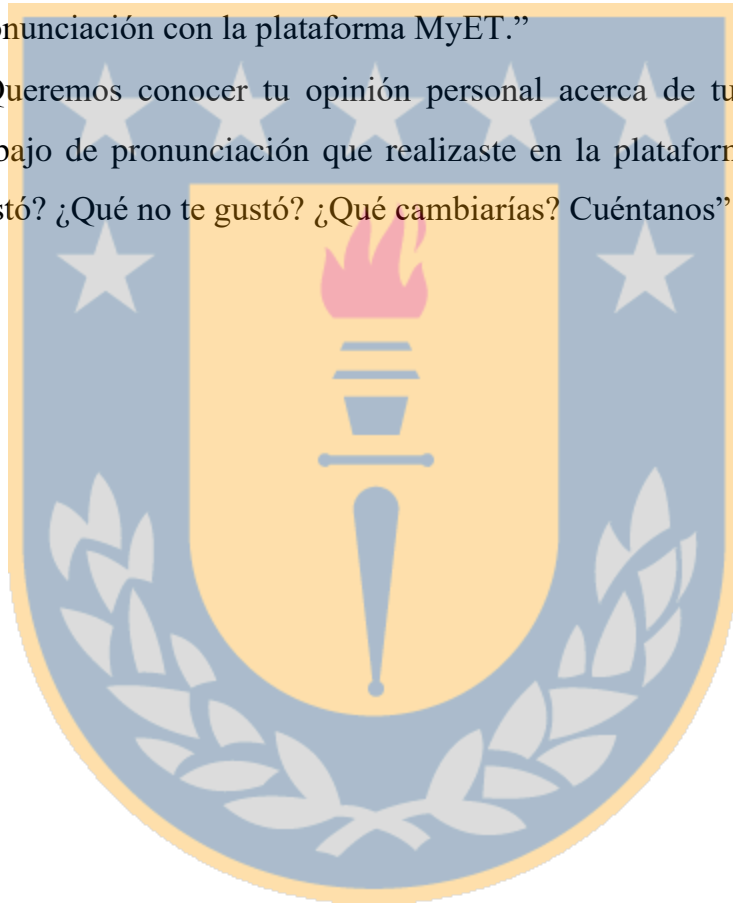


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1

Appendix 3. Perception survey statements

1. “Estas actividades me han dado más confianza en mis habilidades para hablar inglés.”
2. “El trabajar semanalmente con la aplicación MyET me ha motivado a seguir mejorando mi pronunciación.”
3. “El trabajo en la plataforma MyET me ha hecho sentir satisfecho(a) con mi progreso semana a semana.”
4. “Estas actividades han ayudado a mejorar mi opinión sobre el idioma inglés.”
5. “El trabajar de forma individual y privada, sin sentirme expuesto(a) a mis compañeros(as), me ayudó a sentirme más seguro(a) y confiado(a) al momento de realizar las actividades.”
6. “La diversidad de las unidades y lecciones de pronunciación dentro de la aplicación MyET es un aspecto positivo de la intervención.”
7. “He aplicado algunas de las estrategias de aprendizaje utilizadas durante las actividades de pronunciación en otras asignaturas.”
8. “La retroalimentación inmediata y privada entregada por la aplicación MyET me hizo reflexionar sobre mis habilidades en pronunciación.”
9. “El trabajo didáctico en la plataforma me ha permitido desarrollar mis habilidades de pronunciación.”
10. “Las instrucciones entregadas por la profesora facilitaron el uso de la aplicación MyET y sus diversas actividades.”
11. “He aprendido a cargar la voz en algunas sílabas importantes de la oración en inglés (acentuación).”
12. “He aprendido a dar ritmo a las palabras que pronuncio en inglés de mejor manera.”

13. “He aprendido a pronunciar las oraciones del inglés cuyos tonos suben y bajan.”
14. “Las actividades de pronunciación me han ayudado a mejorar la fluidez (fluidity) con la que hablo inglés.”
15. “Creo que mi nivel de inglés ha mejorado gracias a la práctica de la pronunciación con la plataforma MyET.”
16. “Queremos conocer tu opinión personal acerca de tu experiencia en el trabajo de pronunciación que realizaste en la plataforma MyET. ¿Qué te gustó? ¿Qué no te gustó? ¿Qué cambiarías? Cuéntanos”



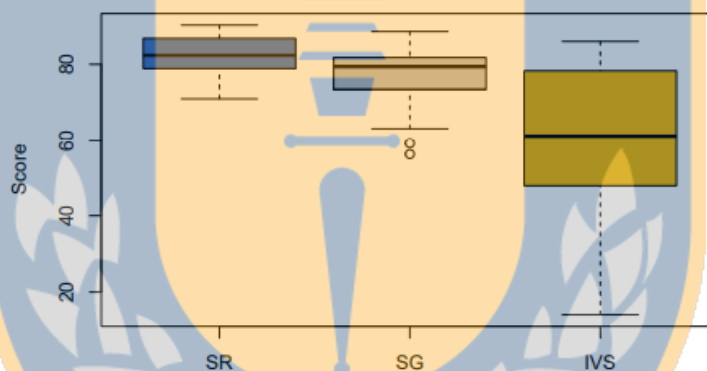
Appendix 4. Statistical analysis of the results

Análisis Puntajes

En el siguiente informe se estudian las diferencias existentes entre los puntajes obtenidos tras la intervención pedagógica realizada a distintos establecimientos educacionales. Estudiando las diferencias existentes entre colegios, a través de la aplicación del mismo test, antes y después del tratamiento.

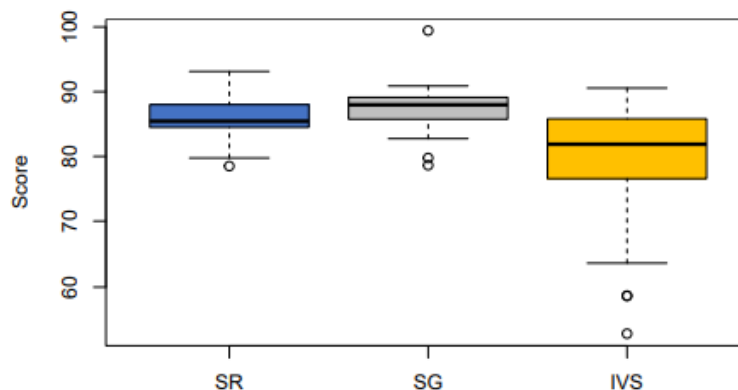
Análisis por colegios

En el siguiente gráfico se observan las distribuciones de los puntajes obtenidos en la primera aplicación (puntaje total), de acuerdo a la variable colegio.



Se observa que no hay grandes diferencias entre los colegios San Gabriel y San Rafael, pero sí entre estos y el Instituto Valle de Sol.

Luego, al realizar el mismo gráfico, pero considerando los puntajes obtenidos en la segunda aplicación se observa un escenario similar.



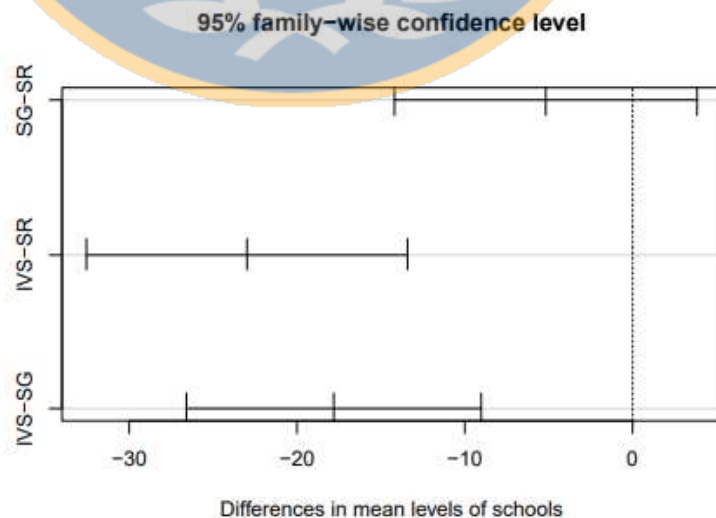
En el siguiente apartado interesa testear la siguiente hipótesis.

H_0 : Las medias de los puntajes totales en los establecimientos son iguales.

Para saber si existen diferencias significativas entre los puntajes totales de la primera aplicación se realiza el análisis de varianza correspondiente, con un valor p inferior a 0.05 se concluye que existe al menos un par de colegios con puntajes significativamente diferentes.

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
schools	2	6630.103	3315.0515	18.907	3e-07
Residuals	71	12448.761	175.3347	NA	NA

Ahora se realizará el test de Tukey para saber cuáles son las medias diferentes. No existe evidencia para decir que los puntajes obtenidos en los colegios San Rafael y San Gabriel son estadísticamente diferentes. Por otra parte, existen diferencias significativas entre estos y el Instituto Valle de Sol, los cual es congruente con el análisis gráfico realizado anteriormente. Lo anterior se puede concluir de dos maneras, estudiando si el 0 está contenido en el intervalo de confianza (existen diferencias significativas si el cero no está dentro de este intervalo) y a partir del valor p (valor p pequeño, en general menor a 0.05, es evidencia a favor de que existen diferencias).

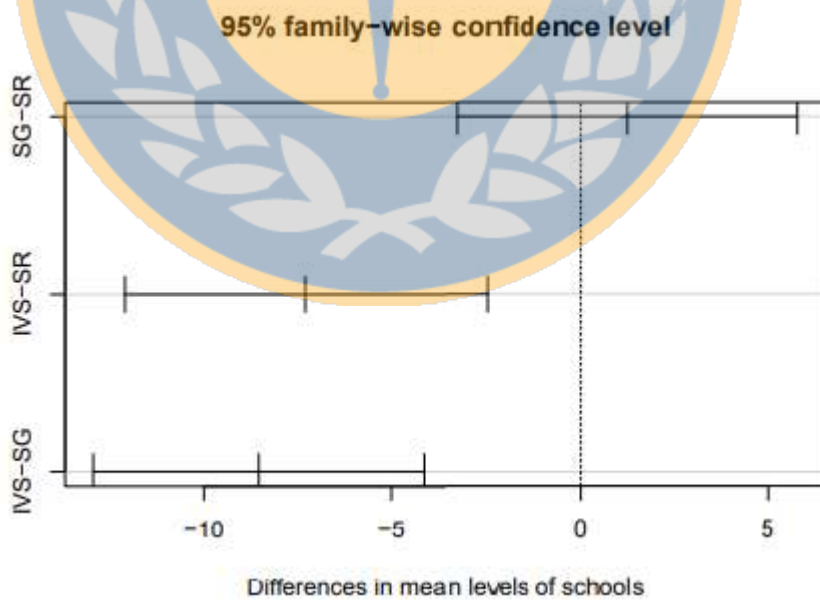


	diff	lwr	upr	p adj
SG-SR	-5.172429	-14.19110	3.846240	0.3604627
IVS-SR	-22.977950	-32.54505	-13.410849	0.0000006
IVS-SG	-17.805522	-26.59051	-9.020537	0.0000207

En el caso de la segunda aplicación también existen al menos un par de colegios con puntajes significativamente distintos. Valor p bajo, inferior a 0.05.

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
schools	2	1039.903	519.95157	11.73201	3.96e-05
Residuals	71	3146.653	44.31905	NA	NA

Al revisar cuáles son diferentes, se obtiene el mismo resultado que en la primera aplicación. No existen diferencias significativas entre los puntajes de los colegios, pero sí entre estos y el instituto.



	diff	lwr	upr	p adj
SG-SR	1.241333	-3.292899	5.775566	0.7899472
IVS-SR	-7.294928	-12.104891	-2.484964	0.0015207
IVS-SG	-8.536261	-12.953006	-4.119516	0.0000480

Análisis pareado (antes - después)

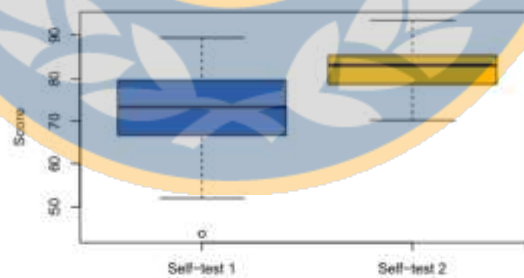
En este apartado interesa testear la siguiente hipótesis.

H_0 : La media del puntaje es la misma en ambas aplicaciones del test.

Rechazar la hipótesis anterior implicaría que existen diferencias significativas en el desarrollo de las habilidades medidas al utilizar la aplicación MYET. Debido a que no se encontraron diferencias significativas entre los colegios, en esta parte del análisis se considerarán como un mismo grupo. Colegios En todas las áreas existen diferencias significativas (valor p pequeño, inferior a 0.05, en cada una de las tablas). Es decir, existe evidencia para afirmar que hubo un aumento en los puntajes obtenidos en cada una de las áreas analizadas, en los colegios.

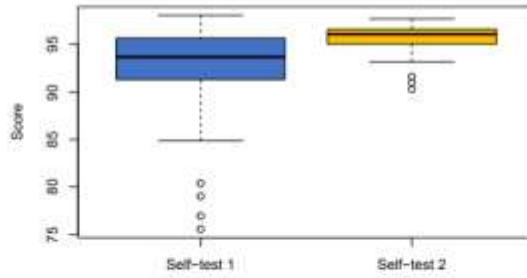
Pronunciación

estimate	statistic	p.value	parameter	conf.low	conf.high	method	alternative
-9.241176	-7.223249	0	50	-11.81086	-6.671495	Paired t-test	two.sided



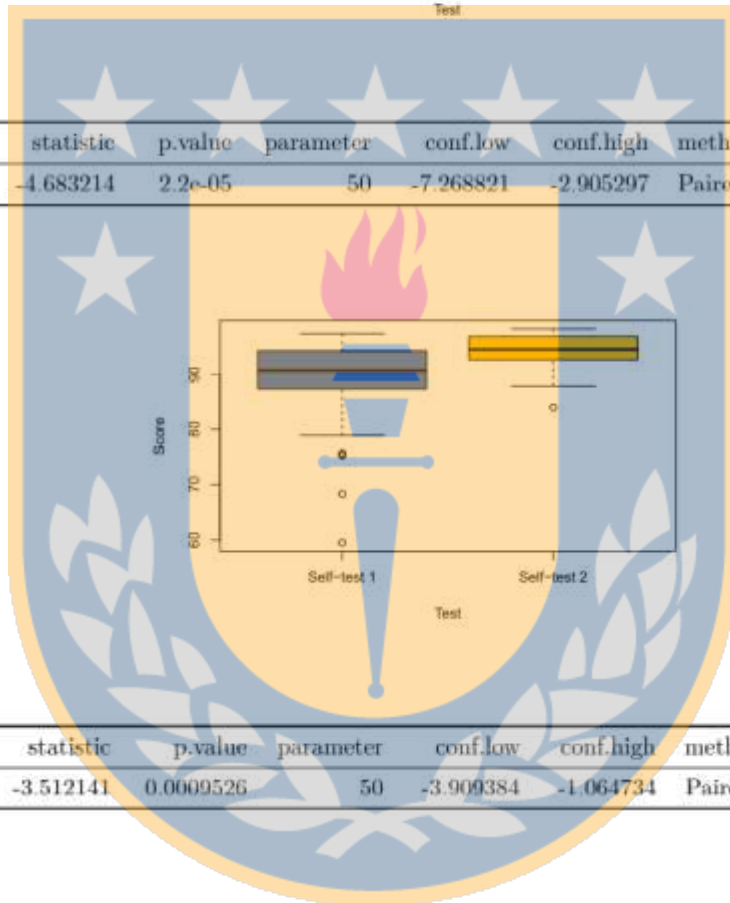
Tono

estimate	statistic	p.value	parameter	conf.low	conf.high	method	alternative
-3.32549	-4.910781	1.01e-05	50	-4.685649	-1.965331	Paired t-test	two.sided



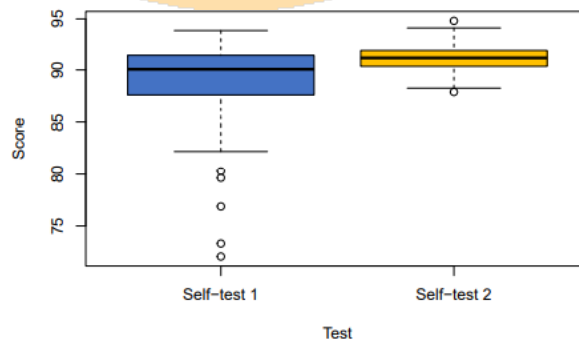
Ritmo

estimate	statistic	p.value	parameter	conf.low	conf.high	method	alternative
-5.087059	-4.683214	2.2e-05	50	-7.268821	-2.905297	Paired t-test	two.sided



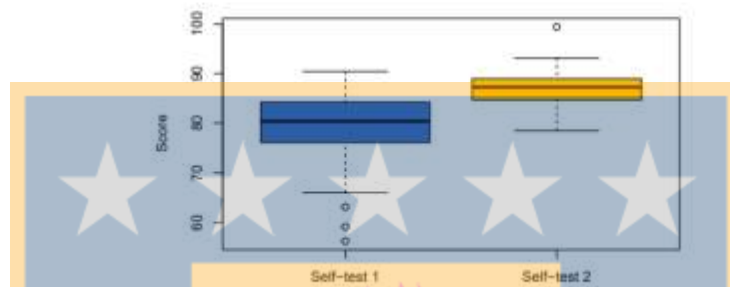
Acento

estimate	statistic	p.value	parameter	conf.low	conf.high	method	alternative
-2.487059	-3.512141	0.0009526	50	-3.909384	-1.064734	Paired t-test	two.sided



Totales

estimate	statistic	p.value	parameter	conf.low	conf.high	method	alternative
-7.448039	-7.082224	0	50	-9.560346	-5.335733	Paired t-test	two.sided

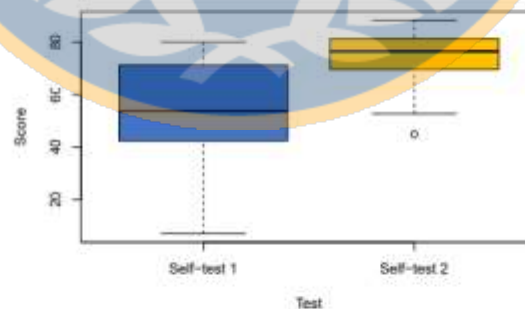


Instituto Valle de Sol

Lo mismo sucede en el Instituto Valle de Sol. Existen diferencias significativas, es decir existe evidencia para rechazar la hipótesis de que no hubo una mejoría en las habilidades de los alumnos al utilizar la aplicación.

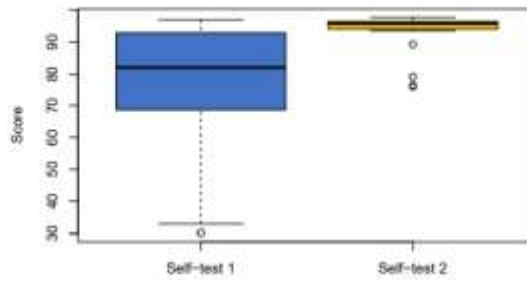
Pronunciación

estimate	statistic	p.value	parameter	conf.low	conf.high	method	alternative
-21.11478	-4.35111	0.0002559	22	-31.17874	-11.05083	Paired t-test	two.sided



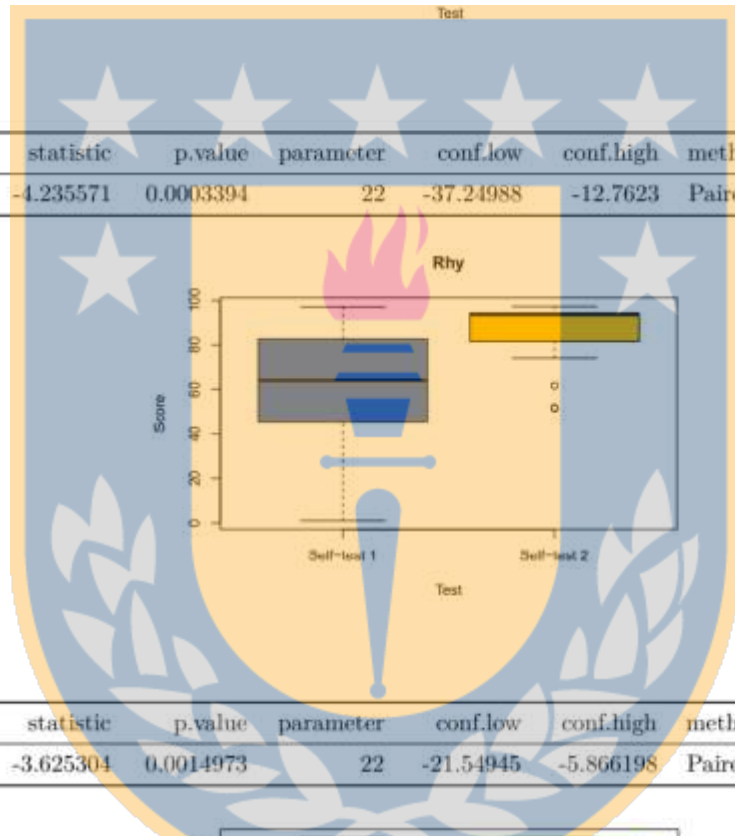
Tono

estimate	statistic	p.value	parameter	conf.low	conf.high	method	alternative
-15.72783	-3.803671	0.0009724	22	-24.3031	-7.152553	Paired t-test	two.sided



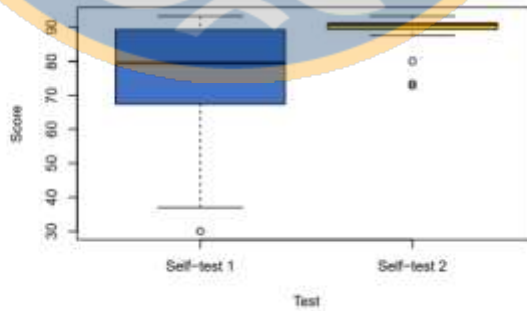
Ritmo

estimate	statistic	p.value	parameter	conf.low	conf.high	method	alternative
-25.00609	-4.235571	0.0003394	22	-37.24988	-12.7623	Paired t-test	two.sided



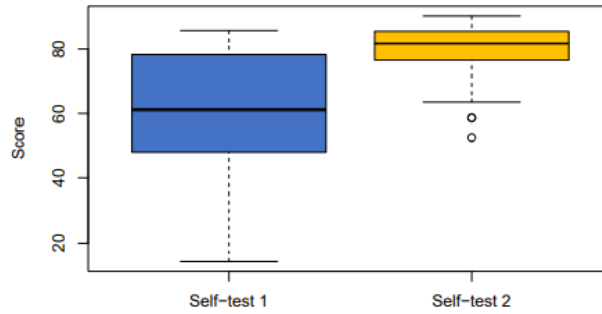
Acento

estimate	statistic	p.value	parameter	conf.low	conf.high	method	alternative
-13.70783	-3.625304	0.0014973	22	-21.54945	-5.866198	Paired t-test	two.sided



Totales

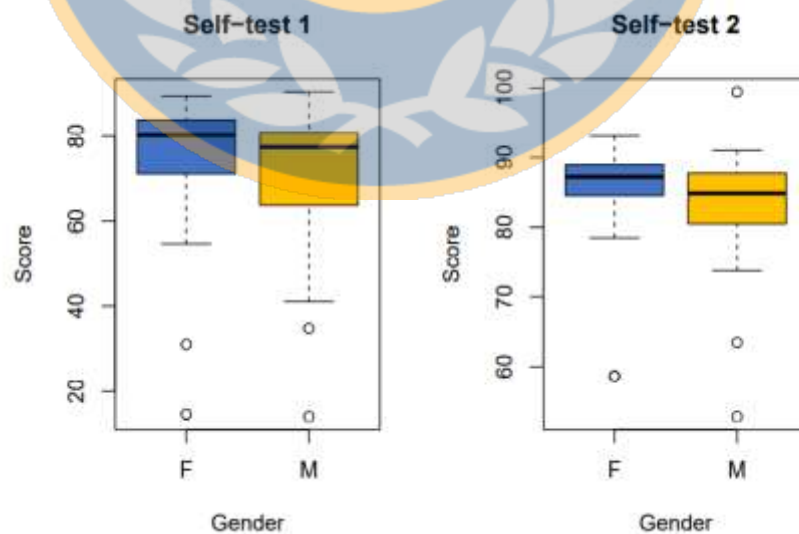
estimate	statistic	p.value	parameter	conf.low	conf.high	method	alternative
-19.35826	-3.94954	0.000682	22	-29.52314	-9.193386	Paired t-test	two.sided



Análisis por género

La interacción entre género y colegio no es significativa, así como tampoco lo es el género. Se puede analizar el género sin considerar colegio. El análisis se realiza sobre los totales.

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Gender	1	195.54	195.54	1.09	0.30
schools	2	6443.16	3221.58	17.90	0.00
Gender:schools	2	199.97	99.98	0.56	0.58
Residuals	68	12240.19	180.00	NA	NA



Ya que el valor p es mayor a 0.05 no existe evidencia de que los puntajes obtenidos al separar por género sean significativamente distintos.

Resultados self-test 1:

estimate	estimate1	estimate2	statistic	p.value	parameter	conf.low	conf.high	method	alternative
3.26	74.84	71.57	0.87	0.39	70.82	-4.25	10.77	Welch Two Sample t-test	two.sided

Resultados self-test 2:

estimate	estimate1	estimate2	statistic	p.value	parameter	conf.low	conf.high	method	alternative
1.81	85.2	83.39	1.03	0.31	70.87	-1.7	5.32	Welch Two Sample t-test	two.sided



Appendix 5. Gantt chart

