The Impact of Instruction in Phonetic and Phonemic Distinctions in Sounds on the Pronunciation of Spanish-speaking ESL Learners [1]

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Abstract

Second language learners must know the linguistically significant sounds in the second language to read, write, and speak fluently, and to avoid miscommunication. This raises the question of whether, how much, and in what form instruction in phonetic and phonemic distinctions in sounds should be implemented in the second language classroom, and whether or not such intervention is effective. This study evaluated the impact of instruction in phonetic and phonemic distinctions in sounds on the English pronunciation of English language learners, specifically, Spanish speakers learning English as a second language (ESL). Target sounds in English deemed difficult for Spanish speakers learning ESL were identified. The target sounds were categorized into sounds having allophonic distinctions between the two languages; sounds having phonemic differences in the two languages, and sounds which are phonemes in English but absent in Spanish. Subjects in the experimental group were instructed in the distinctions between the sounds in English and Spanish through lecture-type as well as technology-enhanced materials. Results indicated that the intervention had a statistically significant impact on the experimental group's pronunciation of the target sounds. Further, subjects' showed improvement in the pronunciation of individual target sounds in the following order: sounds with allophonic distinctions, phonemic differences, and absence in the native language. The paper discusses these findings and their pedagogical implications.

Resumen

Un conocimiento fonológico consciente de sonidos en la segunda lengua no puede ser dado por obvio en alumnos principiantes. Sin embargo los estudiantes de un segundo idioma deben conocer los sonidos lingüísticos significativos en éste para poder leer, escribir y hablar fluidamente para evitar problemas en la comunicación. Como resultado surge la pregunta sobre cuánto y cómo debe implementarse la instrucción en las distinciones fonéticas dentro del aula del segundo idioma, y si tal instrucción es o no es efectiva. El presente estudio evalúo el impacto de la instrucción en distinción fonética y fonémica de sonidos sobre la pronunciación del inglés de estudiantes cuya primera lengua es el español que están aprendiendo el inglés como segunda lengua. En el estudio se identificaron los sonidos que fueron detectados como difíciles para los estudiantes hispanoparlantes. Estos sonidos fueron categorizados en sonidos con distinción alofónica entre ambas lenguas, sonidos con diferencias fonémicas entre ambas lenguas y sonidos cuyos fonemas existen en el inglés pero que no existen en el español. Mediante la

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instrucción directa y del uso de la tecnología, a los sujetos en el grupo experimental se les enseñó las distinciones entre estos sonidos del inglés y los sonidos del español. Los resultados indicaron que el impacto de la intervención sobre la pronunciación de los sonidos seleccionados fue estadísticamente significativo. Asimismo, los sujetos experimentales demostraron mejoras en la pronunciación de los sonidos objetivo individuales de acuerdo al siguiente orden: sonidos con distinciones alofónicas, sonidos con diferencias fonémicas y sonidos ausentes en la lengua natal. El presente documento explica los resultados y sus implicaciones pedagógicas.

Introduction

Phonological awareness of sounds in the second language cannot be presumed in second language learners. Second language learners must know the linguistically significant phonemes and allophones in the second language to read, write, and speak fluently, and to avoid miscommunication. This raises the question of whether, how much, and in what form phonetic instruction should be introduced and applied in the second language classroom, and whether or not such intervention is effective. This study evaluates the impact of instruction in phonetic and phonemic distinctions in sounds on the English pronunciation of English language learners, specifically, Spanish speakers learning English as a second language (ESL).

Need for Accurate Pronunciation Skills in the Second Language

Effect on Communication

A phoneme is the smallest, meaningful unit of sound. All else remaining the same, changing a phoneme in a word changes the meaning of the word, as in b̲an, v̲an, m̲an, and t̲an in English; the sounds /b/, /v/, /m/, and /t/ are linguistically significant sounds, or phonemes, in English. An allophone, on the other hand, is a phonetic variation of a phoneme. This variation does not change the meaning of the word, and therefore, is not linguistically significant. The phoneme /t/ in English, for instance, has, among others, the following two variations or allophones in terms of aspiration: it is aspirated in word-initial position (t̲ʰin, t̲ʰable) and unaspirated in word-medial or word-final positions (mast̲er, paint̲ing, bit̲e, cat̲); misarticulation of these allophones does not change the word meaning.

Whether it is necessary or desirable to speak a second language with native-like accuracy is often a personal choice; what is clear, however, is that certain miscommunications may occur due to lack of phonological awareness in the second language. Kenworthy (1987) stated that language learners must develop concern and awareness for pronunciation because unintelligible speech resulting from inadequate phonological accuracy causes mutual frustration and unpleasantness for both listeners and speakers. In related studies, Plakans (1997) and Gravois (2005) pointed out instances of miscommunication and unintelligibility resulting from inadequate phonological awareness of nonnative English-speaking instructors. To avoid such instances, the second language learner must be able to identify and use the linguistically significant phonemes of the language appropriately. For instance, Spanish speakers learning English may mispronounce the voiceless post alveolar fricative /š/, as in "wa*sh*", as the

voiceless post alveolar affricate /č/, as in "wat*ch*." Because of the lack of the /š/ phoneme in Spanish, some Spanish speakers may mispronounce the English phoneme /š/ as /č/, resulting in possible miscommunication. These problems may be prevented or remedied by instruction on phonetic and phonemic distinctions in sounds.

Academic Need

Phonological awareness has been reported to be a predictor of reading success (Badian, 1998) and general academic achievement (Chard, Pikulski & Templeton, 2000). Native Spanish speakers who learn to speak, read, and write in their native language might have difficulty with the English orthographic system because of native language interference (Terrebone, 1973). Lado (1956), in a study comparing the English and Spanish sound systems, claimed that second language learners tend to transfer their entire knowledge of sounds in their native language, including phonemes and allophones, patterns of syllables, and intonation, into the second language, and these transfers result in nonnative pronunciation and possible miscommunication. Training in phonemic and phonetic contrasts between the two languages may compensate for students' pre-set phonetic and phonemic awareness in the native language.

Need for Instruction in Phonetic and Phonemic Distinctions in Sounds

Research suggests that second language learners' pronunciation is affected by variables including the age and gender of the second language learners; the extent of second language use; length of residence in the second language environment; learners' aptitude; first language background; as well as the presence or absence of phonetic training in the second language (Piske, 2008). However, results of studies investigating the effects of these factors on second language learners' pronunciation are not unanimous. With respect to age being a crucial factor in second language acquisition, Long's (1990) claim that acquiring a second language in early childhood can result in native-like second language pronunciation was supported by Marinova-Todd, Marshall & Snow's (2000) study showing that late starters cannot achieve native-like pronunciation.

However, the results of a study by Flege, Frieda and Nozawa (1997) indicate that native-like pronunciation does not automatically come with early second language acquisition. In that study, a group of bilinguals who acquired English as a second language at an average age of 3.2 years and had been living in an English-speaking environment for more than 18 years were reported to be speaking English with a slight foreign accent. In fact, late learners too can have almost native-like second language pronunciation (Moyer, 2004). Studies show that adult Dutch speakers achieved native-like English pronunciation after phonetic training (Bongaerts, van Summeren, Planken & Schils, 1997), and Japanese adults showed improvement in the phonemic distinction between the /l/ and /r/ contrast in English, subsequent to phonetic training (Flege, Takagi & Mann, 1995). Some researchers (Celce-Murcia, Brinton, & Goodwin, 1996; Morley, 1999; Wong, 1987) argue that second language learners' inaccurate pronunciation results from the sole emphasis on individual sounds in the pronunciation teaching curriculum. In order to achieve real-life communication,

concern for and awareness of rhythm, stress and intonation, namely, suprasegmentals, should be emphasized more. These features may be small and easily overlooked; nevertheless, their essential status in pronunciation teaching should not be undervalued. Mistakes at the suprasegmental level, such as improper intonation contours, failure in connecting words, and nonnative-like stress/rhythm, lead to impressions of abruptness or even rudeness. Indeed, suprasegmentals should not be ignored in pronunciation teaching. Regardless of the accuracy of suprasegmental features, inaccurate phonetic realizations of phonemes still cause problems in communication. Thus, while discussing what should be emphasized in teaching pronunciation, the fundamental goal of phonetic and phonemic accuracy should not be compromised. Both segmental and suprasegmental aspects of pronunciation should be integrated in second language teaching curricula.

Given that the claims of the above studies are not unanimous regarding the age factor in second language acquisition or regarding the appropriate focus in teaching pronunciation, this study seeks to determine whether or not adult native Spanish speakers improve their pronunciation subsequent to instruction in specific phonetic and phonemic distinctions between English and Spanish.

Purpose of the Study

This study examined the impact of instruction in phonetic and phonemic distinctions in sounds on the pronunciation of target sounds by Spanish speakers learning English as a second

language. In particular, the study sought the answers to the following research questions:

1. What effect, if any, does instruction in phonetic and phonemic distinctions in sounds have on the overall pronunciation of target English phonemes and allophones by native Spanish speakers learning ESL?
2. What effect, if any, does instruction in phonetic and phonemic distinctions in sounds have on the pronunciation of individual target English phonemes and allophones by native Spanish speakers learning ESL?

Methodology

Selection of Participants

Subjects in the study were 33 high school students ranging in age from fifteen to nineteen years, all of whom were native speakers of Spanish (as spoken in Mexico), learning English as a Second language (ESL) at a private high school during the period of this research. Students who attend this private high school take an initial placement test, the Secondary Level English Proficiency (SLEP) Test, or the Institutional Testing Program for English Proficiency (ITP) test, both of which are administered by the school. According to school policy, freshmen students who fail the SLEP (if they obtain a combined score of 46th percentile or less) are assigned to an ESL class. Further, incoming sophomore and/or junior

students, who score below 400 on the ITP, are also assigned to ESL classes. Thus, the sampling of participant selection was subject to the school's placement and scheduling policies. For the purpose of this study, participants were divided into two groups, experimental and control, to determine the impact of the intervention, which was the instruction in phonetic and phonemic distinctions in sounds. According to Field (2005), a "convenient sample" refers to a "sample of the population chosen based on factors such as cost, time, participant accessibility, or other logistical concerns." Thus, convenience sampling resulted in subjects being placed in two groups: control (N=12) and experimental (N=21). The experimental group received instruction in phonetic and phonemic distinctions in sounds, but the control group did not. The control group received regular ESL curricular instruction from the classroom teacher, while the experimental group received instruction in phonetic and phonemic distinctions in sounds from the researchers during two 45-minute sessions each week for ten weeks. On the remaining weekdays, they received regular ESL curricular instruction from the classroom teacher.

Subsequent to the Institutional Review Board's approval of the study and the school authorities' permission to conduct the study, the researchers instructed all subjects, orally as well as in writing, of the purpose of the study prior to gaining their consent to participate in it. Consent was also obtained for participants to be audio taped and videotaped during pretest and post-test sessions.

Materials

Based on *A Key to Pronouncing the Consonants of American English* (Dale & Poms, 1986) and *Spanish English Contrasts* (2nd ed.) (Whitley, 2002), seven consonant phonemes deemed difficult for Spanish-speakers of English were selected for instruction. These included sounds that differ from English in the following ways:

- A phonetic feature, specifically, place of articulation:
     voiceless alveolar plosive /t/ as in "ten"; and
     voiced alveolar plosive /d/ as in "den";
- Sounds which differ in phonological behavior, specifically, allophone vs. phoneme:
     voiced labiodental fricative /v/ as in "vase";
     voiced alveolar fricative /z/ as in "zoo";
     voiced interdental fricative /ð / as in "there"; and
- Sounds which are absent in the native language, specifically, Spanish (as spoken in Mexico):
     voiceless interdental fricative /θ/ as in "think"; and
     voiceless post alveolar fricative /š/ as in "shoe".

In the first group of sounds, the place of articulation for the English phoneme /t/ in English is alveolar, i.e. the tip of the tongue touches the alveolar ridge in producing the sound; in Spanish the place of articulation for /t/ is dental, where the tongue tip touches the back of the upper teeth. This allophonic distinction between the English and Spanish sounds is not linguistically significant, but it

could contribute to a nonnative pronunciation of the sounds. A similar distinction is found in the English and Spanish phonemes /d/. In the second group of sounds, /v/, /z/, and /ð/ are phonemes in English. In Spanish, however, they are allophones of /b/, /s/, and /d/ respectively. Without this linguistic awareness or knowledge of accurate articulation of sounds, the Spanish speaker learning English may say, for instance, *ban, lacy*, and *den* instead of *van, lazy*, and *then* respectively. Given certain contexts, such misarticulations could result in miscommunication. The third group of sounds, /θ/ and /š/, are absent in the sound inventory of Spanish, as it is spoken in Mexico. As such, these sounds have to be added to the second language learners' repertoire of English sounds.

In Table 1 below, the target English sounds are presented in contrast to the corresponding sounds in Spanish.

TABLE 1
CATEGORIES OF TARGET SOUNDS

	Target Sounds						
	Differ in a phonetic feature (place of articulation)		Differ in phonological behavior (allophone [AL] vs. phoneme /PH/)			Absent in native language	
	t	d	v	z	ð	θ	š
Spanish	dental 'taco'	dental 'dos'	[AL] 'viva'	[AL] 'zapato'	[AL] 'lado'	Absent	Absent
English	alveolar 'ten'	alveolar 'den'	/PH/ 'van'	/PH/ 'zoo'	/PH/ 'there'	'three'	'shoe'

 Instruction in phonetic and phonemic distinctions in sounds was delivered to the experimental group in the classroom, in formats of, but not necessarily in the order of, verbal instruction, handouts, PowerPoint presentations and pronunciation exercises/activities. Subjects received the training for 90 minutes (during two 45-minute class periods on two weekdays) for a period of 10 weeks. Details of the instruction are as follows.

1. Lecture materials: These included instruction and explanations from the researchers, as well as computer software such as Pronunciation Power 1 & 2 (Buffel, 2000) developed by English Computerized Learning Inc. Handouts containing information on the place and manner of articulation of the target sounds, PowerPoint presentation slides, and photocopiable materials from Pronunciation Games (Hancock, 1995) were provided to the subjects.
2. Technology-enhanced materials: These included presentations made by the researchers using PowerPoint, incorporating animated components such as GIF (Graphics Interchange Format) and/or Flash with an emphasis on interaction between the subjects and the content (instruction in phonetic and phonemic distinctions in sounds). Communicative and interactive materials included exercises such as minimal pair discrimination, as well as activities designed by the researchers in both handout and Computer Assisted Instruction (CAI) formats using SWISH templates available online.

Data Collection Procedures

Common practice in the field of speech pathology includes the assessment of articulation of sounds. One type of phonological assessment entails the collecting of a speech sample, preferably tape recorded; transcribing the sample; and scoring and analyzing the sample (Gordon-Branney & Weiss, 2007). Several traditional tests of articulation use single word or sentence lists containing the target sounds in word initial, medial, and final positions. Based on such practice, and due to lack of readily available articulation tests which contained the target sounds appropriate for adult Spanish-speaking ESL learners, the researchers developed word lists containing the target sounds in initial, medial, and final positions in the word. A total of 60 words were selected to be used in the pretest and post-test. Both tests utilized the same set of words. Of the total number of words presented, six words for each target phoneme with the target sound occurring in word initial, medial, and final positions were ordered randomly for testing. Thus, 42 of the total number of words contained target sounds. The remaining 18 words contained corresponding contrasting sounds, such as /b/, /s/ and /č/ to contrast with /v/, /z/ and /š/ respectively.

Each subject was tested individually in a quiet room conducive to video and tape recording. Both researchers were present during testing. In the pre-test, each card containing a printed word containing the target or contrasting sound was shown to the subject to elicit the pronunciation of the target sound. The subject was asked to read the words aloud. If difficulty in understanding the word was detected, the researcher presented the opposite side of the card containing an image depicting the word. Once the target word was pronounced, the next card with the next word followed. The words were presented with the target sounds in random order.

Both researchers independently recorded and evaluated each subject's pronunciation of the target sound according to its phonetic features. The researchers did not model any of the sounds during testing. A subject's mispronunciation was not corrected; however, self-correction was accepted. Only target sounds in words were evaluated, regardless of possible misarticulation of other sounds in the word. As is customary in formal testing of articulation (Gordon-Branney & Weiss, 2007), the researchers manually recorded their individual perceptions of mispronunciations by noting the sound using IPA symbols; correct pronunciations of target sounds with a check mark; and omitted target sounds with a dash. As a result, each subject had four 'sets' of evaluations for each opportunity to produce each target sound (in initial, medial, and final positions in the word) which was tested twice. For instance, /š/ in initial position of a word was tested in two separate words. Thus, each subject received four evaluations for the pronunciation of /š/ in initial position: (1) by Evaluator 1 for word 1, (2) by Evaluator 1 for word 2, (3) by Evaluator 2 for word 1 and (4) by Evaluator 2 for word 2. These grades were summed up to form a scale from 0 to 4. That is, the combined evaluation of each subject's pronunciation of each tested item was depicted as a number from '0' to '4.' For instance, if the evaluation of an item tested from one evaluator was incorrect, a value of '0' was assigned for that instance. If the evaluation of an item tested from one evaluator was correct,

a value of '1' was assigned for that instance. Results of evaluations from both evaluators were integrated for statistical analysis.

After all the phonetic features of the target sounds were presented in the instruction in phonetic and phonemic distinctions in sounds, a post-test was given to both experimental and control groups in exactly the same format as in the pretest, using the same list of words, testing environment, testing format, and data collection procedures as in the pretest. The time between the pretest and post-test was ten weeks.

Data Analysis Procedures

After the pretest and post-test, the data collected was analyzed in Statistical Package for Social Sciences (SPSS), Version 13. An independent (paired-samples) *t*-test was chosen to answer research question #1. Research question #1 was answered by investigating whether there was a statistically significant difference between the pretest and post-test overall pronunciation scores of target sounds by subjects in the experimental and control groups. Research question #2 was answered by analyzing the frequency of accuracy in production of individual target sounds on a 0-100% scale.

Limitations

Randomization of the participants in this research was subject to the private high school's ESL class schedule in the period during which the research was conducted. Convenience sampling was used for the selection of participants. Therefore, the study sample cannot represent the general population. Any effects of the instruction in phonetic and phonemic distinctions in sounds evident in this study can be generalized only to Spanish-speaking ESL students studying in a private high school similar to the one in this study, and who undergo a similar treatment. The advantage of diversity in terms of heterogeneous grouping was limited due to the sample population. Technology software application was limited to the hardware equipment available.

Results

After implementation of the instruction in phonetic and phonemic distinctions in sounds, the following results were found regarding the overall pronunciation of target sounds by the experimental and control groups. The results, as in Table 2, showed that there was a statistically significant difference in performance between pretest and post-test scores between the experimental and control groups, with $t(31) = .013$, $p=.02$. That is, the overall performance score of the experimental group in the post-test ($M = 85.7$, $SD = 9.84$) was statistically significantly different from that of the overall performance score of the control group in post-test ($M = 76.9$, $SD = 9.06$).

Thus, we can conclude that the instruction in phonetic and phonemic distinctions in sounds had a statistically significant effect on the overall pronunciation of target sounds in the experimental group of this experiment.

TABLE 2
MEAN DIFFERENCES IN PERFORMANCES OF EXPERIMENTAL (N=21) AND CONTROL (N =12) GROUPS

	Experimental		Control	
	M	SD	M	SD
Pretest	71.9	12.5	70.2	5.9
Post-test	85.7	9.8	76.8	9.0
t	.013*			

Note. M = mean; SD = standard deviation.
*p < .02

After implementation of the phonetics and phonological training, the following results were found regarding the pronunciation of individual target sounds by the experimental group:

TABLE 3
PERCENTAGE OF IMPROVEMENT BETWEEN PRETEST AND POST-TEST SCORE

	Target Sounds						
	Sounds different in place of articulation		Sounds linguistically significant (phonemic) in English			Sounds absent in Spanish	
	t	d	v	z	ð	θ	š
word-initial position	45.24	40.48	26.19	38.10	21.43	04.76	02.38
word-middle position	40.48	47.62	09.52	40.48	16.67	07.14	03.97
word-final position	40.48	61.90	14.29	64.29	14.29	02.38	0.00
overall	42.07	57.94	16.67	47.60	17.46	07.14	03.97

Interpretations and Implications

The results of this study show that the Spanish-speaking ESL learners who participated in the study benefitted from the instruction in phonetic and phonemic distinctions in sounds, focusing on specific target English sounds deemed difficult or different for the subject group. Specifically, sounds such as /t/ and /d/ that exist in Spanish but differ from English in place of articulation (dental in Spanish vs. alveolar in English) were easier to improve for the Spanish speaker learning English, than other problem sounds. The "adjustment," in this case, was learning the difference in the phonetic feature, and not a conceptual or phonemic difference between the sounds. Information on the differences between the two sounds was presented clearly to subjects not only in the phonetic descriptions of the sounds presented to them during the training, but also through interactive video clips showing the difference in tongue placement between dental and

alveolar sounds. The category of sounds showing the next best range of improvement is /v/, /z/, and ð/, which are sounds present in Spanish, but which carry a different phonological status in English, i.e. whereas they are allophonic in Spanish, they are linguistically significant or phonemic sounds in English. Here, it was necessary for the subjects to conceptualize and discriminate between the linguistic statuses of these sounds. Finally, sounds which are absent in the English language learner's native language, such as /š/ and /θ/, were the most difficult to master. These results are consistent with the expectations of Prator's (1967) Hierarchy of Difficulty that predicts that linguistic features that are most different between the native and second languages will be those that are most difficult to master. Although predicted or anticipated difficulties in second language learning do not always turn out to be so, based on the findings of this study, teachers may be better prepared to understand and address problems in Spanish-speaking ESL learners' pronunciation of English sounds, should they arise.

Recommendations for Future Research

Overall, the results of this study have pedagogical significance in that they offer insight into the instructional materials that may prove effective in improving Spanish-speaking ESL learners' pronunciation of English sounds. As discussed earlier, improvement in pronunciation can lead to advancement in academic performance too. Future research in this area would benefit from examining the effects of the same type of intervention at the phrase, sentence, or discourse levels. In addition, the range of sounds examined may be expanded to include vowel sounds.   The challenge that remains is the question of how to introduce this type of intervention systematically in ESL classrooms. As a starting point, ESL teachers would have to be trained in articulatory phonetics and linguistics to understand and teach the importance of accurate pronunciation in second language learning.

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