



UNIVERSIDAD DE QUINTANA ROO

División de Ciencias Políticas y Humanidades

**Effects of a fricative perception and production
instruction program on adult EFL learners**

Presenta: Sandy Amairani Chi Blanco

**Trabajo de tesis elaborado para obtener el grado de
Maestra en Educación**

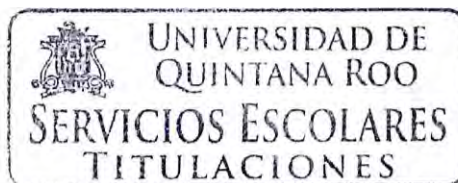
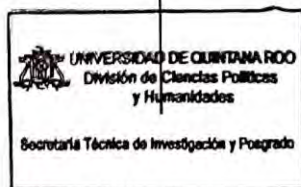
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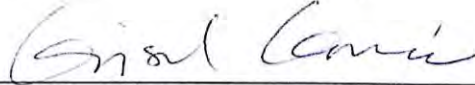
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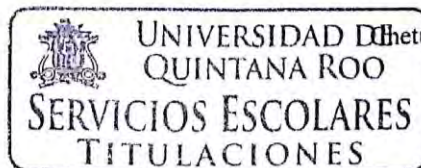
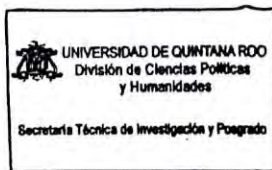
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TABLE OF CONTENTS

DEDICATION	III
ACKNOWLEDGEMENTS	IV
TABLE OF CONTENTS	V
LIST OF TABLES	VIII
LIST OF FIGURES	IX
ABSTRACT	X
INTRODUCTION	1
CHAPTER I: LITERATURE REVIEW	6
1.1 Studies on perception	6
1.1.1 On vowels	6
1.1.2 On consonants	8
1.2 Studies on perception and production	13
1.2.1 On vowels	13
1.2.2 On consonants	15
CHAPTER II: THEORETICAL FRAMEWORK	21
2.1 Speech perception	21
2.1.1 Bottom-up vs top-down processing	22
2.1.2 Active and passive processes of speech perception	22
2.1.3 Active theories of speech perception	23
2.1.3.1 The Motor Theory of speech perception	23
2.1.3.2 Analysis by Synthesis model	24
2.1.4 Passive theories of speech perception	24

2.2 The Phonological Filter hypothesis	25
2.2.1 Analysis of the Phonological Filter hypothesis and its implications in the present study.....	26
2.3 The Critical Period Hypothesis (CPH)	27
2.4 Contrastive Analysis Hypothesis (CAH)	28
2.4.1 Contrastive analysis: problems anticipated in the present study	28
2.4.2 Interference	32
2.4.3 Interlanguage	33
2.4.4 Cross Linguistic Influence (CLI)	33
2.5 Corrective Feedback (CF)	34
CHAPTER III: METHOD	39
3.1 Contextual framework	40
3.2 Subjects	41
3.3 Instruction: assessment materials and procedures	43
3.3.1 The diagnostic test	43
3.3.2 First and second middle test	44
3.3.3 Post-test	45
3.3.4 Delayed post-test	45
3.4 Piloting of the assessment materials	46
3.5 Instruction: instruments and procedures	46
3.5.1 Perception materials	47
3.5.1.1 Listening practice (discrimination tasks)	47
3.5.1.2 Dictation	47

3.5.1.3 Videos	48
3.5.2 Production materials	48
3.5.2.1 Articulatory awareness	48
3.5.2.2 Reading practice (controlled tasks)	49
3.5.2.3 Conversation practice (free tasks)	49
3.6 The instruction	50
3.6.1 A sample session in the instruction	50
3.7 Data analysis	51
CHAPTER IV: RESULTS	52
4.1 Summary of statistical results	52
4.2 Diagnostic test (pre-test)	54
CHAPTER V: DISCUSSION	61
CHAPTER VI: CONCLUSIONS	69
Pedagogical implications	70
Suggestions for future research	71
REFERENCES	72
APPENDIX A	78
APPENDIX B	91

LIST OF TABLES

Table 1: Spanish Phonemic Inventory	29
Table 2: English Phonemic Inventory	29
Table 3. Types of corrective feedback in the present study	37
Table 4: Characteristics of the quasi-experimental design	39
Table 5: Subjects' qualities: learning strategies and years of learning English	53
Table 6: Pretest means of experimental and control groups	54
Table 7: WT1 means of experimental and control groups	55
Table 8: WT2 means of experimental and control groups	56
Table 9: Post-test means of experimental and control groups	56
Table 10: Delayed post-test means of experimental and control groups	57
Table 11 One-way repeated measures ANOVA (perception-experimental group)	58
Table 12: One-way repeated measures ANOVA (production-experimental group)	58
Table 13: Means of the tests in the three periods of time: (pre-test, post-test, and delayed post-test)	60
Table 14: Means of the pre-test, post-test, and delayed post-test of the experimental group	66

LIST OF FIGURES

Figure 1: Variations of the /dʒ/ phoneme	31
Figure 2: Theories, hypotheses, techniques and models of the present study	38
Figure 3. Articulation of /ð/, /v/, /ʒ/, & /θ/	50
Figure 4: Perception and production comparison in the pre-test, post-test, and delayed post-test (experimental group)	59

ABSTRACT

Researchers have carried out speech perception and speech production for decades but in foreign language learning contexts they have been under researched. Therefore, a quasi-experiment framed by cognitive theories and hypotheses such as the Motor Theory of Speech Perception (Liberman, Cooper, & Delattre, 1950), the Phonological Filter hypothesis (Trubetzkoy, 1975), the Critical Period Hypothesis (Lenneberg, 1969), and strategies such as contrastive analysis and oral corrective feedback, was conducted in a public university in southern Mexico with Spanish speakers as participants. The objective of this study was to measure the effects of a perception and production instruction of four English fricative consonants (/ʒ/, /ð/, /θ/, /v/) and to analyze the relation between perception and production. The hypotheses state that:

- 1) Participants in the experimental group would show gains in the perception and production of the four English fricatives because of the perception and production instruction and
- 2) There is a relation between perception and production: the better the perception, the better the production.

Major findings, based on T-tests analysis and analysis of repeated measures (ANOVA), suggest that there were gains in both perception and production accuracy in the experimental group, but only production showed statistically significant results. This study provides evidence that with this type of instruction, non-native English speaking teacher trainees are able to improve their production performance.

Keywords: Speech Perception, Speech Production, English fricatives, ELT.

Introduction

Akahane-Yamada, Bradlow, Pisoni, & Tohkura, 1996; Flege, MacKay, & Meador, 1999; Jerotijević, 2011; and Zhu, 2014 have carried out studies in speech perception and speech production of English consonant and vowels. In terms of perception, there are studies that demonstrate the improvement of the perception of target sounds in second language and foreign language learners when an instruction was implemented (Akahane-Yamada, Flege, Guion, & Pruitt, 2000; Aliaga & Mora, 2009; Bannister, Derwing, Flege, & Munro, 1999; Hazan, & Iverson, 2005; Haslam, 2011; Feiz, McCandliss, & McClelland, 2002; and Ramírez, 2012).

Different factors that affect the perception of second language phones have been identified, such as the age of learners; it is claimed that there is a time period when learning to differentiate one sound from another becomes difficult (Gallardo del Puerto & Gómez, 2014; Herd, 2011). Researchers have also suggested some variables such as the learner's length of exposure to the target language and the quality input of the second language (L2) that condition the perception of the targeted phones. (Aliaga, 2009).

Most of these previous studies have focused on second language contexts, but in foreign language settings, the situation may be different. The length of exposure to the L2, for example, is more limited since learners are likely to be in contact with the target language only in the classroom. On the other hand, the quality of input can be another differential variable. In general, the instructor is the main input source in the classroom and students receive the teacher's input, which may vary in terms of accuracy. Many language teachers working in foreign language contexts are not native speakers and their proficiency may vary. Consequently, the input that learners receive may vary as well.

With regard to production, Reza (2011) posits that one factor that affects production is a sound in the target language that is non-existent in the learner's native phonological inventory; as such, the learner might not be able to produce it. Moreover, Jing and Yanyan (2011) suggest that the lack of equivalents in the L1 may lead to mispronunciation of sounds since L2 learners might be able to perceive the different sounds but they may not be able to produce them accurately.

Another factor found as affecting speech production is corrective feedback, whether or not this is provided to the learners, and the type of feedback used. Some studies assessed the effect of providing and not providing feedback during a instruction of target sounds. The results indicated that learners who did not receive feedback did not show considerable improvement in comparison to those who did receive feedback (Akahane-Yamada, Bradlow, Pisoni, & Tohkura, 1996; Feiz, McCandliss, McClelland, &, 2002).

Most of the studies on speech perception and production have been conducted in countries, such as Canada, Japan, Italy and the United States, with subjects who were learning English as a second language (Best, Bohn, Faber, & Halle, 2003; Flege, 2003; Flege, Frieda, Sloane, & Walley, 1999; Flege, MacKay, & Meador, 1999; García-Pérez, 2003; and Herd, 2011). Not only consonants such as /r/ /l/ /p/, /s/, /b/, /z/, /ʃ/ were part of the studies, but vowels were included as well. In general, the Perceptual Assimilation model, the Speech Learning model, the Perceptual Learning model and the Motor Theory model, framed these investigations and most of them included a treatment or instruction. The results in general were positive since there was a significant improvement not only in the perception but also in the production of the target phonemes.

In Canada, García-Pérez (2003) conducted a study with Spanish speakers learning English as a second language. The purpose of this study was to investigate the effects of a perception and production instruction on the production and perception of three pairs of English vowels in a classroom setting. There was an experimental and a control group. Learners in the experimental group received perception and production instruction, which included exercises such as discrimination tasks, oral repetition, reading out loud, dictation, spelling awareness, and conversation practice. After each instruction session, feedback was provided. Category goodness and comprehensibility tests were used in order to assess students' performance. Results indicated that learners in the experimental group revealed a significant improvement perception of the three pairs of vowels because of the instruction.

In Mexico, speech perception and production in the field of foreign languages and English language teaching education have been under-researched (Amieva, 2009; Ramírez, 2012; Puc-Medina, 2013). Amieva (2009) investigated the relationship between comprehension and foreign accent of EFL (English as a Foreign Language) learners in Mexico. The experimental group received explicit pronunciation instruction and the control group did not receive any kind of instruction. Results showed that English native speakers could understand the learners in the

experimental group and the explicit pronunciation instruction helped them obtain high scores in the post-test.

Ramírez (2012) conducted an experimental study on lax vowels with Spanish learners of English as a foreign language framed by Kuhl's prototype theory (1995). This consisted of activities to sensitize students to the importance of pronunciation. Furthermore, each activity included practice for the perception and the production of the lax vowels based on the elicitation technique. Results indicated that the perception and production of lax vowels increased due to the instruction. Puc-Medina (2013) investigated the effects of the use of strategies and techniques in pronunciation teaching in an English Language program. In a classroom setting, he provided activities that consisted of phonemic patterns, minimal pairs, and discriminations. He also implemented explicit error correction. His results are consistent with Amieva (2009) since explicit pronunciation teaching had a positive effect on subjects' oral production.

Currently, at the Universidad de Quintana Roo in southern Mexico, I have observed that some intermediate learners in the bachelor's degree of English Language Teaching show poor accurate perception and production of the English fricative consonants (/ʒ/, /ð/, /θ/, /v/). In Mexican Spanish, /θ/ and /v/ are non-existent phonemes, and [ð] is an allophone of /d/. In addition, [ʒ] may exist as an allophone of /dʒ/, but it is not very frequent. Consequently, production difficulties may arise when those phonemes or allophones are unknown or unconsciously perceived by some EFL learners whose mother tongue is Spanish.

The problem of poor perception and production of these fricatives becomes a greater concern because the learners are ELT (English Language Teaching) trainees, which means they will become EFL teachers. Celce-Murcia, Brinton, and Goodwin (1996) state that students who are trained to become English Language teachers must receive pronunciation instruction since they are going to be role models in learning institutions where they work.

Therefore, this study intends, by means of a quasi-experimental research design, to conduct perception and production instruction on the four fricative consonants (/ʒ/, /ð/, /θ/, /v/), based on cognitive models and approaches, in order to assess its effects on intermediate EFL students of the English Language Bachelor's program at the Universidad de Quintana Roo.

This thesis addresses two specific objectives:

- To analyze the gains in the perception and production of four English fricative consonants in a laboratory setting.
- To analyze the relation between perception and production of the four fricatives.

From a review of the aims of the present investigation and previous research, this thesis postulates the following hypotheses:

1. Subjects in the experimental group will show gains in the perception and production of the four English fricatives because of perception and production instruction.
2. There is a relation between perception and production results: the better the perception, the better the production.

This study becomes relevant firstly because it is expected that students of the English Language Bachelor's program who participate in the instruction will improve their perception of four fricative consonants and, consequently, the production of the target language. As such, they may be able to perform better in their EFL classes. Furthermore, they could learn pronunciation strategies they could implement when they become EFL teachers. Secondly, this research would be one of the first studies investigating the perception and production of four English fricatives in Mexico.

Accordingly, it will contribute to the area of Applied Linguistics and language teaching by contributing to the techniques and strategies used to improve the learners' perception and production. Once EFL teachers become aware of those strategies and techniques for teaching pronunciation, they might feel confident about implementing them in their classes. This way, the process of learning the target language may be easier and more effective for students because their deficiencies in terms of perception and production would be expected to diminish gradually.

Moreover, this study will provide evidence of which theories, models, strategies, techniques, and hypotheses in speech perception and production may be helpful in order to develop a solid and effective learning in those two aspects of the language. Finally, results of the present investigation will be helpful for further research, which may include other consonants or vowels. The present study will provide information regarding fricative consonant sounds (/ʒ/, /ð/, /θ/,

/v/) since in Mexico there is little investigation about them and it is expected to contribute to the area of speech perception and speech production in an EFL context.

This study has the following limitations. Firstly, due to time and room matters, the number of subjects (five in the experimental group and five in the control group) may seem limited to extrapolate the results. However, the data analysis and discussion is meticulous and rigorous. Another limitation is that the quantitative results of this quasi-experiment are restricted to the subjects from the fifth semester of the English Language Teaching Bachelor's program; consequently, these results may not be applicable to all students in the different semesters of this Bachelor's program or to other EFL students.

Moreover, memory retention might be another limitation. In experimental and quasi-experimental studies and in the learning of languages, memory plays an essential role since several factors can affect it. For the present study, it is probable that subjects face some difficulties in the delayed test since long-term memory plays a very important role. In addition, the outcomes of the instruction may be affected if learners are not aware of their own learning, as Mastin (2010) proposes.

The following delimitations apply. This study was conducted in Chetumal, Quintana Roo, Mexico at the Universidad de Quintana Roo with students of the English Language Bachelor's Program. The topic of the present research focuses on only four fricative English consonants (/ʒ/, /ð/, /θ/, /v/) and the results and discussion of the present study consider these four fricatives only.

CHAPTER I: LITERATURE REVIEW

Speech perception and speech production are two aspects of the language explored in past and recent years. These two aspects play an important role in the acquisition or learning of a language. Many researchers have carried out studies where participants received instruction in order to help them in their acquisition or learning process. This chapter describes studies on perception and perception and production studies in different contexts.

1.1 Studies on perception

1.1.1 On vowels

Flege, Frieda, Sloane, and Walley (1999) evaluated adults' perception of native and nonnative vowels with the perceptual magnet effect, which states that perceptual-cognitive categories are structured in terms of prototypes, following the Native Language Magnet (NLM) theory of Kuhl (1991, 1993a, 1993b, 1993c). Thirty-seven phonetically untrained, monolingual males from The United States were the subjects. The stimuli were identification tests via personal computers and in the main experimental task, he used a method of adjustment procedure to locate individual subjects' /i/ prototype. The results indicated that the subjects exhibited better discrimination overall for stimuli in a non-prototype condition than in a prototype condition. These results highlight the need to further assess and account for individual differences in vowel perception.

Best, Bohn, Faber, and Halle (2003) carried out a cross language perception of nonnative vowel production and the phonological and phonetic effects of native listeners. The Native Language magnet (NLM) and the Speech Learning Model (SLM) supported this research. The subjects were sixteen native speakers of north-east American English and of western Danish, and twenty-four

speakers of Parisian French. They took the tests in their native language and country. A native Norwegian male was recorded producing the tokens of vowel contrasts. Subjects completed categorical AXB discrimination tests involving the tokens of the multiple vowel contrasts. Then, they completed a categorization task on the vowels of all stimulus tokens, judged with respect to native vowels presented in a list of native keywords. Following categorization, they rated the token's goodness of fit to the native vowel they chose. All tokens were presented multiple times in random order. The results demonstrated that there was a strong effect in both phonological and phonetic properties of the native language since all listener groups assimilated Norwegian /y/-/u/ to a native category contrast.

Evans and Iverson (2007) presented a new method of instruction using technology. They compared how first-language Spanish and German speakers learn English vowels via computer-based auditory instruction. There was a total of twenty-six subjects: thirteen Spanish and thirteen German. Spanish subjects were tested in London and German subjects, in Potsdam, Germany. Two native speakers of Standard Southern British English (SSBE) produced the pre-test and post-test stimuli. In the instruction, ten sets of minimal pairs were constructed for each set of vowels, for a total of 140 target words. After each session of instruction, feedback was given. The results demonstrated that German and Spanish speakers learn at different rates given auditory instruction: German speakers improved twice as much, on average, as Spanish speakers after five sessions of instruction, although Spanish speakers attained similar levels of performance after completing an additional ten instruction sessions.

Kewly-Port and Nishi (2007) examined the perception instruction for nonnative vowels with Japanese learners. They investigated the influence of instruction set sizes by instruction native Japanese listeners to identify American English (AE) vowels. The subjects were twelve Japanese learners of English in the experimental group. Five Japanese learners were assigned to the control group. Stimuli were thirty-six monosyllabic consonant vowel consonant (CVC) real words (RW) and fifty-four disyllabic nonsense words (NSW). Performance of the subjects was assessed before and after each instruction session. The NSW were used both in instruction and tests, but the RW were used only in the test to examine generalization in more varied consonantal contexts.

The results of this study showed that the instruction successfully improved Japanese listeners' perception of AE vowels presented during instruction. The performance of the subjects in the control group did not change. This indicates that the naturalistic exposure to spoken English, as well as

learning by means of the tests alone were not the causes for the improved performance of the experimental group.

Reza (2011) conducted a study whose aim was to investigate if phonetic instruction followed by the learners' checking of their pronunciation by the use of phonemic transcription would enhance students' listening activity. Subjects were 45 Iranian students from third grade high school. Twenty subjects were in group A, the experimental group, and 25 were in group B, the control one.

Subjects in the experimental group were given phonetic and phonological instruction along with listening instruction, while subjects in the control group were given listening instruction only. Materials used in this instruction included a chart of the system of symbols for writing the sounds of English; a guide to these symbols along with videos in order to show the pronunciation of each of the sounds; two exercises (schwa and sound-spelling) and five quizzes. (Six items from each of these quizzes were used to develop a 30-item listening test to measure students' listening ability before and after the treatment) which was developed by Alex Bellem from the BBC Learning English program. Twenty-three subjects carried out a pilot study of the test similar to the ones of this study in order to establish the reliability of the test. The instruction lasted two months. Data was analyzed using the SPSS. Moreover, a paired-samples t-test was used to see if there was significant difference in the mean of scores for the prior to the intervention and after the intervention in each group. Results indicated that the experimental group who received phonetic instruction had a better performance than the control group.

The result of this investigation was that the phonetic instruction and the learners' phonemic transcription of different words benefited the subjects in learning the sound system of the English language more accurately.

1.1.2 On consonants

One of the pioneer studies in perception in English as a Second Language was that of Flege (1989). He conducted an experimental study with Chinese speakers examining the perception of the word-

final English /t-/d/ contrast before and after instruction by using acoustic cues. In the first experiment, subjects were thirty Chinese students. The stimuli were words formed by inserting seven vowels into /b-/t/ and /b-/d/ frames. He presented these words via TDH-49 headphones. Subjects identified words and selected the ones they had perceived.

In experiment two, he provided discrimination tasks for the subjects followed by the corresponding feedback. In experiment three, he provided a second instruction as an attempt to find a better method for instruction the contrast between /t/ and /d/ in the final position of English words. Therefore, identification with feedback was used again, but a larger number of instruction trials were given for a fewer number of words. This experiment explored issues about generalization of instruction, acoustic variability of instruction tokens and first language background (L1). In this experiment, there were three blocks. In the first block the subject's tasks were to identify the final stop as "t" or "d" in minimal pairs. In the second block, subjects received feedback and were presented other minimal pair sets. In the last block, there were identification tasks with immediate feedback. The results showed that when the subjects received feedback, their sensitivity to stops increased significantly.

Akahane-Yamada, Flege, Guion, and Pruitt (2000) reported the results of two experiments in Kyoto. They conducted these two experiments through two models that related to the differential learnability of L2 consonants. The Speech Learning model (SLM) developed by Flege (1995) and the Perceptual Assimilation model (PAM) developed by Best, McRoberts, and Sithole, (1988). PAM usually focuses on the discrimination of sounds in an unknown foreign language; and the SLM usually focuses on highly experienced learners of an L2. The purpose was to determine if PAM and the SLM could be extended to early stages of naturalistic L2 acquisition.

In experiment one, nine near-monolingual Japanese listeners participated in a cross-language mapping experiment in which they identified English and Japanese consonants in terms of a Japanese category, then rated the identifications for goodness-of-fit.

In experiment two, they used the same set of stimuli in a categorial discrimination test. Thirty native speakers of Japanese varying in experience with English participated. Ten native Japanese speakers living in the United States comprised the "high-experience" group. Ten native Japanese speakers matched to the United States group for age and education made up the "mid-experience" group. The "low-experience" group consisted of ten Japanese college students who had never lived outside of Japan. Most of their exposure to English had taken place in the classroom

and consisted largely of written English. Ten monolingual native speakers of American English made up the comparison group. Contrast pairs composed of two English consonants, two Japanese consonants; one English and one Japanese consonant were tested.

The results suggested that the PAM framework could be extended to early stages of naturalistic L2 speech learning and the SLM cannot be readily extended to early stages of L2 speech acquisition without further investigation. The results of experiment one suggested insight about how the perceived phonetic distance of English and Japanese consonants affected discrimination of English sounds. In general, results indicated that certain English consonant contrasts are more difficult for Japanese adults to discriminate than other consonant contrasts.

McClelland, Fiez, and McCandliss (2002) conducted an experiment in speech discrimination instruction where they investigated the learning of nonnative speech contrast (English /r/ /l/) in adults with native Japanese speakers. This study followed an adaptive instruction regime (starting with easy stimuli at the beginning) which contrasted with a fixed instruction regime (ending with difficult stimuli). In addition, it was framed by the Hebbian model of learning. This way of learning occurs *when a neuron participates in firing another, the strength of the connection from the first to the second will be increased* (McClelland et al, 2002, p. 657).

The instruction consisted of three sessions. They lasted about twenty minutes. Subjects were native speakers of Japanese living in the United States. These subjects were trained in four different regimes: the adaptive/no feedback regime, the fixed/no feedback regime, the adaptive/with feedback, and the fixed with feedback. Subjects received instruction to discriminate minimal pairs such as “rock” vs. “lock” (using natural spoken stimuli). The purpose of using these examples was to synthesize two continua of sounds interpolating between the natural examples and by exaggerating the differences of the target sounds. Subjects received the stimuli and they had to indicate whether the stimuli started with /l/ or /r/. If the subject did not respond correctly to a particular stimulus, the task was made easier by exaggerating the difference. Then if the subject made eight correct responses, the task was made more difficult. This condition was used with the four regimes.

The results indicated that the four regimes showed improvement in identifying the target sounds but the groups that received feedback indicated that they were not only good at identifying but also they were very good at learning. This means that feedback may modify learning positively.

Bannister, Hazan, and Iverson (2005) carried out a study of phonetic instruction with acoustic cue manipulations. This study differs from the others because they contrasted four different methods: High Variability Phonetic Instruction (HVPT), Secondary Cue Variability, Perceptual Fading, and All Enhanced. This experiment took place in England and Japan and its aims were to test whether there was a reduction on the reliance on secondary cues during learning and to compare the effectiveness of the four different methods.

The study contained sixty-two native speakers of Japanese; sixteen each in Secondary Cue Variability and All Enhanced and fifteen each in HVPT and Perceptual Fading. In the instruction twelve native speakers of British English were digitally recorded as the natural stimuli, there were words with initial position /r/ and /l/ minimal pairs (e.g., *rock* and *lock*). The testing included 40 initial-position /r/ /l/ minimal pair words from the instruction, 40 initial-position /r/ /l/ minimal pair words that were not used in the instruction, 40 medial-position /r/ /l/ minimal pair words (e.g., *arrive* and *alive*), and 40 consonant-cluster /r/ /l/ minimal pair words (e.g., *crash* and *clash*).

The results showed that instruction with natural speech is currently the best method, because the signal processing techniques used here are more labor intensive and offer no additional gains in performance. However, the lack of significant differences between instruction methods also demonstrates that there is nothing particularly special about having fully natural variability.

Boomershine, Currie, Hume, & Johnson (2005) investigated the impact of contrast versus allophony on the perception of speech sounds. They carried out four experiments contrasting the behavior of Spanish-speaking and English-speaking listeners. They also explained how the results of this study should be integrated into a speech perception theory. Two models framed this study: the phonological inferencing model and the exemplar model. It is expected that when sounds are contrastive in one language, listeners will be more aware of the phonetic contrast between these sounds and judge them to be more different from each other than sounds that are in a non-contrastive relationship within a given language.

Experiment 1 (rating [d], [ð], & [r]): participants were a group of native Spanish speakers (N = 10) studying in the United States of America from countries such as Mexico, Colombia, Spain, Argentina, Peru, & Puerto Rico and one group of American English speakers (N = 18). In this experiment, participants heard a pair of sounds and they were asked to rate how similar were those sounds on a scale of 1 (very similar) to 5 (very different). They did not receive any kind of feedback.

Experiment two (discriminating [d], [ð], & [r]): participants were 10 Spanish speakers and 17 American English speakers. They heard a pair of sounds and had to choose whether the sounds were identical or different. After each response, participants received feedback.

Experiment three (rating Greek [d], [ð], & [r] pairs): participants were seven Spanish speakers and 10 American English speakers. The same procedure was used as in experiment one but in this experiment, different tokens were provided to participants.

Experiment 4 (discriminating Greek [d], [ð], & [r] pairs): participants were seven Spanish speakers and 11 American English speakers. This experiment had the same procedure as experiment two but using different tokens.

Results of the four experiments suggest a similar pattern; speakers of a language in which a pair of sounds is phonemically contrastive perceive that pair as being more perceptually different compared with speakers of a language in which the pair is not phonemically contrastive.

Babel and Johnson (2007) conducted two experiments about cross-linguistic differences in the perception of palatalization in the United States. In the first experiment, they hypothesized that language background will not influence the results as listeners will respond to acoustic properties of sounds alone. In this experiment, fifteen native speakers of American English and fourteen speakers of standard Russians participated as listeners. The stimuli were open syllables with onsets with consonants varying degrees of palatalization (/m/, /v/, /b/, /d/, /l/, and /r/) followed by a vowel /a/, /u/ or /i/. Isolated naturally produced consonant + vowel (CV) syllables were presented in pairs to listeners over headphones at a workstation using E-prime Experiment software.

Subjects were instructed to judge whether the two tokens were the same or different and log responses on a button box, having a total of 432 pairs. Feedback was presented on the computer screen. The log reaction time was the dependent variable and the vowel context, listener language, and the degree of palatalization were the independent variables. The result of this experiment was that they confirmed that language background did not affect listeners' responses to the acoustic properties of the stimuli.

In experiment two, they explored the influence of linguistic experience on the perception of speech sounds. Furthermore, the aim of this second experiment was to examine the subjective language-specific organization of speech sounds by asking subjects to rate the perceptual similarity of sounds. The prediction was that language would strongly influence the rated similarity of sounds. Thirteen native speakers of American English and ten speakers of standard Russian were the

subjects. The stimuli of experiment one was used in experiment two. Stimuli were presented in pairs. Different pairs were presented twice while identical pairs were presented for each vowel and consonant combination, having a total of 288 pairs. Listeners were instructed to rate the similarity between the two tokens on a five-point scale and logged their responses on a five-point equal-interval button box. Listeners had five seconds to respond before the presentation of the next stimuli. Listener rating responses from the different pairs were the independent variable and vowel context, listener language, and degree of palatalization, the independent variables.

After post-hoc analyses, the prediction was borne out. Language will strongly influence the perceptual rated similarity of speech sounds. These two experiments provided evidence that in a behavioral task, Russian and native American, English listeners perceived speech sounds the same on a psycho-acoustical level, but slightly differently in terms of subjective perceptual organization of the same sounds.

1.2 Studies on perception and production

1.2.1 On vowels

Flege, MacKay, and Meador (1999) conducted a study on the production and perception of English vowels by seventy-two Italian speakers. They differed according to the age of arrival (AOA) in Canada and the amount of self-reported continued use of Italian. The Speech Learning model and the Perceptual Assimilation model framed this study.

Three questions led the research: the first one was whether the subjects' accuracy producing and perceiving English vowels would diminish as AOA increased. The second one was whether the subjects who began to learn English as young children would perform more like subjects in a native English comparison group than would the subjects who began to learn English as young adults. The final question was whether differences in amount of L1 use would affect the native Italian subjects' production or perception of English vowels.

In the procedure, vowel production accuracy was assessed through an intelligibility test in which native English-speaking listeners attempted to identify vowels spoken by the native Italian subjects. Vowel perception was assessed using a categorical discrimination test. Results indicated that neither of two groups of early Italian and English bilinguals differed significantly from native speakers of English for production or perception. This finding is consistent with the hypothesis of the Speech Learning model that early bilinguals establish new categories for vowels found in the second language. The significant correlation existing between the measures of L2 vowel production and perception is consistent with another hypothesis of the Speech Learning model; the accuracy with which L2 vowels are produced is limited by how accurately they are perceived.

Ramírez (2012) investigated if it was possible for adults to improve their oral production through pronunciation activities. In addition, she formulated questions about the difficult learning processes of perception and production skills. The aim was to present the results of an experiment about perception and production of lax English vowels.

This experiment was framed by the Kuhl's prototype theory (1993) which states that sounds from the L2, which are different from the L1, are easier to perceive. The subjects were four native Spanish speakers assigned to the experimental group and five subjects in the control group. The treatment consisted of activities that sensitized students to the importance of pronunciation. Every activity included practice for perception, recognition and production of lax vowels. Results of this study showed that subjects in the experimental group increased their perception of some vowels following the treatment.

Gómez and Gallardo (2014) examined the impact of phonetic instruction of the English schwa vowel in a primary school. The objective of this study was to explore the effect of classroom phonetic instruction perception and production based, as well as exposure to native accent on the perception of English schwa. Subjects were seventy-five Basque/Spanish from sixth grade of primary school learning English as a foreign language.

Subjects were distributed in three groups (A, B, and C), twenty-five learners in each one. Group A received a instruction based on perception tasks and group B underwent listen-and-repeat-practice. Group C did not receive phonetic instruction but had a native teacher for English and Arts and Crafts. Materials were real two-syllable words in pre-tonic and post-tonic unstressed position recorded by native speakers of English with knowledge of Spanish and the instruction consisted of six sessions. The instruction regime based on perceptual practice (group A) had identification and

discrimination tasks. Feedback was provided after each practice task. The instruction regime for group B was based on imitation practice. Subjects heard a word and they had to repeat it in order to be recorded by a specific computer programme and received feedback from their supervising instructor.

In general, results showed that learners significantly improved their ability to identify incorrect spliced full vowels. However, the groups that underwent explicit phonetic instruction exhibited the improvement in a more significant manner compared to the group with native exposure, evidencing the positive effect of the phonetic instruction regimes. This study shows that phonetic instruction regimes could raise learners' perceptual awareness on L2 sounds.

1.2.2 On consonants

Akahane-Yamada, Bradlow, Pisoni, and Tohkura (1996) investigated the effects of instruction of /r/ and /l/ perceptual identification and production by adult Japanese speakers. This study examined whether L2 perception instruction improves L2 production. Twenty-three native speakers of Japanese participated in the research. Eleven subjects were randomly assigned to the experimental group. The twelve remaining subjects were assigned to the control group. Stimuli were English words contrasting /r/ and /l/ in various positions (e.g., word-initial singleton, word-initial consonant cluster, intervocalic, word-final singleton, and word-final consonant cluster).

In the instruction (high-variability procedure), 136 minimal pairs were provided to the subjects. In the pre and post-tests twenty-four minimal pairs were used. Furthermore, there were two generalization tests. These tests consisted of a minimal word pair, identification task with novel words spoken by a new speaker and were used after a period of the instruction in order to see if the subjects retained what they had learned. Results suggested an improvement in accurate production in the experimental group. The pre-test, the two generalization tests, and the post-test were compared, showing significant improvement in terms of L2 production.

Bettoni and Koarich (2009) investigated the poor production of word-initial /s/-clusters by Brazilian learners of English and that only awareness does not tend to lead to better their production. Furthermore, the effects of a computer-assisted approach to pronunciation instruction were studied

namely perceptual instruction, with the intention being to provide FL learners with substantial native L2 input.

The specific focus was on the English word-initial /s/-clusters. For this investigation there was one question: what are the effects of perceptual instruction on word initial /s/-clusters? Therefore, it was hypothesized that first, there would be improvement in perception and in production after the instruction. Second, there would be retention of improvement five months after the post-test. Third, there would be transfer of improvement to an unfamiliar talker. The Speech Learning Model, (Flege, 1995) and Perceptual Assimilation Model, (Best, 1995, 2007). framed this study.

Participants in this study were two FL Brazilian learners – a female and a male - having an intermediate level of English. Only the female participant received the instruction. This exploratory study consisted of four phases: pre-test, instruction, post-test, and the retention test. After the instruction, the data was collected individually on a laptop computer. Both data (production and perception) were tabulated for each word produced and perceived. Statistical tests were run using SPSS.

The results of this investigation showed that the four hypotheses were confirmed; consequently, perceptual instruction is a good tool for enhancing the learning of word-initial /s/-clusters. In addition, identification and production of several non-native contrasts could be improved by the use of perceptual instruction programs. Even though this study was not carried out in the same context, which is Mexico, it is relevant to the present study since participants share similar characteristics such as their level of English and the fact that they are EFL learners. One weakness is that due to the reduced group of participants, the results cannot be generalized; therefore, a larger group of participants may be considered for future investigations. Furthermore, it only focuses on word-initial /s/-clusters, which means that there are more consonants clusters which can be studied. In addition, since this study was done following the qualitative design and the exploratory approach, another study can be done taking into consideration the quasi-experimental or the experimental ones due to the complexity that characterizes them.

Loscko (2009) carried out a study on the effect of instruction on fricative production in second language speakers, framed by the Flege's Speech Learning model. His objective was to examine short-term learning effects on the acoustic characteristics of /s/ and /ʃ/ fricatives in word initial, word medial and word final positions in real English words.

Subjects of this study were ten native Korean speakers, seven males and three females. Ten native English speakers elicited a production task for a basis control. The testing and the collection were done in two sessions. In the first session, each subject completed a production task to elicit the pre-instruction data. In the second session, subjects received instruction on the production of /s/ and /ʃ/.

The instruction used appropriate pictures and verbal models which were repeated and learned by the subjects. After the instruction, subjects completed a post-test production task. Data was analyzed using the SPSS 17 version. Furthermore, he used a three-way ANOVA (segment, position, and language) in order to see significant differences among the Korean and the native English speakers. Results demonstrated that Korean speakers could make significant improvement to their production of /s/ and /ʃ/ following a short instruction period.

In Spain, Aliaga-García and Mora (2009) assessed the effects of phonetic instruction on four L2 sound contrasts /p/-/b/ and /t/-/d/ in word initial position, as well as the vowel contrasts /i:/-/I/ and /ʌ/-/æ/ in perception and production. The High Variability Phonetic Instruction (HVPT) was the approach used in this study. A total of twenty-nine bilingual Catalan/Spanish undergraduate students of English Philology, learning English as a foreign language performed in the test. There were two groups, the experimental (N=18) and the control one (N=11). The instruction lasted six weeks, two hours per session. Subjects received intensive practice of perception and production starting with articulatory-visual description then, exposure to NS models, and contrastive analysis. The perception instruction consisted of identification, discrimination, and phonetic transcription tasks. The production instruction was based on imitation and reading out-loud tasks. Subjects received immediate feedback during the sessions, cumulative feedback at the end, weekly feedback, and individual 15-minute working sessions based on computer-based visual feedback.

Results revealed that subjects either perceived or produced some of the target sounds more accurately after the instruction. The effect on the phonetic instruction that had this study was positive and this suggests that a short phonetic instruction might enhance L2 perception and production of sounds. The authors suggest that audio-visual and articulatory instruction methods on learners' perception and production competence in the L2 may prove to be a very fruitful research area and these findings could usefully be applied to L2 pronunciation instruction.

Jing and Yanyan (2011) examined the Chinese EFL acquisition of English fricatives. This study took place in China with fifty-eight participants learning English as a foreign language. In

China, there are different majors that have different English classes with respective focuses. There are English majors that focus on pronunciation correction whereas there are other non-English majors that only have comprehensive English class without any special emphasis on English pronunciation. Therefore, 26 English major and 32 non-English major students were chosen to make a comparison to find out whether English pronunciation teaching has helped learners make any improvement in their learning of English sounds.

Instruments for perception and production were discrimination tests. For the data analysis, the SPSS package and the descriptive statistics were used. Results suggested that English major participants had overall advantages over the non-English major participants. This might be because of the pronunciation instruction classes they had attended suggesting the importance of pronunciation instruction classes in order to improve perception and production.

In Serbia, Jerotijević (2011) conducted a study aimed at establishing the effects of phonetic instruction on Serbian learners' perception and production of English interdental fricatives since they are considered problematic for those students. Thirty native speakers of Serbian learning English as a foreign language (intermediate level) around the age of 17 participated as subjects. There

was one experimental (N=15) group and a control group (N=15). The experimental group received a six-month phonetic instruction, one hour per week.

In the instruction, subjects were taught features of the English phonetic system, a practice of the target sounds /θ/ and /ð/ and after each practice, subjects received immediate feedback. In addition, they were provided with articulatory description of sounds, tips for learning pronunciation, native speaker models, and contrastive analysis. Perception tasks consisted of a variety of exercises focusing on multiple contexts, pair work to encourage peer correction as well as critical listening to native speakers. Production tasks included reading out-loud and repetition tasks. After each practical lesson, feedback was provided as well as after each pronunciation mistake.

The results showed that phonetic instruction had positive and beneficial effects on the learners' perception and production of the two English interdental fricatives. This phonetic instruction increased the subjects' level of accuracy in perceiving and producing the target phonemes. Moreover, learners increased their self-confidence and awareness of accurate pronunciation.

Zhu (2014) conducted a study about the relations among speaking styles, attention to the voiceless fricative sound, learners' perception of English native speaker's speech, learners' self-perception, and the learners' production. This study had thirty-four Chinese participants learning English as a second language. Before the experiment, participants were asked to read forty-one minimal pairs words for the perception part. The experiment tasks were divided into three phases: the production test, the perception test, and the interview. At the same time, these three phases were divided into steps. Instruments were tests, questionnaires, stimulated recalls, and a one-to-one interview. In the data analysis, the quantitative part about participants' perception and production using the SPSS package was analyzed. After this, the interview, the questionnaires, and the stimulated recalls for the qualitative part were interpreted. Results of this study showed that participants had a poor performance when the voiceless interdental fricative was at the final position of a word (e.g. birth). Moreover, the participants' L2 production was significantly correlated with perception but the L2 learners produced better than they perceived it.

This overview of previous studies allows us to have a whole picture of what has been done so far regarding phonetic instruction and its effects. Some studies were carried out more than ten years ago; however, the important fact is that those studies set the basis for perception and perception instruction. Almost all studies were similar in terms of carrying out experiments that involved perception instructions and some relation in terms of production. Furthermore, results of these instructions showed considerable improvement in the experimental groups.

Most of these studies, including perception and production, have been conducted in countries such as Canada, Japan, China, Italy, Spain and the United States, with subjects who were learning English as a second language and English as a foreign language. Only two studies were conducted in Mexico (Amieva, 2009; Ramirez, 2012). Not only consonants such as /r/ /p/, /s/, /b/, /l/, /t/ were part of the studies, but vowels were included as well. In general, these investigations carried out in lab settings were framed by models such as the Perceptual Assimilation model, the Speech Learning model, the Perceptual Learning model, the High Variability Phonetic Instruction, the Hebbian learning, and the Motor theory, most of them included a treatment or instruction. The results in general were positive since there was a significant improvement not only in the perception but also the production of the target phonemes.

In summary, the fact that most of the studies were in different contexts, with different learners (second learners), and different focus - vowels and consonants such as stops - gives more

relevance to the present study. With regard to fricative consonants, research in Mexico needs to be done since the only two studies found so far were about vowels and other consonants. *“Effects of a fricative perception and production instruction program on adult EFL learners”* will be one of the first studies in Mexico that will contribute to research of fricative consonants.

It is important to mention that the present study and the previous studies as well, took place in a lab setting. However, the techniques and activities, implemented in the instruction, could also be applied in classroom settings; this is, a instruction could be provided in laboratory or classroom settings.

CHAPTER II. THEORETICAL FRAMEWORK

This chapter discusses the most relevant theories (active and passive), models, and hypotheses about speech perception, speech production (techniques and strategies), and second language acquisition. The present study will focus on the Motor Theory of Speech perception, the Phonological Filter hypothesis, the Critical Period Hypothesis, Contrastive Analysis Hypothesis, and Corrective Feedback.

2.1 Speech perception

Speech perception and speech production are some of the most important aspects in language acquisition and language learning. This becomes even more relevant when a person is learning a second language since their perception and production can be affected by a number of different factors such as the time of exposure to the target language and their learning can turn out imperfect. Brown (2010), for example, states that second language acquisition has to do with cognitive variations, interference, and the creation of new linguistic systems.

Harrington (2002) states that a cognitive theory of second language acquisition describes the psychological mechanisms that have to do with comprehension and production and the means by which those competences develop in the mind of the learner. These cognitive processes, theories, models, and approaches frame the present study. Current studies on speech perception and production provide evidence about the effectiveness of cognitive theoretical basis when instruction learners in the perception and production of second or foreign languages (Flege, Frieda, Sloane, & Walley, 1999; Flege, MacKay, & Meador, 1999; Feiz, McCandliss, & McClelland, 2002; Flege, 2003).

A speech perception theory has to do with acoustic signals and linguistic elements such as phonemes and distinctive features (Diehl, Lotto, and Holt, 2004). In addition, according to Hanavan

(2008), speech perception is characterized by the order of phonemes; they determine how the word will be perceived or recognized (serial order issue). Also, the muscle movement for each sound affects speech production and that can vary. Yet understanding of sounds occurs (degrees of freedom). In addition, speech perception may be affected by the context in which a sound is made; all can have significant implication on meaning (context sensitivity problem).

In speech perception, there are processing approaches involved in auditory information. The following paragraphs provide more information about these approaches.

2.1.1. Bottom-up vs. Top-down processing

Hanavan (2008) states that, on one hand, in the bottom-up processing, listeners receive auditory information, convert it into a neural signal, and process the phonetic feature information. In other words, this type of processing works in the absence of previous or stored knowledge of listeners. On the other hand, in the top-down processing, listeners use stored information of language and the world to make sense of the speech. It works with the knowledge that the listeners have about language, context and experience.

2.1.2 Active and passive processes of speech perception

These two processes refer to the degree to which a sequence of neural responses is possible on processing outcomes (Heald & Nusbaum, 2014). In the passive process a stimulus presented to sensory receptors is transformed through a series of processes into a sequence of pattern representations until a final perceptual representation is the result. The active process is variable and the processing is adjusted by an error correcting mechanism or feedback loop. This feedback loop provides information to provide or correct processing in real time (Heald & Nusbaum, 2014). The following section provides information of active theories of speech perception.

2.1.3 Active Theories of Speech Perception

According to Mannell (2008), active theories of speech perception suggest that there is no direct relationship between the acoustic signal and the perceived but rather that some higher-level mediation is involved in which the input pattern is compared with an internally generated pattern.

2.1.3.1 The Motor Theory of Speech Perception

In the early 1950's, Liberman, Cooper, Delattre, and other researchers pioneered studies related to speech perception (Diehl, Holt, & Lotto, 2004). The main premise of this Motor Theory is that speech is perceived in terms of the place and manner of articulation rather than acoustics. According to this theory, the listener refers to the incoming signal back to the articulatory instructions that the listener would give to the articulators in order to produce the same sequence (Mannell, 2008). This theory argues that the level of motor commands is analogous to the perceptual process of phoneme perception and that a large part of both the descending process (top-down) and ascending (bottom-up), (Mannell, 2008; Diehl, Holt, & Lotto, 2004). Moreover, the main hypothesis of this theory is that the articulatory events recovered by human listeners are neuromotor commands to the articulators such as the tongue, vocal folds, or the lips (Liberman & Mattingly, 1985; Liberman et al., 1967 as cited in Diehl, Holt, & Lotto, 2004).

This Motor Theory of speech perception suggests that there is a special speech code or set of rules which is specific to speech and which bridges the gap between the acoustic data and the highly abstract high linguistic levels. The advantage of this special speech code is that there is not the need for a vast storage of templates since the input signal is converted into a linguistic entity using those codes or rules. These rules achieve their task by a drastic restructuring of the input signal (Mannell, 2008). The acoustic signal does not in itself contain phonemes that can be extracted from the speech signal; instead, it contains features that can be used in conjunction with the rules to recover the phoneme that last existed as a phonemic entity at some point in the neuromuscular events which led to its articulations.

m2.1.3.2 Analysis-by-Synthesis Model

Stevens and Halle, (1967) postulated the analysis-by-synthesis model. It states that the incoming acoustic signal is subjected to an initial analysis at the periphery of the auditory system. Then, that information is passed upward to a master control unit and it is processed there along with certain contextual constraints derived from preceding segments. This produces a hypothesized abstract representation: a set of generative rules. This is used to generate motor commands, but during speech perception, articulation is inhibited and the commands produce a hypothetical auditory pattern, which is then passed to comparator module. If a mismatch occurs, the procedure is repeated until a suitable match is found (Mannell, 2008).

2.1.4 Passive Theories of Speech Perception

According to Mannell (2008), these theories propose that there is some relationship between the acoustic signal and the perceived phoneme; that is, perceptual constancy is matched to a real acoustic constancy. In addition, these theories concentrate on discovering the identity of constant perceptual cues and the forms in which the auditory system may extract them from an acoustic signal. In general, passive theories of speech perception do not involve the mediation of higher cognitive processes in the extraction of these cues. Some passive theories of speech perception are: Distinctive Feature Theory, The Acoustic Theory, Selfridge's Pandemonium Model, Uttley, and Abbs & Sussman (see Morton & Tatham, 2011).

Due to positive results in terms of speech perception and production that some studies provided (Babel and Johnson, 2007; Evans and Iverson, 2007 & Reza, 2011), the Motor Theory of Speech Perception and the bottom-up approach are two important aspects which will be considered in the present study.

In addition to this theory and approach of speech perception, there are some hypotheses with regard to factors that may affect the speech perception in L2 acquisition, such as the

phonological filter hypothesis, the critical period hypothesis, and the contrastive analysis hypothesis, which are described next.

2.2 *The Phonological Filter Hypothesis*

An important mechanism that has been identified as a factor affecting the neurological process of speech perception and, hence production, is known as the phonological filter. This refers to “*anything that can selectively permit some things to pass through and block other things*” (Macquarie University, 2008). Trubetzkoy (1969, as cited in Escudero, 2005) proposed that the inadequate production of L2 sounds had a perceptual basis because he considered that the L1 system performed as a phonological filter through which L2 sounds are perceived and classified. In addition, Trubetzkoy (1939; 1975, as cited in Boomershine, Hall, Hume, and Johnson, 2005) proposed three speculations:

1. L1 experience has some influence on the ability to perceive speech sounds.
2. The phonological relation holding between sounds in a language has some impact on a listener’s perception of those sounds.
3. That it is not just the presence versus the absence of phonological contrast that is relevant in perceiving a sound.

Regarding these three speculations, Trubetzkoy refers to different categories of contrast and suggests that each one of them might have a consequence for speech perception.

The present study predicts that *there is a relation between perception and production results: the better the perception, the better the production*. Considering the Phonological Filter hypothesis, if subjects do not show gains in perception, it is likely that some aspects of their L1 system is, in some way, blocking the input of the L2; however, what if subjects do not show gains in perception but they do show progress in production? Regarding this, it is suggested that the nature of the relationship between speech perception and speech production is not clear (Michaud, 2010; Acheson, Franken, Hagoort, & McQueen, 2015).

In terms of the L1 experience having some influence on the ability to perceive speech sounds, subjects of the present study are more exposed to Spanish since they are learners of English

as a foreign language so, their exposure to English is limited. Therefore, it is likely that they may face difficulties in perceiving the target English consonant sounds.

2.2.1 Analysis of the Phonological Filter and its implications in the present study

A phonological system could be divided into three categories: phonemes, allophonic rules, and phonotactic rules. Ladefoged (2011) defines phoneme as the smallest distinctive sound in a language. According to Hong & Abe (2005), consonants that exist in English but not Spanish might be more difficult for Spanish speakers to learn because of the lack of acoustic phonetic knowledge in their inventory that can provide a good transfer.

For example, there are not good counterparts in Spanish for these English consonants: /v/, /z/, /ʃ/, /h/, and /dʒ/. Even though Spanish does not have the /ʃ/, learners from the Yucatan Peninsula have this phoneme in their phonological inventory since there is great influence from the Mayan language, which does have /ʃ/. Examples of this phoneme in Maya are: *óox* (three), *mulix* (curly hair), *xiiik'* (armpit). However, the influence of this Mayan phoneme /ʃ/ might have some cross-linguistic influence on these learners when trying to communicate in English since they perceive and produce /ʃ/ instead of a /z/.

Boomershine, Currie, Hume, & Johnson (2005) conducted four experiments where Spanish speakers and English listeners were asked to rate the similarities they perceived of pairs of non-identical stimuli: [d] / [r], [d] / [ð], and [r] / [ð]. Results of the four experiments showed a similar pattern: native speakers of a language found more perceptually distinct allophonic contrastive pairs of sounds of another language. For example, in Boomershine, Currie, Hume, & Johnson's study, Spanish speakers found [d] / [r] (this pair of sounds is phonemically contrastive in Spanish but allophonic in English) more perceptually distinct than English speakers did.

The present study takes these results into consideration and will examine four consonant sounds: /v/ (phoneme in both languages), /z/ (phoneme in English, allophone in Spanish), /ð/ (phoneme in English, allophone in Spanish), and /θ/ (phoneme in English, non-existent in Latin American Spanish). It is possible that subjects find it difficult to perceive /ð/ and /z/ because they are allophones in their mother tongue and phonemes in English.

Other theories and hypotheses about speech production in second language acquisition are related to the role of the L1 or other languages, which are discussed next.

2.3 The Critical Period Hypothesis (CPH)

Lenneberg (1969) states, that the development of language depends on the motor skills of the articulating organs and age is one factor in the language acquisition process, since there is a certain point, before puberty, where it becomes difficult. This means that children have that innate ability to acquire not only their first language but also a second or more languages. In the case of young adults or adults, the second language learning process must be undertaken in an academic and conscious way and due to this, the overcoming of the accent and some interference of the mother tongue become difficult (Lenneberg, 1969).

In general, those who acquire languages before puberty, the critical period, will have a better opportunity of native like or near-native like abilities compared to the ones who learn languages after the critical period.

Lenneberg (1967, as cited in Kirkman, 2010) also claimed there is a mechanism that is neurological in nature and it is responsible for maturational change in learning abilities. In addition, when the brain reaches its adult values in the stage of puberty, it loses its plasticity, its abilities and skills for acquiring languages.

In the case of the subjects from the present study, they are not in this critical period since they are young adults. Perceiving and producing the target language becomes a difficult task and they are not going to acquire it as their first language. In addition, learning English as a foreign language limits their possibilities of exposure to the target language. Therefore, the purpose of the present study is to train them, in an academic and conscious way, so that they can perceive and produce the four target sounds, perhaps not in a native-like way, but in an accurate and intelligible manner.

This thesis challenges the Critical Period hypothesis as the instruction was aimed at learners who are enrolled in an English Language Teaching Bachelor's program and have learned English after puberty; therefore, it is important to highlight that this instruction had the objective to assess

and analyze the future English teachers' ability to develop a native-like pronunciation in foreign language context.

2.4 Contrastive Analysis Hypothesis (CAH)

Lado (1957) defined the term Contrastive Analysis Hypothesis (CAH). The most important claim is that patterns that would cause difficulties in learning and patterns that would not cause difficulties could be predicted and could be described by comparing the mother tongue and the target language(s) of learners (Joze, 2015). Johansson (2008) defines CAH as the comparison of two or more languages and its main objective is to identify their similarities and differences. The present study used CA as a technique in order to foresee the possible problems that learners might face during the instruction.

Learner's mother tongue plays an important role in the acquisition of one or more languages. Due to this, it is important to provide or make them notice the differences and similarities from both languages so that they can avoid bad transfer from their L1, and with this, have a native-like or near native-like command of the target language.

The next section is an analysis which will help to understand the possible problems that learners might have when realizing the similarities and difference among the L1 (Spanish) and the L2 (English).

2.4.1 Contrastive Analysis: problems anticipated in the present study

In order to foresee the possible problems that participants may have regarding their L2 production, phonological inventories of English and Spanish and an analysis about both systems will be presented. Having a clear knowledge of both systems will help to understand the possible cross-

linguistic influence of learners. Table 1 shows the Latin American Spanish phonemes, according to the manner and place of articulation.

Table 1: Spanish Phonemic Inventory.

	Bilabial	Labiodental	Dental	Alveolar	Post-alveolar	Palatal	Velar	Glottal
Plosive	p b		t d				k g	
Nasal	m			n		ɲ		
Trill				r				
Tap or flap				ɾ				
Fricative		f		s			x	
Affricate					ʃ			
Glides (approximant)	w					j		
Liquids (lateral approximant)				l				

Source: Goldstein, B. (2000).

The manner and places of articulation of the English inventory are depicted in table 2 in order to make a comparison with the Spanish inventory.

Table 2: English Phonemic Inventory

	Bilabial	Labio-dental	Dental	Alveolar	Palato-alveolar	Palatal	Velar	Glottal
Nasal	m			n				
Stop	p b			t d			k g	ʔ
Fricative		f v	θ ð	s z	ʃ ʒ			h
Affricate								
Central (approximant)	w			r		j		

Lateral (approximant)								
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Source: Ladefoged, P. & Johnson, K. (2011).

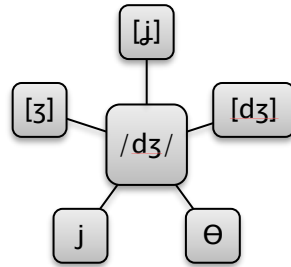
The Spanish inventory has 18 consonants while the English one has 22. In terms of the fricative consonant sounds, the Spanish inventory has three and the English 18.

Comparing the /d/ phoneme and its allophones in Spanish and the /ð/ phoneme in English becomes essential since this might lead to the understanding of some possible errors that participants may face.

In Spanish, the /d/ phoneme has two allophones: [d] *stop* as in “anda” /ánda/ [ánda] and [ð] *approximant*, “dedo” /dédo/ [déðo]. In English, /d/ and /ð/ are two different phonemes where the /d/ phoneme has two allophones: [d] as in *dough* /do/ [dou] and [r] as in *lady* /ledi/ [leɪri]. This comparison provides the idea that Spanish speakers may show positive transfer on the production of the English phoneme /ð/ since the same context exists in their L1. Some examples are father /'faðər/ or mother /'mʌðər/.

In the case of /ʒ/, it is non-existent in Latin American Spanish as a phoneme, but it may be found as an allophone of /dʒ/. The /dʒ/ phoneme has the following variations:

Figure 1: Variations of the /dʒ/ phoneme.



Source: own authorship

Speakers from some regions such as Argentina and Paraguay produce the alveolar fricative voiced consonant /ʒ/ as a phoneme in words such as *llegó, yo or ella* (Zarza, Garrigosa, De la Torre, & Stijnen, 2001).

In many parts of the Peninsula of Yucatan there are plenty of Maya speakers. Due to this, even if a person who lives in this region does not speak Maya, he or she has some contact with the language. The Mayan phonological inventory includes the alveolar fricative voiceless /ʃ/ which is the voiceless counterpart of /ʒ/ in English. Some Maya words containing this phoneme are *xik* /ʃIk/ (armpit) and *mulix* /mʊlɪʃ/ (a person with curly hair). As such, it is common for learners, from this region, to perceive and produce /ʃ/ instead of /ʒ/ when learning English as a foreign language because of the influence of the Maya language.

Regarding the /v/ phoneme, it is also non-existent in terms of production in Latin American Spanish but it exists orthographically. For example, *verbo, vena, or carnívoro*.

Finally, Latin American Spanish lacks the interdental fricative voiceless consonant /θ/ and neither is it found as an allophone. However, it does exist in Spain as a phoneme although it does not have the same orthographic contexts as in English. For example, in English: teeth, thirty or something; in Spanish, from Spain, *corazón*, *cielo* or *canción*.

The fact that there are phonemes and allophones plus the difficulty of noticing the differences between these two concepts might affect subjects' performance in the present study:

1) The influence of subjects' L1, regarding their phonological inventory, might filter the new input of both perception and production,

2) If subjects do not develop enough awareness about the difference between phonemes and allophones of both languages, English and Spanish, it is likely that they do not perceive nor produce the target consonant sounds accurately. Therefore, instruction learners to realize that these phenomena exist and may affect their perception and production of the target language would help them to be conscious and work on their own performances and therefore, they might have beneficial progress in their learning.

When learners develop some consciousness about the similarities and differences of their own language system and the new language system, other phenomena such as interference, interlanguage, and cross-linguistic influence will emerge.

2.4.2 Interference

Dulay, Burt, and Krashen (1982) define the term interference in two ways: first, from a psychological perspective, there is influence from old habits when new ones are learned. Second, from a sociolinguistic perspective, language interactions occur when the two languages are in contact. Some examples are fossilization, borrowing, and codeswitching. Contemporary scholars of transfer such as Jarvis & Pavlenko (2008) (as cited in Hassan, 2014) classified transfer into two categories: linguistic transfer and conceptual transfer.

Generally, interference is described as the term in which any influence from the L1 that might have an effect on the acquisition of the L2. In addition, the term interference was also known as transfer and it was classified as positive and negative. Positive transfer has to do with the concordance that exists between the first and second language. Negative transfer deals with some kind of dissonance between the L1 and L2 leading to a more difficult process of learning the target language.

In this study, subjects might show negative transfer when producing the phonemes /v/, /θ/, and /ʒ/ because in Spanish /v/ only exists orthographically and it is pronounced as the voiced bilabial stop consonant /b/. /θ/ is non-existent in Latin American Spanish so it is likely that subjects

produce a /t/ because of the theta grapheme “th”. Finally, the third one /ʒ/, is also found as an allophone in Spanish but subjects are not aware of this.

2.4.3 Interlanguage

The first one who described this phenomenon was Corder (1967) but Selinker (1972) was the person who proposed the term interlanguage. Corder (1967) conceptualized interlanguage as transitional competence while Nemser referred to it as approximative system. Language learning became a process, which involved the construction of an interlanguage.

Tarone (2006) explains that interlanguage is perceived as a separate linguistic system, which is different from the learner’s L1 and the L2; however, it is linked to both, the L1 and L2 by interlingual identifications in the perception of the learner. Moreover, one main characteristic of the interlanguage is that it fossilizes, this is, the process in which learner’s interlanguage stops developing and it might be permanent.

2.4.4 Cross Linguistic Influence (CLI)

In 1983, Corder proposed the term *Mother Tongue Influence* since he thought there was a need for a word other than transfer. In 1986, Sharwood Smith refined Corder’s idea by suggesting *Cross Linguistic Influence*, which refers to the potential influence of L3 on L2, where another language, but not the L1, might have an effect on the learning of the L2. Cenoz (2003) defines cross-linguistic influence as *the identification of specific conditions that can explain the use of one or more languages when speaking in the L3 and its implications for the organization of the multilingual lexicon (p.1)*.

In this study, the main concern of cross-linguistic influence is the perception and production of /ʃ/ instead of /ʒ/ because the /ʃ/ phoneme comes from a different language than the subjects’ mother tongue. These subjects have Spanish as their L1 but they were also exposed to some words

or phrases in Mayan before learning English, so Mayan could be their L2 and English, their L3. Regarding this, it is important to train subjects to perceive and produce the four target consonant sounds since they have to be aware of the beneficial aspects of perceiving and producing the target sounds accurately; they are going to be English language teachers so they need to have a solid command of the target language.

One way of helping learners notice their errors is by telling them their errors so that they can be aware of them and prevent them in future performances. This way of helping them is by using some strategies that have to do with corrective feedback. This topic will be covered in the next section.

2.5 Corrective Feedback (CF)¹

Providing a speech perception and production instruction is not exclusively focused on how to perceive and speak accurately. A instruction involves a process, which includes techniques, theories, methods, hypotheses, approaches, and strategies that lead to successful results.

Chaudron (1977) (as cited in Sheen, 2011) defined corrective feedback (CF) as “any reaction of the teacher which clearly transforms disapprovingly refers to, or demands improvement of the learner utterance” (p. 1). Learners can be corrected in two ways: written and oral. Since the present study has to do with perception and production accuracy, oral corrective feedback was provided to participants and this description of CF will be focused on this aspect only.

Doughty (2001) (cited in Sheen, 2011) states that it is important to correct the learner when he is paying attention to the feedback that the teacher is providing. This is what the author calls a “window of opportunity”. The important point here is, teachers should provide immediate feedback so that the learners can be aware of their mistakes or errors and then, correct themselves.

According to Sheen (2011), the following is a classification of CF strategies:

Implicit CF strategies

1. Recast

¹ Examples are own authorship.

A recast has to do with a reformulation of the learner's response, which corrects all or part of his response.

Example:

S: How old you are? I have 20 years.

T: How old are you? I am 20 years old.

2. Clarification request

This refers to a question by teacher (excuse me? or Sorry?) to signal that something is not correct with the learners' response.

Example:

S: She sing beautifully.

T: Excuse me?

3. Repetition

Repetition has to do with saying what the learner answered but with emphasis on the incorrect part.

Example:

S: I don't do my homework yesterday.

T: I DON'T do my homework yesterday?

4. Elicitation

Elicitation refers to a repetition of the learner's answer until the part he has the error.

Example:

S: Where does you live?

T: Where...

Explicit CF strategies

1. Explicit correction

Explicit correction involves a clear signal to the learner that he has made an error and the teacher provides the correct answer. The teacher can also say phrases such as “no”, “you should say ...” or “we say A not B”.

Example:

S: I doesn't like chocolate.

T: No, we say I don't like chocolate.

2. Explicit correction with metalinguistic explanation

This has to do with telling the learner the correct answer and also a metalinguistic explanation on the form.

Example:

S: I doesn't like chocolate.

T: No, we say I don't like chocolate. We use “doesn't” when we refer to the third person in the simple present tense.

3. Metalinguistic clue

Metalinguistic clue has to do with giving the learner a metalinguistic explanation so that he/she can correct the error.

Example:

S: My dad get up at 6 a.m.

T: You need an “s” in the verb.

4. Paralinguistic signal

The teacher uses a gesture or facial expression to indicate that the learner has made an error.

Example:

S: Yesterday I eat a piece of cake.

T: (gesture indicating that the verb should be in past tense)

Corrective feedback strategies play an important role in this instruction since they can help learners to notice aspects of their performance that are not correct. In this study, four CF strategies (two implicit and two explicit) were implemented: implicit techniques (recast and clarification request) & explicit techniques (paralinguistic signal and explicit correction). Regarding this, most studies (Carroll and Swain, 1993; Nagata, 1993; Lyster & Ranta, 1997; Carroll, 2000; Panova & Lyster, 2002) suggest that explicit CF strategies have proved to be more effective in second language acquisition since they are the ones that lead to self-repair in learners. These implicit and explicit techniques were used in the instruction when participants had an error and also, general feedback of their performance was provided at the end of each session. The expectation was that students could develop some kind of awareness about their mistakes and with this, improve their production performance.

It is important to notice that although this instruction took place in a lab setting, these corrective feedback techniques can also be used in classroom settings. The following table introduces the four CF strategies that were implemented in the instruction:

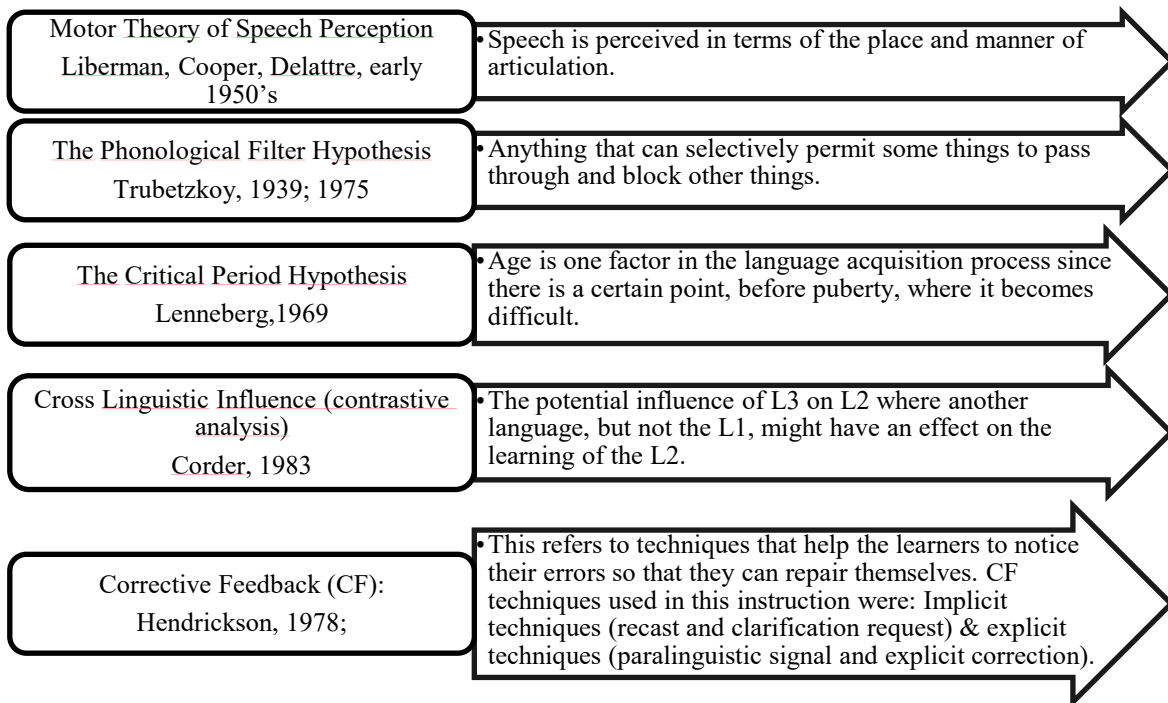
Table 3. Types of corrective feedback in the present study.

Implicit	Explicit
<p>Recast: The corrector incorporates the content words of the immediately preceding incorrect utterance, and changes and corrects the utterance in some way. Example : <i>S: I went there two times.</i> <i>T: You've been. You've been there twice as a group?</i></p>	<p>Paralinguistic signal: The corrector uses a gesture or facial expression to indicate that the learner has made an error. Example: <i>S: Yesterday I go cinema.</i> <i>T: (gestures with right forefinger over left shoulder to indicate past)</i></p>
<p>Clarification request: The corrector indicates that he/she has not understood what the learner said. Example: <i>S: What do you spend with your wife?</i> <i>T: What?</i></p>	<p>Explicit correction: the corrector indicates that there is an error, then he identifies the error, and he provides the correct form. Example: <i>S: My birthday is on 5th May.</i> <i>T: Not on 5th May, my birthday is on May 5th</i></p>

Source: *Teachers' Perceptions About Oral Corrective Feedback and Their Practice in EFL Classrooms*, Hernández and Reyes (2012). *Corrective Feedback and Teacher Development*, Ellis (2009).

Theories, models, and hypotheses in the field of speech perception, speech production, and second language acquisition are many but the present study focuses on the following theories, hypotheses, techniques, and strategies, since these could provide positive progress or results in an EFL context:

Figure 2: Theories, hypotheses, techniques and models of the present study.



Source: own authorship

CHAPTER III: METHOD

The present study was carried out following a quantitative longitudinal approach by means of a quasi-experimental design. Trochim (2006) defines a quasi-experimental design as one that is similar to an experimental design but it lacks the random assignment. Table 4 describes some characteristics of the quasi-experimental design.

Table 4: Characteristics of the quasi-experimental design.

Objectives	Analysis of the impact of instructions and processes of intra and inter-individual changes.
Inferred effects	High risks in having differences in the cross-sectional design.
External factors	Limited control
Selection of participants	Biased
Emphasized validity	Internal validity

Source: Bono (2009).

According to Hernández, Collado, & Baptista (2010), a longitudinal study is an observable research approach in which data is gathered through certain time periods repeatedly. This is a quantitative longitudinal study because a perception and production instruction was provided and during this instruction, the subjects were observed and tested during different time periods.

When conducting research, validity becomes a very important concept that is defined by Trochim (2006) as the degree to which inferences can legitimately be made from the operationalization in a study to the theoretical constructs on which those operationalizations were based. According to Bono (2009), internal validity in a quasi-experimental or experimental research has to do with the consistent results about the effectiveness of a instruction or treatment and external validity refers to the scope and extent of the results of the treatment.

In order to validate this quasi-experimental study, besides the experimental group, there was a control group; this way, only the former received the treatment, but both were assessed considering the target sounds. In addition, since the present research is a longitudinal study, there were five assessment tests (a diagnostic test before the instruction, two during the instruction- the first one testing /v/ and /ʒ/ and the second one /θ/ and /ð/-, and two after the instruction). These tests were used to measure and compare the effects of the treatment in different time periods, measuring intra and inter groups. According to Bono (2009), this strategy is called repeated measures. Moreover, this repeated measure strategy helped to analyze the data considering the time variable.

The following paragraphs provide details about the contextual framework, the subjects' characteristics, assessment materials, the instruments and procedures that were used in the instruction, the instruction, and how the results were analyzed and interpreted.

3.1 Contextual framework

According to the official web page of the Universidad de Quintana Roo, this university offers bachelor's, master's, and doctoral programs at its four campuses Chetumal, Cozumel, Playa del Carmen, and recently, Cancún. The Chetumal Campus offers seventeen bachelor's programs, seven master's programs, and one doctoral program.

For the purpose of this study, students from the fifth semester of the English Language Teaching bachelor's program were chosen. This program trains students to become English as Foreign Language teachers and, unlike students of other programs, learners from the English Language Teaching program are expected to be concerned about the accurate perception and production of sounds.

According to the curriculum of the English Language Teaching Bachelor's program (2007), the credits for this major generally can be fulfilled in ten semesters. Students are required to take eight courses of English (from English I to English VIII). In these courses, students develop four abilities: listening, speaking, reading, and writing. In terms of pronunciation, some professors include it in their teaching, but it is not compulsory (empirical evidence). The program offers only

one Phonology and Phonetics course in the seventh semester, which focuses on the study of the production of speech sounds and the analysis of sound patterns according to phonological processes; however, one course seems not to be enough for students to develop a proficient perception and production of the target language.

The Certificate in Advanced English (CAE), C1, according to the Common European Framework of Reference for Languages, is a graduation requirement for students enrolled in this BA program

At the end of the English Language Teaching Bachelor's program (2007), students will:

- Design and analyze English Language courses syllabi based on their specific objectives and needs.
- Design, implement, and/or improve, in a creative and flexible way, methods that adapt to the needs of each course.
- Facilitate the process of learning and teaching through appropriate methodologies and techniques.
- Analyze and design appropriate course materials according to the particular needs of the course.
- Do some education, methodological, and linguistic research in order to improve the teaching practice.
- Design and/or adapt instruments for the evaluation of objectives and needs of each course.

3.2 Subjects

Ten native Spanish speakers at the intermediate English level enrolled in the English Language Teaching Bachelor's program at the Universidad de Quintana Roo, (Chetumal campus) participated in the present study (five subjects in the control group and five in the experimental one). This study used a convenience sampling approach as per Dörnyei (2007) which states "*members of the target population are selected for the purpose of the study if they meet certain criteria*" (pp. 98-99). It was not possible to have a random sampling due to the space limitations (a laboratory). Because of this, dependent variables could not be controlled randomly, in the teaching situation.

In order to collect the sample, a diagnostic test, containing the four English fricatives, was provided to a group of approximately thirty students, from fifth semester of the English Language Bachelor's program (intermediate level of English). Based on the results of this diagnostic test, ten students with the lowest grades were invited to participate in the instruction.

It was decided to work with these ten subjects because of their necessity to develop a solid perception and production of the target sounds, even though only five of them received the instruction. Next, students were sorted in two groups: the experimental and the control group. There was a random draw to select the five members that consisted of the experimental group. Their ages ranged from 20 to 26 years. However, gender and age were not considered as variables in the present study since there are not significant differences among the ages of these learners. Subjects were informed by means of a consent letter of the main objective of the instruction, which is to analyze the effects of a perception and production treatment of four English fricatives and its procedure.

Students from both groups were taking the English IV course and other courses such as Psycholinguistics, English Grammar I, and Philosophy of Education (all instructed in English). The total amount of exposure to English -in the classroom- was about twenty hours per week. Although these students have not taken the Phonology and Phonetics course yet, they have probably received some pronunciation instruction in their English courses in an implicit way.

Subjects in the control and experimental groups may show some gains in the middle test, posttest or delayed test, and this might occur because of their learning and interlanguage development, taking place by means of the other courses or their own exposure to the target language. On the other hand, subjects in both groups might face phases of uncertainty -about what they have learned- or because of interlanguage development. According to Manguiera Lima Júnior (2013), interlanguage development “*tends to be gradual and, at times, has abrupt changes which show the (re)structuring attempts of the system through self-organization and/or attractors (p.7),*” and as such, they might show no significant progress in their middle test and/or posttest. Due to these assumptions, a delayed test was provided in order to give some time to assimilate and accommodate all the input obtained.

3.3 Instruction: Assessment materials and procedures

3.3.1 The diagnostic test

Before the instruction there was a diagnostic test in order to select the sample. This diagnostic test consisted of three sections. The first one included general questions about the background of students, (name, age, mother tongue, personal strategies to improve their English, languages spoken, and years of learning the L2).

The second part was concerned with the perception of the four fricatives (/ʒ/, /ð/, /θ/, /v/) consisting of one section only. In this section, which is about sound discrimination, students heard two words. In some cases, the two words were the same. In other cases, they had a different sound. Students listened to each item twice and they had to choose S (same) column or the D (different) column (see appendix A).

Example:

If you hear *three three* tick the **S** column.

If you hear *three tree* tick the **D** column.

S	D
✓	
	✓

The third section was about production, and this consisted of two types of activities: controlled and free activities. The purpose of having these two types of activities was to notice if participants perform better in the controlled activities than the free activities or vice a versa. In the controlled activity, there was a paragraph with twenty words approximately containing the four target phonemes. Students read it aloud and were recorded in order to analyze their pronunciation. In the free activity, students were asked questions their opinions about... and at the same time, their production was assessed. Both sections took them about 10 minutes to complete.

From the diagnostic test, the experimental and the control groups were made up by means of a random draw. In addition, this diagnostic test served to compare the progress of the participants with the posttest and the delayed posttest.

The production section was evaluated by a specialist of phonology and phonetics and by myself, who provided the instruction. The controlled activity had a total of sixteen words that contained the target sounds (/ʒ/, /ð/, /θ/, /v/). Each accurate pronounced word received one point. In the free activity section five questions were asked. In this case, the answers of the participants had words containing the target consonant sounds. These words were counted and after this, they were analyzed in order to know if they were produced accurately.

3.3.2 First and second middle tests

Each of the following tests took about one hour and a half to complete. The first middle test (WT1) was provided after the fifth session (10 hours of instruction), this was during the third week of the instruction and the second middle test (WT2) was in the sixth week (18 hours of instruction). These tests were evaluated by the instructor with the assistance of a specialist of phonology and phonetics.

The first middle test had the purpose of measuring the subjects' perception and production of the first two phonemes (/v/ and /ʒ/). The first part of this middle test was the perception section containing discrimination tasks (AX same-different). Subjects heard pairs of words or sentences and they had to choose if they were the same or different. Then, the dictation part was presented so they listened to sentences or short paragraphs and they had to write what they perceived. The second part corresponds to the production section, which was divided into controlled and free tasks. In the controlled tasks, subjects were given paragraphs so that they could read them aloud and be recorded by the instructor. In the free tasks, subjects were given topics and questions in order to express their opinions about them.

The purpose of having these two types of activities is to provide a distinction in terms of the high level of awareness that subjects have in the controlled ones compared with the free tasks. This is, students may respond better to the controlled activities since they are conscious about the accurate pronunciation of the target sounds.

It is important to mention that in this production section, the instructor received one student at a time in order to gather his answers; so, students were recorded individually. The second middle test had the same procedure as the first one. The only aspect that differed was the assessment of the two phonemes /θ/ and /ð/.

3.3.3 Post-test

The posttest was the same as the diagnostic/pretest, previously described, because it served to measure the subjects' performance before and after the instruction. This posttest assessed the four target phonemes. Based on these results, it was possible to assess the effects that the instruction produced on the subjects' perception and production of the four fricatives. This test was provided after the twelfth session (20 hours of treatment), and it was evaluated by the instructor and the assistance of a specialist of phonology and phonetics.

3.3.4 Delayed post-test

In the delayed posttest, there was a perception and production section as well as the previous tests. This delayed test had the same methodology and tasks as the middle tests and posttest. This test was intended to give participants some time to process the knowledge that they learned during the instruction. Subjects took this test one month after the treatment and it was evaluated by the instructor and the assistance of an expert.

In order to validate these assessment materials, they were piloted five months prior to the testing. The piloting of these tests was carried out with groups from sixth and eighth semester of the English Language Teaching Bachelor's program. During the piloting, students were asked to write comments about the tests (if instructions and tasks were clear or if the tracks were understandable). Moreover, three English language teachers of the Universidad de Quintana Roo, Chetumal Campus assessed the content of these five tests in order to validate them. During the

piloting, students were asked to express their doubts or comments about the activities, instructions, and recordings of the tests. All comments were written down in order to redo the tests if necessary.

3.4 Piloting of the assessment materials

To validate the assessment materials (five tests), a linguist was required to review them. The piloting of these tests was carried out with groups of the English Language Bachelor's program: two groups in their third year and two groups in their fifth. During the piloting, students undertook the tests and they were asked to express all their concerns and comments (if instructions and tasks were clear or if the tracks were understandable).

The changes that were made in the tests were: First, an audio in the second section of the perception part (diagnostic test) was recorded again since participants found the activity difficult because the recording was poor. Second, a question in the general information part was reformulated because it was not clear (diagnostic test). Third, more time between sentences was given because participants did not have enough time to write their answers (diagnostic, second and delayed tests). Fourth, the instructions of the second section in the perception part needed correction because there was a typing error (second middle test). Finally, an activity of the second section in the production part was corrected since participants did not produce any of the target sounds (first middle test). In order to obtain the results of the tests, two codifiers assessed them.

3.5 Instruction: Instruments and procedures

This section describes the instruction materials for perception and for production.

3.5.1 Perception materials

During the instruction, subjects were provided with a variety of activities to help them improve the perception of four English fricatives. The following is a list of the exercises provided in the instruction:

3.5.1.1 Listening practice (discrimination tasks)

Discrimination tasks refer to those that measure the subjects' ability to differentiate one token from another (McGuire, 2010). Discrimination tasks contain a variety of different tasks, ABX, 2I2AFC, AX, 4IAX, 4IA2FC (Gerrits and Schouten, 2004). This study implemented only the AX (same-different) task. In this, subjects listened to pairs of stimuli and they had to choose if each pair was similar or different. These activities have the purpose of stimulating the subjects' perception of the target sounds (/z/, /ð/, /θ/, /v/).

3.5.1.2 Dictation

In this task, subjects listened to some recordings which contained the target sounds and they had to write what they heard, paying special attention to the four target fricatives. Recordings of native English speakers were provided as well as dictation tasks produced by the instructor.

3.5.1.3 Videos

The exposure to video material with subtitles in English helped subjects improve their speech perception. Also, this helped them to start developing awareness of the relationship between sounds and words. Moreover, subjects watched videos (interviews and songs) of native Spanish speakers speaking English in order to become aware of the accurate or inaccurate pronunciation and to contrast the similarities or differences between English and Spanish.

3.5.2 Production materials

After the perception section, the production part was carried out. The different tasks that subjects performed were:

3.5.2.1 Articulatory awareness

Vidor-Souza, Bolli and Marostega (2011) define articulatory awareness as the ability of reflecting on the articulatory characteristics of phonemes and this contributes to the development and consolidation of the phonemic knowledge. Sammy diagrams, videos of native English speakers producing the target phonemes as well as the articulatory modeling of the trainer and a mirror were used in order to practice this articulation part. First, Sammy diagrams helped subjects visualize the articulator's position before practicing the production of sounds. Then, videos of native English speakers producing the target phonemes and the articulatory modeling of the instructor helped learners see the movements of the articulators so that they could do the same in the production section. Finally, the use of a mirror enabled the learners to compare articulation of the target phonemes with the articulation of the native English speakers.

These exercises aimed at raising the learner's awareness of the importance of articulating the target sounds accurately because eventually, this would lead them to achieve the accurate production of the target language. These activities were framed by the Motor theory.

3.5.2.2 Reading practice (controlled tasks)

Subjects were given worksheets containing paragraphs, which they had to read in order to assess the production of /ʒ/, /ð/, /θ/, /v/. This is a controlled activity since the instructor chose the reading materials so that the subjects could produce the target sounds.

3.5.2.3 Conversation practice (free tasks)

In this section, subjects were given interesting topics so that they could talk, discuss, and share their opinions first with a classmate and then with the rest of the class. In addition, the instructor gave subjects some questions so that they could discuss them and express what they thought of them. After this, they share their answers so the instructor could assess their performance.

Before providing the instruction, the materials were piloted in order to validate them. The materials provided in the instruction were piloted with a group from the sixth semester of the English Language Bachelor's program. In addition, three English Language professors assessed them. This instruction was carried out during two months and it took place at the Laboratory of Linguistics, Universidad de Quintana Roo, Chetumal campus. The two-hour sessions were twice per week in consideration of the days that the students were available, accumulating a total of four hours per week and 20 hours for the whole instruction sessions.

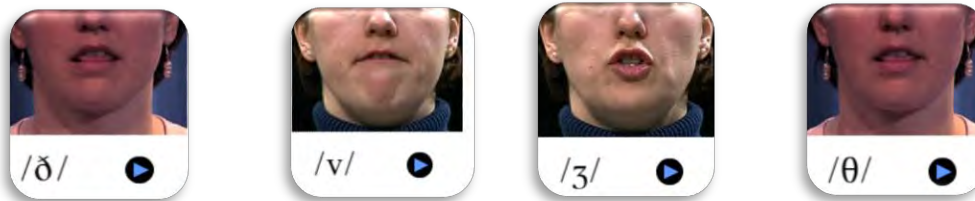
Corrective feedback played an important role in the present study. During and after each of the above mentioned activities, the instructor provided feedback to the participants so that they could realize their errors and try to prevent them in future activities.

3.6 The instruction

3.6.1 A sample session in the instruction

First, the articulation part. In this section, a brief explanation about how the target sound (/v/, for example) is produced was provided to subjects in the experimental group. In addition, a picture of how this sound is produced was presented. After this, a video was projected so that subjects could see the movements of this /v/ sound. Example: According to Yule (2006), the /v/ sound is formed with the upper teeth and the lower lip. This sound has the characteristic of being voiced; this means that when you produce this sound you will feel some vibration if you place your fingers on the front of you throat.

Figure 3. Articulation of /ð/, /v/, /z/, & /θ/.



Source: *Phonetics: The Sound of American English*. The University of Iowa, (2005). Retrieved from <http://soundsofspeech.uiowa.edu/english/english.html>

The second part was the perception practice. In this section, subjects listened to some perception activities in order to identify how the /v/ sound is produced. After this, the perception practice was carried out. Here, subjects listened to words and they had to circle the ones that were produced with the /v/ consonant sound.

The third part consisted of the production practice. Subjects were given some lists of words containing /v/ sounds in different positions (beginning, middle and end of the words). They were given some time in order to practice and check for pronunciation difficulties since after this practice, they were recorded producing those words.

At the end of and during each activity, subjects received oral corrective feedback since it plays an important role for them to realize their perception and production performance. Each participant at a time received feedback. This way, subjects started developing their awareness and the importance of perceiving and producing the target sounds. Techniques for corrective feedback were both explicit and implicit: paralinguistic signal, clarification request, recast, and explicit correction.

Since this instruction is framed by the bottom up approach, subjects started learning and practicing both perception and production from the minimal unit of speech sounds (phonemes) to complex listening comprehension tasks in different contexts (for complete materials, see appendix A).

3.7 Data analysis

Data was analyzed using the Statistical Package for the Social Sciences (SPSS), 23 version. Data of the tests were entered into the computer for analysis. Statistics through T-tests, Repeated measures and Analysis of Variance (ANOVA) were used in order to analyze the results of the tests from the experimental and control groups and to examine if there were significant differences between the two groups and within the experimental group. T-tests have the function of assessing whether the means of two groups are statistically different from each other (Trochim, 2006). In addition, the subjects were assessed in two ways –intra and inter group during three different periods of time.

The objective of using t-tests was to assess if the gains in the instruction group were significantly larger than the control one. Analysis of Variance (ANOVA) is very similar to t-test but in this case, I assessed the significance of the differences in the means of two groups (Dörnyei, 2007).

CHAPTER IV: RESULTS

This chapter presents the results to address the two hypotheses postulated in this thesis:

1. Subjects in the experimental group will show gains in the perception and production of the four English fricatives because of the perception and production instruction.
2. There is a relation between perception and production results: the better the perception, the better the production.

The next paragraphs are a summary of the statistical results of the instruction.

4.1 Summary of statistical results

This section presents the statistical results of the instruction:

- 1) Demographic information and participants' qualities.
- 2) Statistical results of the tests comparing the control and experimental groups.
- 3) Effects of the instruction shown by one-way repeated measures analysis of variance (ANOVA).

Thus, to begin with the demographic information and participant qualities, the population of this study was a group of 26 students from the fifth semester of the English Language Bachelor's program at Universidad de Quintana Roo. A diagnostic test was administered to this group in order to obtain the sample. After grading the diagnostic tests, ten students with the lowest grades were invited to participate in the quasi-experiment. As a result, there were 10 participants, five in each group (experimental and control); the assignation of participants to each group was random. In the former, there were four women and one man. In the latter, three men and two women. The ages of the participants ranged from 20 to 24.

Once the experimental and the control groups were formed, it is important to clarify that the diagnostic test also served as the pre-test where there was a short section with general questions in order to know participants' background. They answered six questions about their language

strategies to learn EFL and previous language experience. It turned out that all participants have Spanish as their mother tongue. Table 5 summarizes subjects' qualities regarding strategies and years of learning English.

Table 5: Subjects' qualities: learning strategies and years of learning English.

Subjects	Strategies						Total	Years of English			Total
	None	Watch movies and series	Sing songs in English	Study at home by himself/herself	Watch movies, series and listen to music	Watch movies and series and read		0-5	6-10	11-15	
Control	1		1	1	2		5	3	1	1	5
Experimental		3				2	5	3	2	0	5

Source: own authorship

As we can observe, participants shared similar results in terms of the strategies they use, mother tongue, age range, and number of years they have learned English. These participants will become English Language teachers and according to their answers, they do not have enough learning strategies because most of them only have a few years learning the target language. This means that subjects were in the same conditions when classifying them into the groups (experimental and control) prior to the instruction. Since participants shared similar results and conditions, there was no need to look for another group in order to carry out the quasi-experiment.

4.2 Diagnostic test (pre-test)

The pre-test assessed the four target phonemes /v/, /ʒ/, /ð/ and /θ/ and it consisted of two sections: one to assess perception and one to assess production. In the perception part, there were discrimination and identification activities. In production, there were controlled and free activities. Table 6 shows the mean results of the perception and production pretest of subjects in both groups.

Table 6: Pretest means of experimental and control groups.

	Experimental	Control	Mean difference Perception	Mean difference production
Perception	5.9	6.5	.5	1.2
Production	3.0	4.2		

Source: own authorship

The results of the pretest indicate that there was a difference in the means between the control group and the experimental one. According to table 4.2, the control group had higher means in both perception (M = 6.5) and production (4.2) accuracy. Even though the control group performed better in both perception and production, the mean difference was not that large (perception = .5) (production = 1.2); therefore, the experimental and control groups were considered homogeneous, and they were acceptable for this instruction.

Next, the results of t-tests analysis will be compared of both the experimental and control groups and related to the hypotheses postulated in this thesis:

Hypothesis 1

Subjects in the experimental group will show gains in the perception and production of the four English fricatives because of the perception and production instruction.

In order to validate this hypothesis, both groups were tested with two midterm tests, a posttest, and a delayed test; the latter was administered one month after the instruction. T-test analyses were conducted on the four tests (WT1 – first midterm, WT2 – second midterm, posttest, and delayed test) in order to compare the means and the standard deviation of the experimental and control groups. All tests assessed perception and production accuracy.

Table 7 shows the results of the WT1 on the perception and production accuracy of subjects in the control and experimental groups.

Table 7: WT1 means of experimental and control groups.

	Experimental	Control	Sig.
Perception	8.3	3.9	P = 0.0
Production	8.0	2.6	P = 0.0

Source: own authorship

The first test during the instruction (WT1) covered two target phonemes: /v/ and /z/. According to table 4.3, experimental subjects had considerably higher means in both perception (M = 8.3) and production (M = 8.0) accuracy than subjects in the control group: perception (M = 3.9), production (M = 2.6). As a result, subjects in the experimental group showed statistically significant results in both perception (P = 0.0) and production (P = 0.0).

The second test during the instruction (WT2) assessed the other two target phonemes /ð/ and /θ/. The mean between both groups in terms of perception was not as different as in the WT1: experimental (M=4.4) and control (M=2.0), but there was important improvement on subjects in the experimental group due to the instruction. Regarding production, the mean of the experimental group (M = 4.5) was higher than the control group mean (M = 2.0); the results were significant (P

= 0.04). Table 8 summarizes the results of the WT2 on the perception and production accuracy of subjects in the control and experimental groups.

Table 8: WT2 means of experimental and control groups.

	Experimental	Control	Sig.
Perception	6.1	4.5	P>0.05
Production	4.4	2.0	P = 0.04

Source: own authorship

Two days after the instruction, there was a posttest that covered the four fricative consonants /v/, /z/, /ð/ and /θ/. The results of this posttest demonstrated that subjects in the experimental group showed some progress in perception accuracy (M = 7.3), but there was no statistically significant improvement. Regarding production, subjects in the experimental group showed high significant results (P = 0.0) and their mean (M=7.0) was higher than the control group's mean (M=2.5). Production accuracy had considerably high positive results (P = 0.0). Table 9 presents the results of the post-test on the perception and production accuracy of subjects in the control and experimental groups.

Table 9: Post-test means of experimental and control groups.

	Experimental	Control	Sig.
Perception	7.3	6.8	P>0.05
Production	7.0	2.5	P = 0.00

Source: own authorship

One month after the instruction, subjects took a delayed test that assessed the four target fricative consonants /v/, /ʒ/, /ð/ and /θ/. In the perception section, the experimental and control groups had similar mean results: experimental (M=6.9), control (M=6.3). Therefore, there was no significant statistical difference between both groups. In terms of production, the experimental group showed significant results, even though the mean between the experimental group and the control group were more similar: experimental (5.6) and control (4.0). Table 10 displays the results of the delayed test on the perception and production accuracy of subjects in the control and experimental groups based on T-test analyses.

Table 10: Delayed post-test means of experimental and control groups.

	Experimental	Control	Sig.
Perception	6.9	6.3	P>0.05
Production	5.6	4.0	P = 0.03

These values are means and P stands for the significant values.
Notice that the effect is null in perception and the effect on production is weak.

Source: own authorship

In order to analyze the effect of time on the perception and production accuracy of subjects in the experimental and control group, a comparison between the means of the tests at the three different times –before, two days after the instruction, and one month after the instruction – of both groups (experimental and control) was carried out. This mean comparison was done using a one-way repeated measures analysis of variance (ANOVA). The two midterm tests (WT1 & WT2) were not taken into consideration in this mean comparison since WT1 assessed two target phonemes /v/ & /ʒ/ and WT2, the other two target phonemes /θ/ & /ð/. Table 11 illustrates the one-way repeated measures ANOVA of perception tests of subjects in the experimental group.

Table 11 One-way repeated measures ANOVA (perception-experimental group)

	Value	F	Hypothesis df	Error df	Sig.	Partial Eta. Squared
Pillai's Trace	.856	8.883	2.000	3.000	.055	.856
Wilks' Lambda	.144	8.883	2.000	3.000	.055	.856
Hotelling's Trace	5.922	8.883	2.000	3.000	.055	.856
Roy's Largest Root	5.922	8.883	2.000	3.000	.055	.856

Source: own authorship

According to table 11, there was not a statistically significant improvement of perception on subjects in the experimental group; however, it is considerably close to be significant ($P = .05$) taking into consideration the level of reliability (95%).

Regarding production, table 12 shows the one-way repeated measures ANOVA of subjects in the experimental group.

Table 12: One-way repeated measures ANOVA (production-experimental group)

	Value	F	Hypothesis df	Error df	Sig.	Partial Eta. Squared
Pillai's Trace	.983	85.931	2.000	3.000	.002	.983
Wilks' Lambda	.017	85.931	2.000	3.000	.002	.983
Hotelling's Trace	57.287	85.931	2.000	3.000	.002	.983
Roy's Largest Root	57.287	85.931	2.000	3.000	.002	.983

Source: own authorship

There was a significant improvement in production on subjects in the experimental group, Wilks' Lambda = .017, $F(2, 3) = 85.931$, $P = .002$.

Furthermore, three paired samples t-tests were used to make post hoc comparisons between conditions. The first paired samples t-test indicated that there was a significant difference ($P = .004$) between the pretest ($M = 30.4$, $SD = 5.3$) and the posttest ($M = 70.8$, $SD = 1.7$) on production accuracy. The second paired samples t-test showed that there was a significant difference ($P = .032$)

between the pretest ($M = 30.4$, $SD^2 = 5.3$) and the delayed test ($M = 56.0$, $SD = 4.9$) on production accuracy. Finally, the third paired samples t-test revealed that there was significant difference ($P = .03$) between the posttest ($M = 70.8$, $SD = 17$) and the delayed test ($M = 56.0$, $SD = 4.9$). There was not a positive effect on perception but positive results occurred on production.

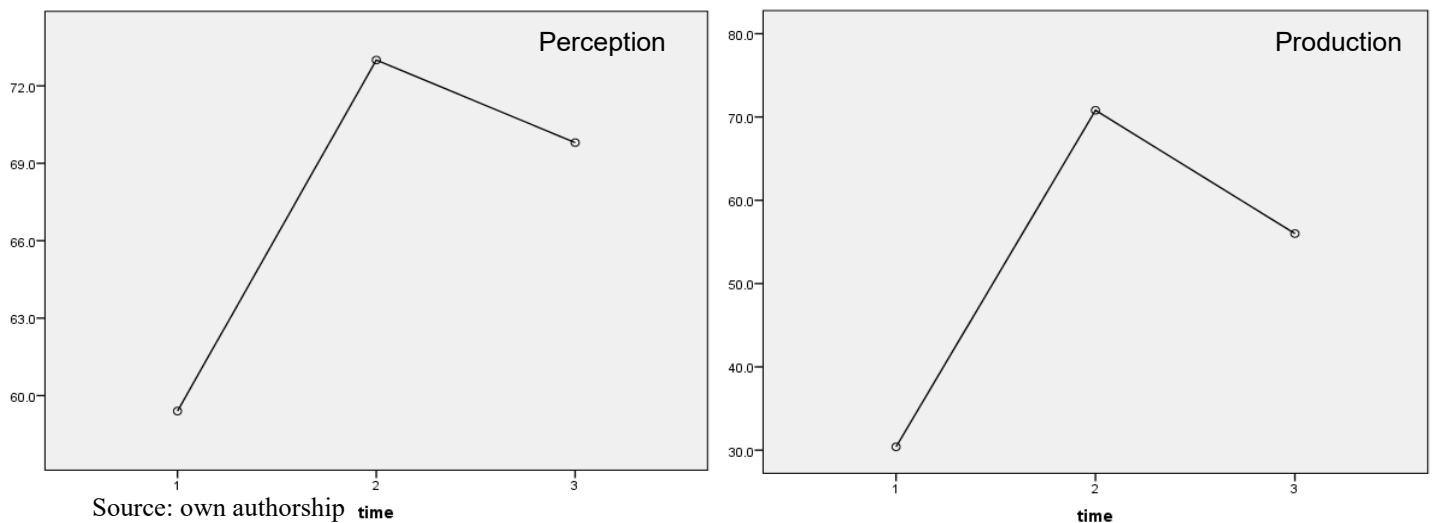
I will now introduce the next results based on the previous information and results of the one-way repeated measures ANOVA addressing the second hypothesis:

Hypothesis 2

There is a relation between perception and production results: the better the perception, the better the production.

Figure 4 depicts the experimental within subjects' results, of both perception and production accuracy in three time periods. 1) Pre-instruction, 2) two days after the instruction, 3) one month after the instruction.

Figure 4: Perception and production comparison in the pre-test, post-test, and delayed post-test (experimental group).







According to these results, subjects had a low performance in both perception and production before the instruction (time one, pre-test). Then, in the post-test (time two), they showed

² SD=standard deviation

significant improvement in both perception and production, with better results in perception than in production. In addition, the production graphic in time two, shows little improvement in comparison with the perception graph because subjects had a poor performance in the pretest (M = 30). On perception, they had a better performance (M = 59). Finally, in the delayed test (time three), there is a slight decrease in both perception and production accuracy when comparing time two and time three. However, subjects still showed great progress after the instruction. Table 13 provides the means of the tests at the three time periods of the experimental group.

Table 13: Means of the tests in the three periods of time: (pre-test, post-test, and delayed post-test)

TESTS	PERCEPTION	PRODUCTION
Pre-test (time one)	5.9  +	3  +
Post-test (time two)	-  7.3	-  7.0
Delayed test (time three)	6.9	5.6

Source: own authorship

According to table 13 regarding perception, subjects showed a significant improvement from time one (M = 5.9) to time two (M = 7.3). However, there is a slight decrease from time two (7.3) to time three (6.9). In terms of production, subjects had the same performance as in perception since subjects showed gains in time two (M = 7.0) but from time two to three, no improvement is shown. On the contrary, their performance was poor, with similar outcomes to the first test (M = 5.6).

Based on these results, the hypothesis *there is a relation between perception and production results: the better the perception, the better the production* is not validated, since there were no significant results in all the tests.

In summary, significant improvement was evident in production accuracy; perception accuracy was not statistically significant but subjects showed better results when comparing the pretest and the post-test.

CHAPTER V: DISCUSSION

In this chapter, a general discussion about the effects of the instruction is provided. The two hypotheses of this thesis are discussed and related with the results presented in chapter IV, with previous studies and the theory that framed this study.

This instruction was provided to learners who will be EFL teachers and who need to develop a solid and accurate perception and production of the target language because they will be role models.

The first hypothesis of the present study is now discussed:

Hypothesis 1: subjects in the experimental group will show gains in the perception and production of the four English fricatives because of the perception and production instruction.

Based on the results in chapter IV, subjects in the experimental group showed gains in both perception and production. However, production was more significant than perception. Regarding this, the present study is consistent with other studies (Akahane-Yamada, Bradlow, Pisoni, and Tohkura, 1996; Loscko, 2009) where a perception and production instruction was provided and as a result of this, participants had more significant gains in production rather than perception. This could have been a result of different causes, attributed to the effectiveness of strategies and techniques used for the development of production accuracy:

1) The constant implicit and explicit corrective feedback: Subjects in the experimental group showed significant results in production probably due to explicit and implicit corrective feedback provided during the instruction. According to Ellis (2009), corrective feedback contributes to language learning since learners are encouraged to keep on learning. During the instruction, subjects were corrected when they were not producing the target words or sentences accurately. It is important to address that subjects were told beforehand about these types of corrective feedback so that they did not feel ashamed or emotionally bad, at the moment of correcting them. Furthermore, explicit and implicit feedback strategies were used. Explicit CF strategies were paralinguistic signal, metalinguistic explanation, and explicit correction. Implicit CF strategies were recast and clarification request.

Some studies (Flege, 1989; Evans and Iverson, 2007; Aliaga-García and Mora, 2009; Jerotijević, 2011; Gómez and Gallardo, 2014) which implemented a perception and production instruction provided feedback to participants. This is, they only told participants the correct answers for each one of the tokens but they did not provide any explanation or signal about how participants could repair their errors. The present study went a little beyond previous studies because the trainer implemented corrective feedback strategies, which helped learners realize their errors. Once participants knew what they were not doing in the correct way, they could work on their errors, repair them, and avoid them in the next tasks.

The most effective corrective feedback strategies, in this study, belong to the explicit corrective feedback category since subjects performed better when the trainer indicated to the participant that there was an error and provided the correction, which led to the participant's awareness of his/her error. In addition, this awareness was evident when they started to correct themselves or correct their classmates whenever they heard or saw that they were not articulating the words or sentences in an accurate way. Furthermore, several studies, (Carroll and Swain, 1993; Nagata, 1993; Lyster & Ranta; Muranoi, 2000; Carroll, 2001; Ellis, Basturkmen, & Loewen, 2001; Panova & Lyster, 2002; Ellis, Loewen, & Erlam, 2006; Surakka, 2007; Fawbush, 2010; Homsini, 2013), suggest that explicit CF strategies have a positive and effective impact on second language acquisition because learners develop attention and awareness when they are corrected with these explicit CF strategies.

Implicit CF strategies (recast and clarification request) were also implemented in this instruction; however, they were not as effective as the explicit ones. One of the aspects that played an important role during the instruction was the degree of attention when participants were being corrected. Gass, Mackey, Robinson, & Schmidt (2012) propose that attention has some functions – (e.g. *selecting information for processing it, focusing on it, and inhibiting distractions, p. 249*) which regulate our actions in and make our learning easy. These implicit CF strategies did not catch participants' attention because, in a way, they might have thought that what the instructor was saying was not important. Nevertheless, when the instructor was direct in signaling the error, giving the right answer, and some metalinguistic information, the reaction of the participants was different; they seemed attentive and interested.

All in all, it is suggested that attention was the key element in the effectiveness of the explicit CF strategies in comparison with the implicit CF strategies.

2) The bottom-up approach: in the present study, it was decided to implement the bottom-up approach during the instruction since in previous studies (Flege, 1989; Bannister, Hazan, & Iverson, 2005), participants had positive results following this approach.

In the instruction, it was decided to start teaching the minimal unit of sounds (phoneme) to participants. Then, isolated words containing the target phonemes were modelled and participants had to produce them. Next, these words were used in sentences and finally, in paragraphs.

It is important to state that the supra-segmental features of the target language such as intonation and rhythm were not taken into consideration when participants were reading the words, sentences, or paragraphs, (i.e. participants were not corrected if the intonation or rhythm was not right). The reason for this was because participants might have felt overwhelmed with a lot of new input provided by the trainer and also, that they had to include all that input when they were speaking since this involves being highly aware of these aspects of the language.

In addition, it is also important to highlight that they were told to read the material as naturally and fluently as possible. Regarding this, sometimes they could not read as fluently as expected because they were so aware about producing the target sounds accurately that they forgot to read fluently and this was a disadvantage in using the bottom-up approach.

Although participants were asked to read the tasks as fluently as possible, it was hard for them because they were not taught how to combine fluency and accuracy at the same time. On the one hand, the advantage of implementing the bottom-up approach is that participants developed accuracy. On the other hand, they showed poor fluency when they were reading the texts. They were focused on reading the paragraphs as accurately as possible and they were not able to speak naturally.

3) Contrastive analysis: the use of contrastive analysis was an excellent technique implemented during the instruction because participants increased their awareness in producing the target consonant sounds accurately.

After teaching some characteristics of the English consonant sounds to the participants such as manner and place of articulation, an explanation of both Spanish and English phonological inventories was given so that they could realize that in a language, a certain sound is a phoneme but in the other language, the same sound is an allophone.

Videos of Latin American people who were speaking in English were given to participants so that they could notice if those people were producing the four fricative consonant sounds in an

accurate way. This task helped to raise their awareness of producing the target sounds since they stated that they did not want to speak the way those people did.

The implementation of contrastive analysis was effective with the four phonemes even though some of them are non-existent (/v/ & /θ/) in Latin American Spanish (more details regarding the difficulties in perceiving and producing the four phonemes are provided in the second hypothesis). In addition, the fact that all participants are native Spanish speakers helped tremendously in the effective implementation of this contrastive analysis.

4) The Motor Theory of speech perception helped participants to realize how and where they have to articulate the four target sounds. The Motor Theory of speech perception states that speech is perceived in terms of the place and manner of articulation. Discrimination and identification tasks were provided to participants in this perception section, which is consistent with the study of Flege (1989).

Even though this theory is focused on improving speech perception, participants of the present study performed better in producing the target sounds rather than perceiving them. This might be due to the material and the way that material was presented to participants.

First, Sammy diagrams, modelling of the target phonemes by the trainer and by native English speakers of videos from the University of Iowa were provided to participants so that they could realize how sounds must be articulated. After this, participants were given some discrimination and identification tasks; when they finished, the right answers were given to them. Then, the trainer focused on production tasks.

The trainer tried to devote the same amount of time for both perception and production but eventually, more time was dedicated to production. With regard to this, the present study differs from the one of Bettoni and Koarich (2009), because in their instruction, the focus was on perception and their results were significant in both perception and production.

With regard to the results of perception, they were not statistically significant although students had gains compared with time one (before the instruction) and time two and three (after the instruction). This could be attributed to the following causes:

1) Time: participants took two hours of instruction per day. One hour was dedicated to perception tasks and one hour, to production tasks. Regarding this, participants might have needed more time for perception accuracy since this skill involves a different learning process. This is, unlike production, perception is less manipulable. In perception, one cannot provide any kind of

corrective feedback while the participant is doing the task; no one can intervene and provide a clue or some help when the participant is carrying out the task. More time and more input may be key to have a significant progress in perception accuracy.

2) Memory retention: Kosslyn & Smith (2008) argue that there are rules and memories of individual members of category knowledge called exemplars. In order to provide a better concept of exemplars, a short description is provided: the first time we see an unknown word and then we are told its meaning, a memory of that unknown word and its meaning are stored in our brain. As we see the same unknown word in more texts, a memory of each one of them will be associated with the meaning and with other memories of that word.

Having these arguments about rules and exemplars, we could say that production works with rules, and perception, with exemplars. In production, participants were given some “rules” so they just needed to follow them and think what they were going to say. In addition, they had other learning mechanisms such as visual and motor tools and corrective feedback. In perception, participants just had memories of those rules and little time to process and think of which rule they had to use and then, choose or write the correct answer.

As a hypothesis, perception and production have different learning mechanisms and the time and input provided to participants can make a difference in perception.

In the next paragraphs, the second hypothesis is discussed:

Hypothesis 2: there is a relation between perception and production results: the better the perception, the better the production.

Table 14 provides the means of the pre-test, post-test, and delayed post-test of the experimental group. These means show that this hypothesis is not validated.

Table 14: Means of the pre-test, post-test, and delayed post-test of the experimental group.

TESTS	PERCEPTION	PRODUCTION
PRE TEST	5.9	3.0
POST TEST	7.3	7.0
DELAYED POST TEST	6.9	5.6

Source: own authorship

In this instruction, participants had significant gains in production but not in perception as described in hypothesis 1. This thesis is not consistent with Llisterra (1995) because he states that speech perception and production are related. There are other studies which differ, since they state that the relationship between speech perception and speech production is complicated and unclear due to participants who demonstrated good production ability but poor perception ability (Michaud, 2010; Peperkamp & Bouchon, 2011; Kusumoto, 2012).

Results of the present study indicate that *the better the perception, the better the production*, is not really true. In fact, it could be the opposite. The progress that participants had on perception (as shown in table 14) may be attributed to the significant gains that they had on their production of the four consonant sounds.

Regarding the differences of the effects of the instruction in terms of the four fricative consonant sounds (/ʒ/, /v/, /ð/, /θ/), a description explaining why participants found some of these sounds more difficult to produce or perceive than the others is provided.

1) /v/: In Spanish, this phoneme shares the same place and manner of articulation of /f/. the only characteristic that is different is voicing, this is, /v/ is voiced and /f/ is voiceless. Taking this into consideration, participants only had to learn the voicing feature. This is why this phoneme was one of easiest to perceive and produce.

2) /ʒ/: In Mexican Spanish, this phoneme may exist as an allophone of /j/. In Maya, there is a phoneme /ʃ/ which shares the features, place, and manner of articulation. The only characteristic that participants had to learn was, again, voicing. /ʃ/ is voiceless and /ʒ/ is voiced. It is important to

mention that participants of this thesis are from the Peninsula of Yucatan and they are exposed to some kind of input in Maya because there are people who have it as their mother tongue.

3) /ð/: In Spanish, /ð/ is an allophone of /d/. this allophone can be found at the end of words such as (*libertad, juventud*) and in intervocalic position such as (*edad, dedo*). In initial position, it is always going to be the /d/ phoneme. In English, /ð/ is a phoneme and it does not have allophones. Therefore, participants had to learn the phonotactics (this has to do with possible combinations of phonemes) of this phoneme.

4) /θ/: Theta was the most difficult phoneme to perceive and produce since it is non-existent in Mexican Spanish. Participants had to learn all the features of this phoneme: place of articulation, manner of articulation, and the voicing feature.

In conclusion, the effect of this instruction provided to future EFL teachers was positive. It is true that there were difficulties in perceiving and producing some of the four target phonemes such as theta /θ/ but with more practice and more input especially in perception, this problem may be diminished.

The theory (Motor Theory of Speech Perception), approaches (bottom-up approach), hypotheses (the Critical Period Hypothesis), strategies (Contrastive Analysis and Corrective Feedback) implemented in the present study played an important role in the final results.

First, the implementation of the Motor Theory helped participants to not only recognize sounds, words, and phrases but also, to produce them accurately. This might be due to the visual aids (Sammy diagrams and videos of articulation) that were provided to the participants.

Second, the use of the bottom-up approach in the instruction was helpful but it would have been much more significant if it had been combined with the top-down approach. This approach was helpful since participants started to learn the features of the target consonant sounds from the minimal unit and then, to move on to more structures such as sentences and paragraphs

Third, the CPH was one of the hypotheses considered in this study. Its main premise is that learners might not be capable of acquiring a native-like command of a second language if they are adults. This thesis challenges the CPH since the EFL learners who participated in this instruction showed positive results in their perception and production of a second language. The participants are young adults, their ages range from 20 to 26. They demonstrated that they are capable of producing the four target phonemes in a very native-like manner. This means that, with a well-planned instruction, learners are able to reach a native or near native like command of a second

language even if they are adults. This instruction provides evidence that participants could reach a native-like pronunciation of these four consonant sounds (/ʒ/, /ð/, /θ/, /v/).

Fourth, having a contrastive analysis in the instruction was an efficient strategy that helped participants realize the similarities and difference of both languages. Matte (2005) states that the systematic comparison between two languages would allow the identification of the most problematic aspects of the languages that we as teachers should take into consideration when designing teaching materials. However, there are some authors, who are opposed to contrastive analysis Butzkamm & Caldewell (2009) (as cited in Timor, 2012).

The use of contrastive analysis does not mean that learners will use their mother tongue during the whole class, it is just used as a strategy that will help them to notice the similarities and differences of their mother tongue and the target language. This would also prevent possible errors that learners might have.

Fifth, corrective feedback was also one strategy that led to self and peer repair. Explicit and implicit corrective feedback strategies were implemented during the instruction. The most effective strategies were the explicit ones since participants could repair themselves when the trainer told them their mispronunciations.

Finally, memory retention was an aspect that affected both production and perception but it had a more negative impact on the latter. Speech perception is an ability that needs practice just as solving a Sudoku puzzle. In addition, speech perception cannot be compared to speech production because the latter involves more mechanisms such as visual aids and motor features that help learners improve that ability. Learners should be exposed to as much input and practice as possible in order to improve speech perception.

CHAPTER VI: CONCLUSIONS

This chapter begins with the objectives of this thesis. Then, it continues with a summary of the main findings of this research, which also includes pedagogical implications. Finally, it concludes with suggestions for future research.

The main objective of the present study was to analyze the effects of a perception and production instruction of four English fricatives in a laboratory setting, based on cognitive models and approaches, with intermediate EFL learners who have Spanish as L1. The effect of providing a perception and production instruction was positive. Participants showed gains in speech perception and had statistically significant results in production. The implementation of the Motor Theory of speech perception, the explicit and implicit corrective feedback as a technique, the bottom-up approach, and the use of contrastive analysis led to significant and positive results.

In addition, this study aimed to raise the students' awareness of the accurate perception and production of the four target consonant sounds. With this instruction, participants increased their awareness of perceiving and producing the four target consonant sounds. During the instruction, participants started to monitor their performance when doing the tasks that the trainer provided to them. In addition, there was self-correction and peer-correction whenever they noticed that one of them was not producing the target sounds accurately. Finally, when they were watching videos where Latin American people were speaking in English, they were able to identify if those people were producing the sounds accurately or not.

An additional objective was to analyze the gains in the perception and production of the four English fricative consonants in a lab setting. As mentioned in previous chapters, the gains in the post-test were significant in comparison with the pre-test; however, in the delayed post-test, there was a decrease in both perception and production. This decrease might be because of memory retention. According to Kosslyn and Smith (2008), learners tend to forget information due to interference, this is, it is possible that old information interfered the new input they learned during the instruction.

In terms of perception, participants may not have had significant progress owing to the slow pronunciation of the instructor and when participants had to listen to authentic material, they were

not able to perceive accurately because of intonation, speed, rhythm, stress of words, and other suprasegmental features which were not considered in the instruction. Moreover, participants focused more on meaning than on form. All these aspects might have affected the perception ability of the participants in this study.

In general, this instruction was an effective tool to develop the ability of perceiving and producing the four target fricative consonant sounds. With this, evidence that people are capable to produce English sounds in a native-like manner with instruction is provided in the present study. The present study challenges the CPH since it provides evidence that people who are not in their critical period (during or before puberty), are capable to have a native-like or near native-like pronunciation of the target language.

Finally, it is highly important to remark that this instruction was provided to future English Language teachers. These students have to be committed with the target language and they have to be conscious that their output will be transmitted to young learners. English Language teachers play an essential role in the process of learning and their command of the language must be as native-like as possible.

Pedagogical implications

The following is a list of the pedagogical implications that arose from this thesis.

The first pedagogical implication of providing a perception and production instruction is that EFL learners are capable of achieving native-like pronunciation of, in this case, four fricatives despite their age, which is the opposite of what the CPH proposes.

Second, teaching pronunciation classes is an effective tool that help learners to improve not only their production but also their perception accuracy. Teachers should notice that it is important to implement these pronunciation lessons since learners need to master these two abilities of the English Language.

Third, with the implementation of techniques such as corrective feedback, learners developed the ability to self-correct and peer-correct which means that they are constructing a path

to autonomy. This might help them to look for different ways to experience the target language and this, eventually, may lead to positive progress.

Finally, the implementation of contrastive analysis was another technique that helped to make gains in the instruction. Some authors such as Butzkamm & Caldewell (2009) do not agree with the use of contrastive analysis since they insist that the mother tongue should be avoided in the second language classrooms. In contrast, this thesis promotes the use of contrastive analysis in EFL classrooms since teachers have the opportunity to foresee problems that learners might have when producing the target language. By learning the similarities and differences of both systems, learners might realize the importance of developing an accurate perception and production of the target language.

Suggestions for future research

First, due to the fact that this thesis focused on the segmental characteristics of the language, one should consider the supra-segmental characteristics of the language. In order to develop a native-like pronunciation, it is important to teach intonation patterns, word stress, and rhythm so that learners can be fluent and confident when producing the target language. Second, it would be interesting to report how learners would perform in a instruction that explores the top-down approach. Interesting differences might result from this approach. Third, provide a perception and production instruction in a classroom setting with a larger group of participants because it is not the same to have five participants as opposed to 30. Fourth, provide the instruction with the help of the technology. Nowadays, technology plays an important role in learning and learners would be willing to try new experiences. Fifth, implement other theories and models such as the High Variability Phonetic Instruction or the Perceptual Assimilation model, which have provided positive results in other studies. Finally, carrying out a study based on mixed design since it would be interesting to know how learners feel before, during, and after an instruction and what aspects of it, they would change or keep.

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Appendix A

Research Project: Effects of a Perception and Production instruction of four English Fricatives in an EFL context

Diagnostic test

I. General questions

Answer the following questions and in question number 4, circle one YES or NO.

1. Name: _____
2. Age: _____
3. Mother tongue: _____
4. Personal strategies to improve your English: Yes / No

If YES, which ones? _____

5. Languages spoken: _____
6. How many years have you learned English? _____

II. Perception section

Section 1: You will hear two words in each item. In some cases, the two words are the same. In some other cases, they have one sound that is different. You are going to tick the S (same) column or the D (different) column. Remember that you are going to listen to each item twice.

Item	S	D
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

13		
14		
15		
16		
17		
18		
19		
20		

Section II: Listen to each sentence and circle the word you hear:

1. One person – (one **boat** / vote).
2. We use our (**van** / fan) in the summer.
3. We saw two (cabs / **calves**) on the roads.
4. They need to talk to the (“**composer**” / “composure”)
5. People were prepared for a striking (invention / **invasion**)
6. Send (**tanks** / thanks).
7. She (taught / **thought**) for a long time.
8. It’s not (true / **through**), is it?
9. We waited until (**day** / they) came.
10. They’re (breeding / **breathing**) like rabbits.
11. Did you see the (letter / **leather**)?

III. Production section

Section I: Read aloud the following text:

My mother is thirty two years old and my father is thirty three but today I want to talk about my brother, John. Last Thursday, after he visited my grandmother, he bought a new television so we were very excited! I love my brother because he always does good things; actually, I designed a photo collage of him and me, it was fantastic! He is very clever too, this is the reason I admire and love him so much.

Section II: Answer the following questions:

- a) Do you think learning English is important nowadays? Why?
- b) Is it important for you to have a good pronunciation of English? Why?
- c) What do you think about listening to music to improve your English?

**First middle test /z/ and/v/
Perception section**

Section I: Circle the words you hear:

1. composure composer

2. curve curb

3. delusion dilution

4. boat vote

5. baize beige

6. aleutian allusion

7. rove robe

8. rues rouge

9. ballet valet

10. grieve grief

11. erasure eraser

12. save safe

13. version virgin

14. invest infest

15. relieve relief

16. liaison liège

Section II: *Write the words you hear. You are going to listen to three words for each number.*

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

Production section

Section I: Read the following:

Vance's Vacation

Every summer Vance and his family went on vacation to Beaver Mountain. It only took them a few hours to travel there from their home in Vermont. They spent seven days hiking, playing volleyball, and driving all over the mountain in their van. Vance's family loved to explore different parts of the mountain as well as the small village on the South side.

Vision of Treasure

Her parents named her Azure because she was born by the crystal blue ocean. Azure was proud of her name and wanted to do something adventurous. She had read about a hidden treasure located on a tiny Island in the Persian Gulf.

The legend was about an explosion that happened in the Gulf a few hundred years ago. The explosion created an underwater cave. If a person could get inside the cave, follow specific instructions, and make special measurements, they would find a secret treasure worth millions of dollars.

Azure had researched the Persian treasure for months and told her parents she knew the treasure was real.

Section II: Answer the following questions:

Do you think people watch too much television nowadays?

How do you think television will change in the future?

In what way do you think television could be improved?

Do you think television is a threat to national cultures?

**Second middle test /ð/ and /θ/
Perception section**

Section I: Circle the words you hear:

- | | |
|------------|----------|
| 1. Udder | other |
| 2. Wordy | worthy |
| 3. Day | they |
| 4. Their | dare |
| 5. Thigh | thy |
| 6. Teeth | teethe |
| 7. Eighth | eight |
| 8. Deaf | death |
| 9. Fateful | faithful |
| 10. Theory | teary |
| 11. Tin | thin |
| 12. Thread | tread |
| 13. Thrust | trust |
| 14. Whiff | with |
| 15. Thrill | frill |
| 16. Offer | author |
| 17. Oaf | oath |

Section II: Listen to the following sentences and write how many theta /θ/ and eth /ð/ sounds you hear:

	/ð/	/θ/
1. Give me that.		
2. I'll do more than that.		
3. Isn't there anything?		
4. I'm sure of this.		
5. Within one month of going abroad, he became sick.		
6. He got over the shock of his father's death.		
7. Thank you for inviting me to your birthday party.		
8. To tell the truth, I didn't go there.		
9. He is lying through his teeth.		
10. Tom and Mary have been married for more than thirty years.		
11. Tom never fails to send a birthday present to his father.		
12. I think it's unlikely that the next version of Windows will come out before the end of this month.		

Production section

Section I: Read the following dialog in pairs. One student is going to be "A" and the other one is going to be "B".

A: Hey! How are you today?

B: Not feeling good.

A: Why? Is your father coming to the gathering this Thursday?

B: No. Neither is my mother.

A: That's too bad. My brother was looking forward to seeing them.

B: Well, they're both a little under the weather.

A: Oh, sorry to hear that. Can I send something to cheer them up?

B: Please don't bother. They'll be fine.

A: Ok. Well, see you then.

B: Sure, thanks for everything.

Section II:

1. The following cards contain some situations.
2. Choose one card, read your situation and then, discuss it with your partner.

Delayed test

/ɜ/ /ð/ /θ/ /v/

Perception section

*Section I: You will hear two words in each item. You are going to tick the **S** (if the two words are the same) column or the **D** (if the two words are different) column*

Item	S	D
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

Section II. Write the sentences that you hear. You are going to listen to the recording twice.

1. The three children bathe in the same bath.
2. Even though my father is a weatherman, he can't predict whether it will rain or not.
3. A sooth herbal tea from that store will soothe her.
4. Does thy thigh hurt a lot after the operation?
5. The wedding will be in Vermont, in a small hotel called Valden Vest, there are still vacancies.
6. Rose and John lived in Belleville; they viewed trivial things in Venice.
7. My decision to study abroad provoked a collision of ideas between my parents.
8. He admitted that he had stolen the treasure that was hidden in the garage.

Production section

Section I: Read the following texts:

Farmer in India

This farmer of northeast India is checking on a crop of lettuce. The farmers of this area must continuously cultivate their crops in order to survive. In most cases, money from the crops is just enough to keep a family going. Farmers all over the world are dependent on the weather, which dictates whether or not a crop will reach harvest.

Thad

Thad had a lot of fun thinking of new ways to prank his classmates. His teacher, Ms. South, didn't think it was healthy. She knew Thad was a very thoughtful writer. He was also very smart in math. She thought his writing was so good that he could become an author someday.

Jacques Photography

Jacques was born in France but grew up in Asia. He was a massage therapist who traveled the world. One of Jacques' favorite hobbies was to make collages. He also loved taking photos so after taking them; he would develop them in his garage. He specialized in capturing breath-taking colors. Jacques had a vision of photography that was higher than anyone I've ever met.

Section II: Answer the following questions:

1. Is television an effective tool in building the minds of children?
2. Is human cloning justified, and should it be allowed?
3. Are humans too dependent on computers?
4. Should gay marriages be legalized?

Appendix B

Piloting

Diagnostic test

Perception part - Section 1

	/ʒ/ (5)	/θ/ (5)	/ð/ (5)	/v/ (5)
Participant 1	4	3	4	5
Participant 2	4	3	3	3
Participant 3	4	1	3	5

Piloting

Diagnostic test

Perception part – Section 2

	/ʒ/ (2)	/θ/ (3)	/ð/ (3)	/v/ (3)
Participant 1	2	3	3	2
Participant 2	2	2	2	1
Participant 3	2	2	2	1

Piloting
First middle test
Perception part - Section 1

	<i>l3l</i>	<i>lv</i>
Participant 1	6/6	5/9
Participant 2	3/6	4/9
Participant 3	5/6	5/9
Participant 4	4/6	5/9
Participant 5	4/6	5/9
Participant 6	6/6	7/9

Piloting
First middle test
Perception part - Section 2

	<i>l3l</i>	<i>lv</i>
Participant 1	0/2	2/2
Participant 2	0/2	0/2
Participant 3	0/2	2/2
Participant 4	1/2	0/2
Participant 5	0/2	1/2
Participant 6	1/2	0/2

Piloting
First middle test
Production part - Section 1

	<i> 3 </i>	<i> v </i>
Participant 1	1/6	16/16
Participant 2	1/6	9/16
Participant 3	0/6	11/16
Participant 4	0/6	8/16
Participant 5	1/6	9/16
Participant 6	0/6	8/16

Piloting
First middle test
Production part - Section 2

	<i> 3 </i>		<i> v </i>	
	P	C	P	C
Participant 1	0	0	1	1
Participant 2	0	0	4	2
Participant 3	0	0	1	1
Participant 4	0	0	14	14
Participant 5	0	0	0	0
Participant 6	0	0	13	7

Piloting
Second middle test
Perception part - Section 1

	<i>/ð/ (6)</i>	<i>/θ/ (11)</i>
Participant 1	5	11
Participant 2	9	3
Participant 3	4	9
Participant 4	3	10
Participant 5	2	8
Participant 6	4	8

Piloting
Second middle test
Perception part - Section 2

	<i>/ð/ (15)</i>	<i>/θ/ (12)</i>
Participant 1	14	12
Participant 2	14	12
Participant 3	10	7
Participant 4	11	15
Participant 5	9	10
Participant 6	12	12

Piloting
Second middle test
Production part - Section 1

	<i>/θ/ (5)</i>	<i>/ð/ (14)</i>
Participant 1	2	2
Participant 2	1	0
Participant 3	3	3
Participant 4	1	4
Participant 5	1	2
Participant 6	1	2

Piloting
Second middle test
Production part - Section 2

	<i>/θ/</i>		<i>/ð/</i>	
	P	C	P	C
Participant 1	9	4	11	2
Participant 2	3	0	0	0
Participant 3	4	2	6	3
Participant 4	2	1	4	0
Participant 5	1	0	6	1
Participant 6	3	0	8	1

Piloting
Delayed test
Perception part - Section 1

	/ʒ/ (5)	/θ/ (5)	/ð/ (5)	/v/ (5)
Participant 1	4	4	4	4
Participant 2	4	5	2	4
Participant 3	4	3	3	3
Participant 4	5	4	1	3
Participant 5	3	4	3	4
Participant 6	4	5	5	3

Piloting
Delayed test
Perception part - Section 2

	/ʒ/ (4)	/θ/ (5)	/ð/ (17)	/v/ (11)
Participant 1	2	1	7	1
Participant 2	1	0	1	0
Participant 3	1	1	5	1
Participant 4	2	1	5	1
Participant 5	2	1	5	1
Participant 6	1	2	6	1

Piloting
Delayed test
Production part - Section 1

	/ʒ/ (3)	/θ/ (3)	/ð/ (15)	/v/ (5)
Participant 1	0	3	3	5
Participant 2	0	0	3	4
Participant 3	0	0	3	2
Participant 4	0	0	2	4
Participant 5	0	0	3	3
Participant 6	0	3	2	4

Piloting
Delayed test
Production part - Section 2

	/ʒ/		/v/		/ð/		/θ/	
	P	C	P	C	P	C	P	C
Participant 1	1	0	10	9	4	0	6	2
Participant 2	0	0	2	2	7	0	4	3
Participant 3	0	0	6	5	4	0	5	0
Participant 4	1	0	4	3	15	0	8	4
Participant 5	0	0	7	5	17	0	2	1
Participant 6	0	0	6	4	2	0	4	4