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Second Language Instruction with Phonological Knowledge: Teaching Arabic to Speakers of English

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SECOND LANGUAGE INSTRUCTION WITH PHONOLOGICAL KNOWLEDGE: TEACHING ARABIC TO SPEAKERS OF ENGLISH

By

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Second Language Instruction with Phonological Knowledge: Teaching Arabic to Speakers of English

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This study examined whether explicit instruction in phonetics and the phonologies of English and Arabic improved the sound production and recognition skills of adult native speakers of English learning Arabic as a foreign language. The study utilized an intervention strategy that introduced the letters and sounds of Arabic to two groups of adult English-speaking learners of Arabic.

Forty-six students of Arabic 101 at The University of Montana participated in the study as the control and experimental groups. The experimental group received instruction on the letters and sounds of Arabic with an introduction to phonetics and the phonologies of English and Arabic for a period of 20 classroom hours over a period of five weeks, whereas the control group received instruction on the letters and sounds of Arabic without the phonetics and English-Arabic phonology component for the same period of time.

The two groups took a sound recognition pre-test, sound recognition post-test, and sound production post-test. Independent two-sample t-Tests were used to analyze the data collected from the tests. Students in the experimental group responded to a survey to reflect on their views on value of the instruction on the phonetics and English-Arabic phonology component.

Data analysis resulted in important and statistically consistent differences in the sound production and sound recognition with the students in the experimental group achieving higher scores than the students in the control group, especially for those sounds that do not exist in English and for those that exist but have different allophonic distributions ($p < .001$). For the most part, students in the experimental group stated that it is important to include this type of instruction when teaching a second language.

The results of this study strongly suggest that including an introductory component to articulatory phonetics and the phonologies of the first and target languages improves sound production and sound recognition skills of adults learning a second language.

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To my three-month-old son, Emad,

who is in the process of acquiring the sounds of Arabic and English.

CHAPTER ONE

INTRODUCTION

Purpose Statement

The purpose of this study was to investigate whether explicit instruction in phonetics and the phonologies of English and Arabic would help English-speaking adults learning Arabic improve their Arabic sound production and recognition skills in a college level Arabic 101 course. This investigation examined whether teaching American learners of Arabic linguistic knowledge to transcribe, describe, and differentiate among the speech sounds of English and Arabic would help them produce and recognize the sounds of Arabic more accurately, leading to enhanced listening and speaking skills in Arabic as another language.

Background of the Study

Adult students learning a second language have mastered communicative competence in their first language. This communicative competence "includes knowledge the speaker-listener has of what constitutes appropriate as well as correct language behavior and also of what constitutes effective language behavior in relation to particular communicative goals" (Ellis, 1994, p. 13).

When adults learn a second language, they aspire to understand and be understood when they communicate orally with native speakers of the target language. Having a near-native pronunciation in the second language is desirable for second language learners. However, when adults start learning how to say words and phrases in a second language, they are likely to apply the rules of their native language. Using rules from one language and applying them to a new language could result in negative transfer.

Studies in applied linguistics show that there is disagreement among linguists on the role of formal classroom instruction in the acquisition of second language phonology. Some studies (Krashen & Terrell, 1983) suggest that classroom instruction does not seem to facilitate the acquisition of second language phonology. On the other hand, another study (Long, 1983) argues that classroom instruction plays an important role in the acquisition of second language phonology. Studies that support the latter claim argue that explicit instruction of language rules that is supported by examples and practice is more effective than implicit instruction (Ellis, 1993). The aim of this study was to explore the effectiveness of phonological knowledge on second language sound production and recognition skills.

Phonologies of English and Arabic

Speech sounds can be divided into two categories: vowels and consonants. Vowels are sounds during the articulation of which speech sounds are made "without any major obstruction or impediment to airflow" (Clark & Yallop, 1995, p. 13). On the other hand, consonants are sounds that are "made by exploiting the articulatory capabilities of the tongue, teeth, and lips in such a way that airflow through the mouth cavity is radically constricted or even temporarily blocked" (Clark & Yallop, 1995, p. 13).

The English language has a phonemic inventory of nine vowels and five diphthongs. Below is a list of the vowels of English with an example for each:

Monophthongs

1. /i/ front high unrounded tense as in bead
2. /ɪ/ front high unrounded lax as in bid
3. /e/ front mid unrounded lax as in bed

4. /æ/ front low unrounded as in bad
5. /ʌ/ central mid unrounded as in bud
6. /u/ back high rounded tense as in booed
7. /ʊ/ back high rounded lax as in good
8. /ɔ/ back mid rounded lax as in ball
9. /ɑ/ back low unrounded as in pod

Diphthongs

1. /eɪ/ glide from front mid to front high as in say
2. /aɪ/ glide from mid low to front high as in sigh
3. /ɔɪ/ glide from mid back to front high as in soy
4. /ɑʊ/ glide from low back to back high as in sow (noun)
5. /oʊ/ glide from upper mid back to back high as in so

On the other hand, the vowel system of Arabic consists of six vowels: three long and three short counterparts. The three long vowels are represented by three letters of the alphabet, while the three short vowels are represented by diacritical marks.

1. /i/ front high unrounded long as represented by the letter ـيـ in قَـديم /qaḍim/ (Old)
2. /ɪ/ front high unrounded short as represented by the mark ـِ in قَـدِم /qaḍɪm/ (Arrive)
3. /u/ back high rounded long as represented by the letter و in سوق /suq/ (Market)

4. /ʊ/ back high rounded short as represented by the mark ُ in سُق /sʊq/ (Drive – imperative)
5. /æ/ front low unrounded long as represented by the letter ا in سـامَح /sæmaн/ (Forgive)
6. /a/ central low unrounded short as represented by the mark َ in سَمَـح /samaн/ (Allow)

Five of the six vowels that exist in Arabic, namely /i/, /ɪ/, /u/, /ʊ/, and /æ/, have equivalent counterparts in English. The only vowel in Arabic that does not have an English equivalent is the central low unrounded short vowel /a/.

The English consonantal system consists of 24 phonemes. These are:

Stops

1. /p/ voiceless bilabial stop as in Paul
2. /b/ voiced bilabial stop as in ball
3. /t/ voiceless alveolar stop as in ten
4. /d/ voiced alveolar stop as in den
5. /k/ voiceless velar stop as in cat
6. /g/ voiced velar stop as in go

Fricatives

1. /f/ voiceless labio-dental fricative as in fine
2. /v/ voiced labio-dental fricative as in vine
3. /θ/ voiceless inter-dental fricative as in three
4. /ð/ voiced inter-dental fricative as in that
5. /s/ voiceless alveolar fricative as in sip
6. /z/ voiced alveolar fricative as in zip
7. /ʃ/ voiceless palato-alveolar fricative as in she
8. /ʒ/ voiced palato-alveolar fricative as in pleasure
9. /h/ voiceless glottal fricative as in he

Affricates

1. /tʃ/ voiceless palato-alveolar affricate as in chair
2. /dʒ/ voiced palato-alveolar affricate as in jar

Nasals

1. /m/ voiced bilabial nasal as in me
2. /n/ voiced alveolar nasal as in no
3. /ŋ/ voiced velar nasal as in sing

Liquids

1. /l/ voiced alveolar lateral liquid as in light
2. /ɹ/ voiced alveolar retroflexed liquid as in right

Semi-vowels

1. /w/ voiced velar semi-vowel as in Wes
2. /j/ voiced palatal semi-vowel as in yes

On the other hand, the consonantal system of the Arabic language has an inventory of 28 consonants. These are:

Stops

1. /b/ voiced bilabial stop
2. /t̪/ voiceless denti-alveolar stop
3. /t̪ˤ/ voiceless denti-alveolar pharyngeal stop
4. /d̪/ voiced denti-alveolar stop
5. /d̪ˤ/ voiced denti-alveolar pharyngeal stop
6. /k/ voiceless velar stop
7. /q/ voiceless uvular stop
8. /ʔ/ voiceless glottal stop

Fricatives

1. /f/ voiceless denti-alveolar fricative
2. /θ/ voiceless inter-dental fricative
3. /ð/ voiced inter-dental fricative
4. /ðˤ/ voiced inter-dental pharyngeal fricative
5. /s/ voiceless alveolar fricative

6. /sˤ/ voiceless alveolar pharyngeal fricative
7. /z/ voiced alveolar fricative
8. /ʃ/ voiceless palatal fricative
9. /ʒ / voiced palatal fricative
10. /x/ voiceless velar fricative
11. /ɣ/ voiced velar fricative
12. /ʜ/ voiceless epiglottal fricative
13. /ʢ/ voiced epiglottal fricative
14. /h/ voiceless glottal fricative

Nasals

1. /m/ voiced bilabial nasal
2. /n/ voiced alveolar nasal

Lateral

1. /l/ voiced alveolar lateral

Trill

1. /r/ voiced alveolar trill

Semi-vowels

1. /j/ voiced palatal semi-vowel
2. /w/ voiced labio-velar semi-vowel

A closer look at the consonantal systems of English and Arabic shows 13 phonemes exist in Arabic but not in English. These phonemes are: /t̪/, /t̪ˤ/, /d̪/, /d̪ˤ/, /q/, /ʔ/, /ðˤ/, /sˤ/, /x/, /ɣ/, /ʜ/, /ʢ/, and /r/. Moreover, some of the phonemes that exist in both languages do not actually have consistent phonological rules. This results in differences that restrict the occurrence of certain allophones. For example, the phoneme /l/ is realized as a velarized allophone [ɬ] at the end of English words, while it is realized as a non-velarized allophone [l] at the end of Arabic words.

Moreover, the allophonic distribution in these two languages is different. For example, the voiced bilabial stop [b] and the voiceless bilabial stop [p] occur in English as allophones of two phonemes, while they are allophones of the same phoneme in Arabic in that [p] occurs before voiceless consonants while [b] occurs elsewhere. Thus, the English and Arabic phonemic systems have many differences. This is very likely to create confusion for English-speaking learners of Arabic.

Problem Statement

There are many differences between the phonological structure of English and that of Arabic. For example, some sounds exist in the English language but not in Arabic, and vice versa. Another example, the allophonic distribution in the two languages is not the same: the voiceless bilabial stop [p] and the voiced bilabial stop [b] belong to two different phonemes in English, whereas, they are members of one phoneme in Arabic.

Even when the differences between English and Arabic sounds are slight, some of these differences render the speech of non-native speakers of Arabic to sound foreign. For instance, the English /t/ is produced with the tip of the tongue touching the alveolar ridge, the area that is between the hard palate and the upper front teeth, while the Arabic

/t̪/ is produced with the tip of the tongue touching the back of the front teeth. Native speakers of Arabic can easily hear this difference in the speech of American learners of Arabic, though they might not be able to explain the reason for this "foreign accent."

Similarly, when raising awareness of the production of speech sounds, we realize that native speakers of English pronounce the phoneme /l/ differently in the words *leaf* and *feel*. The former begins with a non-velarized /l/, while the latter ends with a velarized /l/. This feature is not universal and could be simply described in a phonological rule. Without having this phonological awareness, adult non-native speakers of English are very likely to produce versions of /l/ that are inconsistent with what is permissible by the phonology of English.

Thus, one of the major problems that adult language learners face is phonological. When adults learn to speak a second language, they tend to produce utterances that are governed by the phonology of their first language (Ellis, 1994; Tarone, 1987). More research is needed to examine whether explicit knowledge of phonetics and the phonologies of the first and target languages can improve the sound production and recognition skills of adults learning another language.

Research Questions

This study addressed the following central research question: How does student participation in an introductory course in phonetics and the phonologies of English and Arabic impact their sound recognition and sound production skills in Arabic as a foreign language as an instructional component of the Arabic 101 course?

This question was addressed through the following sub-questions:

1. Does student participation in an introductory course in phonetics and the phonologies of English and Arabic improve their sound recognition skills in Arabic as a foreign language?

2. Does student participation in an introductory course in phonetics and the phonologies of English and Arabic improve their sound production skills in Arabic as a foreign language?

3. What value do students in the experimental group place on studying the sounds of Arabic with the phonetics and English-Arabic phonology component?

Significance of the Study

Globalization has heightened Americans' awareness for the need to learn Arabic at near-competency levels. A number of American federal agencies have shown interest in hiring American citizens who speak Arabic fluently. However, Arabic in the United States is still a less commonly taught language, yet it is perceived as a strategically useful and critical language in the United States (Ryding, 2005). Moreover, the field of business and the importance of world trade between the United States and the Middle East necessitate the need for Americans who can speak Arabic fluently.

As this study aimed at providing pedagogical suggestions related to an instructional method of teaching Arabic to native speakers of English, decision-makers in education and curriculum developers would also find the results of this study of interest. The question that language institutes address today is not whether to teach Arabic or not, but how to best teach Arabic, including achieving native-like pronunciation.

Definition of Terms

Adult: is a college-level student who is at least 18 years old

Affricate: is a stop sound in which "the release of the constriction is modified in such a way as to produce a more prolonged period of frication after the release" (Ladefoged & Maddieson, 1996, p. 90).

Allophone: is a phonetic variant of a phoneme in a particular language.

Classroom Hour: is 50 minutes.

Contrastive Analysis Hypothesis (CAH): is a theory that suggests L2 learners depend entirely on their L1 in the process of their second language acquisition (Lado, 1957).

Contrastive Analysis (CA): is the application of Contrastive Analysis Hypothesis (CAH).

Diphthongs: are vowels "whose quality changes during their production" (Katamba, 1989, p. 12).

Fricative: is a sound during the articulation of which "the articulators are brought very close together leaving only a very narrow channel through which the air squeezes on its way out, producing turbulence in the process" (Katamba, 1989, p. 7).

Interlanguage: is "the systematic knowledge of an L2 (second language) which is independent of both these learner's L1 (first language) and the target language" (Ellis, 1994, p. 710).

L1: First Language; in this research, it is American English.

L2: Second Language; in this research, it is Modern Standard Arabic.

Language Transfer: is the "influence resulting from similarities and differences between the target language and any other language that has been previously (and perhaps imperfectly) acquired" (Odlin, 1989, p. 27).

Lateral: is a sound during the production of which "the air is obstructed by the tongue at a point along the centre of the mouth but the sides of the tongue are left low so that air is allowed to escape over one or both sides of the tongue" (Katamba, 1989, p. 7).

Monophthongs: are vowels "whose quality remains virtually unchanged throughout their production" (Katamba, 1989, p. 12).

Nasals: are sounds that "are produced with air escaping though the nose; the velum is lowered to allow access to the nasal tract" (Katamba, 1989, p. 7).

Native Language (NL): is the first language a child speaks.

Phoneme: is a sound unit that distinguishes meaning.

Phonetics: is the scientific study of speech.

Phonology: is the scientific study of the sound system of a particular language.

Modern Standard Arabic: is the dialect of Arabic used for academic purposes and by educated Arabs. It is the dialect that is taught in most second language institutions.

Segmental Features: are phonological features which are easily identified, such as consonants and vowels.

Second Language Acquisition (SLA): is a language learned in addition to the native language.

Semi-vowel: are "sounds that are like vowels in that they have no obstruction in the vocal tract, but unlike vowels in that they are not syllabic" (Ladefoged & Maddieson, 1996, p. 282).

Stops: are sounds during the articulation of which the "articulators come together and completely cut off the flow of air momentarily, then they separate abruptly" (Katamba, 1989, p. 6).

Suprasegmental Feature: is a speech feature that extends over more than one sound segment in an utterance, such as tone and stress.

Trill: is a sound during the articulation of which one speech organ vibrates against another, such the Spanish and Arabic r's.

Delimitations and Limitations

Though it is important to look at both the segmental and suprasegmental features when investigating phonological issues in second language acquisition, this study confined itself to the segmental features of the phonologies of Arabic and English.

Due to the small number of American learners of Arabic at The University of Montana, the results of this study cannot be generalizable to all adult English-speaking learners of Arabic. However, through the utilization of qualitative and quantitative data, this study provides information for improving and strengthening instruction in modern foreign languages, using Arabic as a test case.

As the researcher was the only native speaker of Arabic at The University of Montana with a graduate degree in linguistics, the researcher was the main instructor for the control and experimental groups during the intervention period. The researcher met each group for two hours every week for a period of five weeks, and another Arabic language instructor met with each group for the same period of time to work with the students on the sounds that the researcher had introduced. To minimize bias in the study, the researcher trained a team of three native speakers of Arabic to score the pre-tests and post-tests.

Summary

Adult second language learners tend to rely on their first language when learning a second language. This dependence results in foreign accent, which can negatively affect the production and recognition skills of the language learners.

The purpose of this study was to investigate whether or not an introductory course in phonetics and the phonologies of English and Arabic as part of an Arabic 101 course would help adult English-speaking learners of Arabic improve Arabic sound production and recognition. In other words, this investigation examined whether teaching American learners of Arabic linguistic knowledge to transcribe, describe, and differentiate among the speech sounds of English and Arabic would help them produce and recognize the sounds of Arabic more accurately, leading to enhanced listening and speaking skills in Arabic as a foreign language. By focusing the learners' attention to the production of speech sounds and providing them with skills to transcribe and describe the speech sounds of the native and second languages, did this have a positive effect on the production and recognition of the speech sounds of the second language?

CHAPTER TWO

REVIEW OF THE LITERATURE

This study investigated whether explicit instruction in phonetics and the phonologies of English and Arabic would help English-speaking adults learning Arabic improve their Arabic sound production and recognition skills in a college level Arabic 101 course. To provide background information related to this study, previous research in the area of second language acquisition, speech perception, speech production is reviewed. Before starting the review, a brief introduction to the Arabic language is presented.

The Arabic Language

Arabic is a South-Central Semitic language spoken by approximately 422 million speakers around the world (Microsoft Student, 2008). It is spoken as a first language (L1) in all the countries of the Arabian Peninsula (i.e., Bahrain, Iraq, Jordan, Kuwait, Lebanon, Oman, Palestine/Israel, Qatar, Saudi Arabia, Syria, United Arab Emirates and Yemen), as well as in the Arab countries of Africa (i.e., Algeria, Djibouti, Egypt, Libya, Mauritania, Morocco, Somalia, Sudan, and Tunisia). These countries are collectively referred to as the Arab World simply because their inhabitants speak Arabic as L1. Arabic is also spoken as a second language (L2) in some countries of Asia (e.g., Iran, Pakistan, India, and Indonesia) and Africa (e.g., Chad and Nigeria).

Arabic has much religious significance and is the religious language of Muslims in many parts of the world. Muslims must use Arabic when they pray. The Holy Qur'an, the sacred book of Muslims, was revealed to the Prophet Mohammad in Arabic. The Holy Qur'an is believed to be the word of God, and Muslims worldwide believe that to

understand the message of God in the Holy Qur'an, it must be read in Arabic (Hewer, 2006).

The language found in the Holy Qur'an is what is usually referred to as Classical Arabic and is calculated from approximately the sixth century. Classical Arabic was the language of public recitation and oral composition of poetry practiced by Arab tribes in the Arabian Peninsula. For many Arabs, Classical Arabic was a "highly developed formal oral art practiced by all Arab tribal groups and held in the highest esteem" (Ryding, 2005, p. 2). Since the seventh century, Classical Arabic underwent gradual linguistic changes. This resulted in what is referred to today as Modern Standard Arabic (MSA). Some of the main features that distinguish Classical Arabic from modern spoken Arabic are style, vocabulary, the use of word-final case, and mood inflection (Ryding, 2005, pp. 2-3).

Since the 1970s, MSA has been one of the official languages of the United Nations. When non-native speakers of Arabic learn Arabic as a foreign/second language, it is this dialect of Arabic that they are exposed to in language institutions in a number of countries, including the United States. For this reason, the researcher has chosen this particular dialect to be taught in this study.

The sound systems of both Arabic and English, as well as the writing systems of these two languages, differ. Arabic is written from right to left, and Arabic books are held with the spine on the right-hand side. There are 28 letters in the Arabic alphabet, which only represent consonants and long vowels, while short vowels are indicated with diacritical marks. These marks are not often used in ordinary writing, as native speakers can easily identify the intended words from the context and experience. Because of both

oral and written language differences, native speakers of English may confront more difficulty learning Arabic than other, more similar European languages.

Second Language Acquisition

In the early 1980s, Krashen proposed the Input Hypothesis to address the question of how second languages are acquired. He claimed that it is necessary (but not sufficient) that the learner understands and focuses on the meaning in the content and that linguistic input is a prerequisite to second language production.

Ladefoged (1967) claimed that people perceive sounds based on the way they produce those sounds and that "people cannot hear differences between sounds until after they have learned to make these differences" (p. 167). Of course, this process is not that simple. Levelt's (1983) Speech Production Model recognizes that speech production requires effort to access words from the lexicon, execution of a grammatical coding and then assigning a phonological coding. Ellis (1994) added that speech "production involves a constant trade-off of the competing demands on memory and control mechanism" (p. 132).

The Age Factor

Age is one of the main factors that affect the second language (L2) acquisition process. Romaine (1995) stated that the "age at which acquisition takes place, …, can have consequences for the level and kind of skills that develop" (p. 182). It is commonly believed that younger L2 learners acquire the language better than older learners. However, studies in language acquisition show that there are four propositions that are related to the effect of age on second language acquisition (Singleton & Ryan, 2004).

The first position states that L2 learners whose exposure to the L2 begins in childhood are globally more efficient and successful than older learners. This position is supported by the Critical Age Hypothesis (Singleton & Ryan, 2004), which states that there is a fixed period of years during which second language learners can achieve native-like proficiency and after which it is not possible to achieve.

A number of studies show that early age of entry into the country where the target language is used leads to successful second language acquisition (Singleton & Ryan, 2004). For example, Asher and Garcia (1969) conducted a study that involved 71 Cuban subjects who entered the US ranging in age from 7 to 19 years old. Thirty American students served as the control group. The subjects in both the groups were asked to utter sentences in English. The scores were based on a four-point scale, ranging between "native speaker" and "definite foreign accent." Most of the subjects who entered the US at an early age achieved a near-like accent. Asher and Garcia concluded that age can predict the success in second language acquisition.

The second position states that L2 learners whose exposure to the L2 begins in adolescence/early adulthood are globally more efficient and successful than younger learners. Singleton and Ryan (2004) suggested that, "Evidence favoring the hypothesis that older L2 learners are more successful than younger ones mostly comes from studies of learning as an outcome of formal instruction …" (p. 72). For example, Bongaerts, Planken, and Schils (1995) concluded that Dutch learners of English as a second language who started learning English after that age of 12 in instructional settings received the same ratings that native speakers of English achieved when they took an

English pronunciation test. This contradicts the previous hypothesis that the younger the learner is, the more successful he/she will be in second language acquisition.

The third position states that L2 learners whose exposure to the L2 begins in childhood are more efficient and successful than older learners only in some respects. Because of the contradicting results of the research referred to in the previous two sections, some researchers suggested that younger learners might be better than older learners in certain linguistic areas.

Fathman (1975) examined 140 subjects who came to the US and who spoke different L1s. The ages of the subjects ranged from 6 to 15 years old, and they were all exposed to English for the same period of time. The test had two sections: (a) phonology and (b) morphology and syntax. This study showed that subjects between the ages of 6 and 10 achieved significantly higher scores than subjects between the ages of 11 and 15 in the phonology test. On the other hand, subjects between the ages of 11 to 15 achieved significantly higher scores than the younger subjects on the grammar test. Snow & Hoefnagel-Höhle (1979) also found similar results, suggesting that pronunciation and grammar relate differently to the age factor in the domain of second language acquisition.

The fourth position states that adolescent/adult L2 learners are initially more efficient, but in the long run the younger a learner is when the L2 acquisition process begins, the more successful the outcome of that process will be. This hypothesis is based on Krashen, Long, and Scarcella's (1979) distinction between short-term and long-term attainment in L2 acquisition.

Thus, the role of age in second language learning is a complex area. However, there is agreement in most recent studies that it is one of the main factors that affect the process of second language acquisition.

Language Skills

Language is a means of communication that allows people to give and receive information, ideas, and thoughts. The four language skills—listening, speaking, reading, and writing—are crucial processes that can determine literacy growth and predict academic success. These four language skills or systems are based on many of the same mental processes. However, they overlap, and they are supportive of one another though language does not have one specific area in the brain that is solely responsible for language processing (Berninger & Richards, 2002).

According to the Motor Theory of Speech Perception, speech perception draws on speech production (Berninger & Richards, 2002). This is "because listeners are also speakers, they have stored representations of the articulatory features used to produce words" (Berninger & Richards, 2002, p. 118). Human beings require the integration of phonological, semantic, and syntactic processes to understand language. Writing builds on reading; speaking builds on listening; reading and writing build on listening and speaking (Berninger & Richards, 2002).

The human brain has the ability to encode and decode these continuous signals. The process of producing a spoken word involves activating Wernicke's area. This makes information about meaning and pronunciation ready for use by other parts of brain.

Knowledge of language is brought to consciousness when it is the object of attention (Berninger & Richards, 2002). This process requires dependence on memory and attention and results in linguistic awareness, which has three main forms: phonological (spoken word), morphological (word form), and orthographic (written word) (Berninger & Richards, 2002). One of the layers of phonological awareness is the subword level, which includes knowledge of phonemes, syllables, and subsyllabic units (Berninger & Richards, 2002). When a person begins to read, the different forms of linguistic awareness (i.e. phonological, morphological, and orthographic) interact with each other and create multiple connections. Following proper teaching strategies and with practice, these connections are established and automated.

Language Transfer

Language transfer is the "influence resulting from similarities and differences between the target language and any other language that has been previously (and perhaps imperfectly) acquired" (Odlin, 1989, p. 27). Language transfer has long been a controversial issue, and the debate on the influence of the first language (L1) on L2 is still on-going among applied linguists. Gass and Selinker (1994) stated that the "acceptance and/or rejection of language transfer as a viable concept has been related to the acceptance or rejection of the specific theory with which it has been associated" (p. 53).

Two opposite views regarding language transfer are Lado's (1957) and Dulay and Burt's (1974). Lado (1957) proposed the contrastive analysis hypothesis (CAH) and argued that L2 learners depend entirely on their L1 in the process of their second language acquisition (SLA). However, in 1974, the pendulum swung in the opposite

direction when Dulay and Burt argued that transfer had nothing to do with the errors committed by L2 learners. Currently, it is widely accepted that language transfer is one of many factors responsible for the errors committed by L2 learners. McCarthy (2001) stated that when "new languages are encountered, the existing representations of L1 are activated and reshape L2 incoming information" (p. 83).

Language transfer is the "incorporation of features of the L1 into the knowledge system of the L2 which the learner is trying to build" (Ellis, 1994). It occurs in one of two forms: (a) *positive transfer* or *facilitation*, which occurs where there is a similarity between L1 and L2, leading to something correct. This kind of transfer would assist the acquisition process, and (b) *negative transfer* or *interference*, which occurs where there is dissimilarity between L1 and L2, leading to something incorrect. This kind of transfer is claimed to impede the acquisition process (Ellis, 1994). However, it is not sufficient to focus on the production of errors, as many manifestations of transfer will be missed (Ellis, 1994).

One of the important manifestations of language transfer that is not detectable in production is avoidance. That is to say, learners might avoid using a certain linguistic structure in their L2 because this structure does not occur in their L1. In other words, language transfer might not surface as the production of errors but as avoiding the use of the different structure altogether. For example, Schachter (1974) found that because they produced far fewer relative clauses overall, Chinese and Japanese learners of L2 English made fewer errors in the use of relative clauses than Persian or Arabic learners (cited in Ellis 1994, p. 304). This important phenomenon was not considered by classical contrastive analysis (CA).

Contrastive Analysis Hypothesis (CAH)

The Beginnings of the CAH

The discussion of language transfer leads to the discussion of the Contrastive Analysis Hypothesis. In his famous book *Teaching and Learning English as a Foreign Language*, Fries (1945) stated that "The most efficient materials are those that are based upon a scientific description of the language to be learned, carefully compared with a parallel description of the native language of the learner" (p. 9). However, Selinker (1992) noted that "Fries is not known for having undertaken detailed CAs himself and that is most likely why histories of CA and SLA usually fail to mention him" (p. 9).

In 1957, Lado made CA explicit by stating that L1 plays a very important role in SLA. In his influential book *Linguistics Across Cultures*, Lado (as cited in Gass & Selinker, 1993) mentioned that

> … individuals tend to transfer the forms and meanings, and the distribution of forms and meanings of their native language and culture to the foreign language and culture—both productively when attempting to speak the language and to act in the culture, and receptively when attempting to grasp and understand the language and the culture as practiced by natives. (p. 53)

Lado (as cited in Ellis, 1994) also argued that

> … the student who comes into contact with a foreign language will find some features of it quite easy and others extremely difficult. Those elements that are similar to his native language will be simple for him, and those elements that are different will be difficult. (p. 306)

The above quotes outline the CAH in its classical form, a form that did not hold true in the face of empirical evidence, as discussed in the section *Decline of the CAH*.

Assumptions of the CAH

The CAH states that (1) a feature in the L2 is easy to learn if a similar feature exists in the learner's L1 and that (2) a feature in the L2 is difficult to learn if it is different from or does not exist in the learner's L1. The first scenario would result in a positive transfer, while the second one would result in a negative transfer.

Followers of this hypothesis describe language as habit formation and second language acquisition as developing a new set of habits. Errors in SLA are interpreted as the result of transferring the L1 "habits" to the L2. This is the view that behaviorists, such as Skinner, argued for in the 1950s and led to the development of the Audiolingual method of teaching.

Below are the six assumptions that form the basis for the CAH, summarized by Gass and Selinker (1994):

1. Contrastive analysis is based on a theory of language that claims that language is habit and that language learning involves the establishment of a new set of habits.
2. The major source of error in the production and/or reception of a second language is the native language.
3. One can account for errors by considering differences between the L1 and the L2.
4. A corollary to #3 is the greater the differences, the more errors that will occur.
5. What one has to do in learning a second language is to learn the differences. Similarities can be safely ignored as no new learning is involved. In other words, what is dissimilar between two languages is what must be learned.

6. Difficulty and ease in learning are determined respectively by differences and similarities between the two languages in contrast. (p. 60)

Purpose of CAH

Initially, the motivation for doing CA was to find the "best" teaching materials. This hypothesis suggested that before preparing teaching materials, one should compare L1 and L2. Fries' (1945) aim was to develop teaching materials, which were considered language specific, for adults that would help them master the sound and structural systems of L2 as automatic and unconscious "habits." This purpose is clear in Fries' preface to his book *Teaching and Learning English as a Foreign Language*: "language teaching is always a matter of teaching a specific 'foreign' language to students who have a specific 'native' language background" (p. vi).

As stated above, the birth of the CAH started with Lado's (1957) work, which was also developed for pedagogical purposes. Lado suggested that the native language and the target language should be compared in order to determine the similarities and differences between them. The comparison was not limited to the phonology, morphology, and syntax, but included even the culture of both languages. This theory purports that if L1 is similar to L2, learning will be facilitated. And conversely, if L1 is different from L2, learning will be more difficult, encountering negative transfer. The pedagogical purpose of the CAH was made clear by Lado (as cited in Selinker, 1992) in that "The most important new thing in the preparation of teaching materials is the comparison of native and foreign language and culture in order to find the hurdles that really have to be surmounted in the teaching" (pp. 9-10).

Procedures of CAH

Two languages can be compared in terms of their phonological systems, syntactic systems, vocabulary, writing systems, and cultural behavior. Below is the outline that is usually followed while doing CA (Gass & Selinker, 1993):

1. Description of the two languages;
2. Selection of certain areas or items of the two languages for detailed comparison;
3. Comparison (i.e., the identification of areas of difference and similarity);
4. Prediction (i.e., determining which areas are likely to cause errors); and
5. Testing the predictions.

In the field of phonology, Lado (cited in Selinker, 1992) suggested that at least three checks should be provided when comparing each phoneme; these are:

1. Does the L1 have a phonetically similar phoneme?
2. Are the variants (all allophones) of the phonemes similar in both languages?
3. Are the phonemes and their variants similarly distributed?

Positions in the CAH

The CAH can be interpreted as representing (a) a strong view and (b) a weak view. While the strong view states that predictions are made based on a comparison between L1 and L2, the weak view starts with the learners' errors and attempts to account for them by comparing L1 and L2. The weak view became part of Error Analysis, while the strong view quickly failed because some predictions did not appear in the actual learners' speech.

Decline of the CAH

The major reason behind the decline of the CAH is that it promised too much. Lado (as cited in Selinker, 1992) stated that language teachers "who understand this field [CA] will acquire insights and tools for … diagnosing student difficulties accurately" (p. 11). The unfulfillment of this *promise* made the CAH crash. When researchers began looking at the errors made by second language learners, they found that some of the errors came from neither the L1 nor the L2. There were errors that had not been predicted by the CAH, and there were predicted errors that did not occur.

The CAH was proposed at a time when language was viewed as a set of habits. This hypothesis was based on the behaviorist theory of language and language learning. When the behaviorist theory failed to explain several empirical facts of language development in the 1960s, the CAH also lost favor.

The CAH claimed that the starting point in the process of SLA (at all linguistic levels) is the learner's L1. Learners were believed to rely exclusively on their L1 in the process of SLA. However, this extreme position was attacked by Dulay and Burt (1974), who argued for another extreme position that claimed that language transfer did not have any role in creating Interlanguage (IL) (as cited in Selinker, 1992). Both these two extreme views failed in the face of empirical testing and evidence.

A number of studies suggest that language learning is systematic and that learners are not always guided by their L1 in their acquisition of a second language (White, 1989). Selinker (1972) introduced the term interlanguage (IL) to refer to the linguistic system that learners build on during the process of acquiring the target language. The CAH

promised too much and did not consider the "other factors," such as "language distance …, cognitive load, attention, sociolinguistic factors, etc." (McCarthy 2001, p. 83).

Ellis (1994) stated that "the problem with the CAH is that it is too simplistic and too restrictive." The problem with CA, as analyzed by Gass and Selinker (1993), is that "Classical CA statements provided predictive statements without careful descriptive and analytical studies of actual second language learners under clearly specified conditions." (p. 2).

Moreover, current studies show that there is difference between the acquisition of phonology and the acquisition of syntax in that the starting points in the acquisition of phonology and syntax are not the same (Brinton, 2000). Corder (as cited in Selinker, 1992) stated that

> (a) there is a difference between phonological and syntactic IL learning; (b) for the acquisition of IL phonology, there is 'successive restructuring' from the NL [Native Language]; and (c) for the acquisition of syntax, the starting point is not the NL but rather a 'universal' starting point which is something like a 'universal core.' (p. 34)

In the area of phonology, current studies show that the learners' L1 plays an important role that affects their production of speech in the L2. Ellis (1994) stated that there is "a widespread recognition that transfer is more pronounced at the level of the sound system than at the level of syntax" (p. 316). However, one of the attempts to experimentally test predictions made by CA on the phonological level was conducted in 1960 by Nemser (as cited in Selinker, 1992), who concluded that "in terms of the

learning of phonological units, classical CA predictions can sometimes lead to correct results and sometimes to incorrect results" (p. 177).

Yet, Gass and Selinker (1993) argued that Lado did not overlook this difficulty in that he made it clear that the "list of problems resulting from the comparison of the foreign language with the native language … must be considered a list of hypothetical problems until final validation is achieved by checking it against the actual speech of students" (p. 2).

Reconsidering the CAH

Many attempts to discard the entire CAH were unsuccessful. Selinker (1992) referred to such attempts as the "baby and bathwater syndrome" (p. 3). He believed that the attempts to get rid of CAH have failed and that there is a need to go back to CAH. He stated that "it is unfortunate that the extreme claims of CA as SLA prediction led many to abandon CA entirely because of those cases when predictions of errors, especially, did not come true," and he argued that "it is a fact that CA predictions sometimes work" and that "SLA thought has never abandoned some fundamental insights inherent in CA" (pp. 10-12).

However, in response to the question to what extent can CAH succeed in predicting learners' errors, Selinker (1992) wrote:

> Learners do not always transfer to their IL what is in their NL …, and common sense states that learners may know things important to SLA (e.g., universal grammatical knowledge, knowledge from a third language, cognitive abilities) that cannot be directly related to their NL competence. (p. 14)

Thus, language transfer is a complex phenomenon, and mere comparison between the L1 and the L2 cannot help us understand the role that the L1 plays in SLA. Gass and Selinker (1994) stated that "there are other factors that affect second language learning development and that the role of the native language is far more complex than the simple 1:1 correspondence implied by the early version of the CAH" (p. 64).

Khattab's work (1998) combines childhood bilingualism, phonology, and sociolinguistics, "three areas that are rarely dealt with in combination." She concluded that "there are other important reasons" for transfer beside phonology, such as sociolinguistic factors.

Dealing with those "other factors" goes beyond the scope of this paper. In fact, it is not easy to detect transfer because, as Ellis (1994) puts it, it is sometimes 'apparent' and sometimes it is not. McCarthy (2001) commented that "perhaps the most stubborn issue that refuses to go away in SLA is the influence of the first or some other language on the acquisition of a new language" (p. 74). He added that "while there is no doubt that a simple cross-linguistic comparison of two languages is insufficient to explain and predict performance in a second language, accounting for features of second language performance is by no means easy" (p. 74). Selinker (1992) concluded that "we need to reinforce the view that one dimension of Lado was indeed deeply empirical and that this has by and large been missed in the critical literature" (p. 23).

Summary

Many recent studies (for a comprehensive revision see Ellis, 1994) support the view that L1 does have an impact on L2, but, as Selinker (1992) reported, "not in the classical CA absolute 'all or nothing' fashion" (p. 182). This issue is of interest to

language teachers and educational researchers. Selinker (1992) stated that "knowledge of the NL plays an extensive role in SLA; evidence … strongly supports this view, which can now be stated as SLA fact" (p. 171). There is "no theory of L2 acquisition that ignores the learner's prior linguistic knowledge that can be considered complete" (Ellis 1994, p. 300). However, language transfer is a complex phenomenon that cannot be explained by just one theory. It is "indeed a real and central phenomenon that must be considered in any full account of the second language process" (Gass & Selinker, 1993, p. 7).

Recent studies in SLA agree that "contrastive analysis is still an essential tool in transfer research, particularly if it is supplemented by comparisons of learners with different language backgrounds" (Ellis, 1994, p. 342). CA does not empirically show the impact that L1 has on L2 at the level of syntax, but it succeeds in providing an explanation for transfer at the level of phonology. A number of studies suggest that the CAH should not be abandoned, but it should be carefully modified (Ellis, 1994).

CHAPTER THREE

METHODOLOGY

This study examined whether explicit instruction in phonetics and the phonologies of English and Arabic improved the sound production and recognition skills of adult native speakers of English learning Arabic as a foreign language. The study utilized an intervention strategy that introduced the letters and sounds of Arabic to two groups of adult English-speaking learners of Arabic. The experimental group studied the sounds and letters of Arabic with an introduction to phonetics and the phonologies of English and Arabic, while the control group studied the sounds and letters of Arabic without the phonetics and the phonologies components.

Research Design

The current study utilized qualitative and quantitative components in a mixed method at The University of Montana, where Arabic is taught as a foreign language. The experimental group was taught Arabic with an introductory course to phonetics and the phonologies of Arabic and English, while the control group was taught Arabic without the treatment. Qualitative data were collected to record students' attitudes towards the intervention, while quantitative methods were used to compare achievements test scores between the experimental group and control group.

Concurrent Triangulation Strategy

This study used concurrent triangulation strategy in which qualitative and quantitative data are combined to overcome the limitations involved in using either method separately (Creswell, 2003). While sound recognition and production are often interpreted using qualitative methods, achievement is often based on quantitative

measures of students' progress. Thus, qualitative and quantitative methods are both important to determine oral communication and L2 acquisition achievement. As noted by Creswell (2003, p. 217), a study that follows the concurrent triangulation strategy is "advantageous because it … can result in well-validated and substantiated findings."

Triangulation in this study consisted of mixing data collection tools used in qualitative and quantitative research designs. The researcher used test scores and feedback from students in the experimental group on the intervention.

Intervention

The researcher implemented a 20-hour course on the sounds and letters of the Arabic language: (a) with phonetics and the phonologies of English and Arabic to introduce the students in the experimental group, and (b) without these linguistic components to the students in the control group. The researcher met each group for 2 hours a week for 5 weeks during the Fall 2007 semester at The University of Montana to teach the intervention course, and the main Arabic first year Arabic language instructor met the students for 2 hours a week for 5 weeks to help the students work on drills and activities.

The researcher used *Alif Baa with DVDs: Introduction to Arabic Letters and Sounds* by Brustad, Al-Batal, and Al-Tonsi (2004) for instruction with both the groups. The students in the experimental group had access to a website where the researcher posted information on phonetics and the phonologies of English and Arabic tailored to be taught with the examples in the *Alif Baa* textbook. Throughout the course, the control group studied and worked on activities related to the sounds of Arabic, as explained in

the *Alif Baa* textbook. This text does not include any phonological foundation of the sound systems of English and Arabic.

Students in the experimental group studied the sounds and letters of Arabic from the *Alif Baa* textbook and were exposed to the phonological differences and similarities between the sound systems of these two languages and worked on activities related to sound recognition and production. On the other hand, students in the control group studied the sounds and letters of Arabic from the *Alif Baa* textbook and worked on activities and drills that focus on word repetition.

Due to the fact that the researcher was the only qualified native speaker of Arabic with an advanced degree in linguistics to teach English-Arabic contrastive phonology at The University of Montana, he taught the intervention course. The main first year Arabic teacher helped in meeting each group for 2 hours a week to practice with them what the researcher had introduced. The students in the experimental group learned the sounds and letters of Arabic through phonetics and the phonologies of English and Arabic and participated in classroom activities: sound production, sound recognition, and sound repetition. The students in the control group learned the sounds and letters of Arabic without phonological explanations and participated in classroom activities: sound production, sound recognition, and sound repetition. The researcher, other Arabic instructor, and students used English as the language of instruction.

Qualitative Components of the Study

The dominant research design in this study is quantitative. However, qualitative data were collected to provide insight into how the students who received instruction on the sounds and letters of Arabic with the phonetics and phonologies component perceived

this type of instruction. The students responded to the survey using an online format. Also, informal classroom observations conducted by another Arabic language instructor were also collected in examined.

Quantitative Components of the Study

Pre- and post-testing data measured Arabic sound recognition and production for both the control and experimental groups. Both the groups completed the sound recognition pre-test at the beginning of the course. At the end of intervention (5 weeks and a total of 20 classroom hours), both groups repeated the same test and also a sound production test. Both the pre- and post-test were completed online, and the results were recorded in an online form that the researcher developed. The t-Test was used to compare the test scores of students in the experimental and control groups.

Research Questions

The study addressed the following central research question: How does student participation in an introductory course on phonetics and the phonologies of English and Arabic impact their sound recognition and sound production skills when learning Arabic as a foreign language?

This question was addressed through the following sub-questions:

1. Does student participation in an introductory course on phonetics and the phonologies of English and Arabic improve their sound recognition skills in Arabic as a foreign language?

This question was addressed through quantitative analyses of achievement data collected from the experimental and control groups. Both groups took pre-treatment and post-treatment Arabic tests to assess the achievement they gained during the intervention.

Mean scores from each group were compared to determine whether the intervention correlated to any experimental differences between the two groups.

2. Does student participation in an introductory course on phonetics and the phonologies of English and Arabic improve their sound production skills in Arabic as a foreign language?

This question was addressed through quantitative analyses of achievement data collected from the experimental and control groups. Because both the groups scored poorly on the sound recognition pre-test due to the fact that none of the students was exposed to Arabic literacy before, the researcher did not conduct a sound production pre-test. At the end of intervention, both groups took post-treatment sound production Arabic tests to examine difference in scores. Mean scores from each group were compared to determine whether the intervention correlated to any experimental differences between the two groups.

3. What value do students in the experimental group place on studying the sounds of Arabic with the phonetics and English-Arabic phonology component?

This question was answered through a discussion of qualitative data by having students in the experimental group respond anonymously to an online survey. The main question asked was whether the intervention helped the students improve their listening and speaking skills in Arabic or not. The students were given the option of commenting on what they thought was relevant.

Population and Sample

The population for this study consisted of the Arabic language students at The University of Montana in the Fall 2007 semester enrolled in the course Arabic 101. All

the subjects spoke American English as their first language. The population consisted of 46 students divided into two sections: 24 students in section A and 22 students in section B.

The students' names do not appear in the study and remain confidential with the researcher. The researcher randomly selected section A as the control group and section B as the experimental group.

Variables

The independent variable was the type of instruction (learning Arabic with phonological knowledge or learning Arabic without phonological knowledge). The dependent variable was the achievement scores. Achievement was measured by student test scores on the pre-test and post-test. The scores were expressed as percentages and provided ratio level of data.

Hypotheses

Null Hypothesis: Sound Production

H_1: There will be no experimentally important or consistent mean difference ($X_1 - X_2$) between the gains in achievement in sound production test scores (X_1) of the students who participated in the phonetics and phonology course and the gains in achievement test scores in sound production (X_2) of the students who did not attend the course on phonetics and phonology.

Null Hypothesis: Sound Recognition

H_2: There will be no experimentally important or consistent mean difference ($Y_1 - Y_2$) between the gains in achievement in sound recognition test scores (Y_1) of the students who participated in the phonetics and phonology course and the gains in

achievement test scores in sound recognition (Y_2) of the students who did not attend the course on phonetics and phonology (i.e., the control group).

Data Collection

After the intervention, students in the experimental group responded anonymously to an online survey to collect information on whether they thought the intervention helped them produce and recognize the sounds of Arabic. The students were allowed to provide comments and suggestions.

Both the pre- and post-tests were conducted using an online assessment developed by the researcher. Students were able to take the tests at home using a computer and access to the internet. The pre-test, which consisted of the sound recognition component, helped define the level of the learners' performance of these skills in Arabic prior to the intervention. Since both the groups performed poorly on the test, the researcher did not conduct a sound production pre-test. The post-test, which consisted of both sound recognition and sound production, provided data regarding the difference in achievement for the control and experimental groups.

The sound recognition test was done online and consisted of a list of sets of minimal pair words. The audio files were recorded at 44,000 Hz and 16 Bit. Informal feedback from the students shows that the recordings were clear and of high quality. A minimal pair is a set of two words that differ only by one sound in the same position, such as *sit* and *sat*. The words in each pair were similar in all the sounds except one sound that is known to cause pronunciation difficulties as suggested in Huthaily (2003). Only one of the two words was recorded. The students listened to the word and were

asked to select the word they heard. Students could also select "I don't know/I am not sure."

The sound production test consisted of lists of words to be read aloud by the subjects and recorded digitally. The students used a number of audio recording programs, such as Sony SoundForge and a built-in feature in Windows Movie Maker. The researcher a link to a free audio recording program (Audacity) for Windows and Mac users. The words in the test were selected in such a way that they represented each sound in the Arabic language in word-initial, word-medial, and word-final positions.

Three native speakers of Arabic worked with the researcher to score the pre- and post-tests. The researcher provided basic training in International Phonetic Alphabet (IPA) transcription and necessary instructions to the Arabic speakers.

Data Analysis

Qualitative Analysis

The researcher examined the responses of the subjects in the experimental group on the intervention evaluation forms. The survey provided the researcher with qualitative data on whether the subjects thought the intervention helped them produce and recognize the sounds of Arabic or not.

Quantitative Analysis

The sound production test was digitally recorded and transcribed. Three adult native speakers of Arabic who speak English as a second language and who reside in Missoula, MT, served as raters in this study. It was essential to this study that the raters: (a) were born in an Arabic-speaking country, (b) came to the United States after the age of puberty, and (c) use Arabic on a daily basis. The three raters determined whether the

subjects produced the target sound intelligibly or not. An interrater reliability test was conducted to assess rater consistency and to have confidence in the rating process. The achievement scale was a 0-1 point scale to measure students' degree of comprehension and their abilities to produce and recognize the target sounds.

An independent two-sample t-Test was used to determine if there was an experimental important difference between the means of the two groups in the pre-test and post-test. Experimental importance was defined as a mean difference of 5% or more between the experimental group and control group, while experimental consistency was set at the $\alpha = .05$ level.

Role of Researcher

The researcher was the intervention instructor due to the fact that he is the only native speaker of Arabic at The University of Montana who was qualified to teach a course on contrastive phonology of English and Arabic. Precedence for using the researcher as the intervention exists in other language studies (Penjwini, 1993).

To minimize the level of bias in the study, the surveys and pre- and post-tests were done online, and a team of three native speakers of Arabic scored the sound production pre- and post-tests. The researcher applied interrater reliability to their results. Finally, the researcher received and analyzed all data, interpreted results in relation to the larger body of research, and made recommendations for further research.

Ethical Issues Pertaining to Participants

The researcher does not foresee any potential danger that may harm the participants in this study. Participation was voluntary. Formal consent of all subjects was sought upon approval by the Institutional Review Board at The University of Montana.

The researcher officially informed the subjects of their right to discontinue involvement in the study at any time.

Summary

This mixed method study utilized the qualitative design through the use of surveys to collect information on how students in the experimental group evaluated the intervention and quantitative design through the use of pre- and post-tests to measure the subjects' Arabic sound production and recognition performance. The experimental group studied the sounds and letters of Arabic with an introduction to phonetics and the phonologies of English and Arabic, while the control group studied the sounds and letters of Arabic without the phonetics and phonology component. The students in both the groups received intervention for the same amount of time. The researcher collected data through test scores and surveys.

CHAPTER FOUR

ANALYSIS

This study investigated whether an introductory course in phonetics and the phonologies of English and Arabic helps adult English-speaking learners of Arabic improve Arabic sound production and recognition. The first goal examined whether student participation in an introductory course to phonetics and the phonologies of English and Arabic would improve their sound recognition skills in Arabic as a foreign language. The second goal examined whether student participation in an introductory course to phonetics and the phonologies of English and Arabic would improve their sound production skills in Arabic as a foreign language. The third goal explored the value an introductory course in phonetics and the phonologies of English and Arabic have for native speakers of English learning Arabic as a foreign language. To address three research questions, a mixed method, dominant quantitative study was conducted. A quantitative quasi-experimental design was employed to analyze the data. A survey gathered qualitative information.

Subjects

There were 50 students who self-selected into two groups of 25 students in first year Arabic at The University of Montana in the Fall 2007 semester. Two students were not native speakers of English, and two students did not take both the pre- and post-tests. Thus, the total number of the subjects in this study was 46 students.

The researcher randomly assigned the first group to be the control group and the second group to be the experimental group. There were 14 male students and 8 female students in the experimental group, for a total of 22 subjects. In the control group, there

were 15 male students and 9 female students, for a total of 24 subjects. One student in the experimental group and two in the control group served in the US army in Iraq for a period of three to six months. None of the students had studied Arabic before the intervention was administered.

Each subject in the control group and experimental group took a sound recognition pre-test in Arabic. All the students in each group scored zero in the sound recognition pre-test, indicating initial equivalence with no background knowledge of Arabic. The researcher decided not to conduct a sound production pre-test because all the subjects were not exposed to Arabic before and scored equally on the sound recognition pre-test.

Intervention

Students in the experimental group and control group received instruction on the sounds and letters of Arabic for a period of five weeks. Instruction was provided by the researcher, as well as the students' main Arabic language instructor. The researcher introduced the letters and sounds of Arabic on Mondays and Wednesdays, and the instructor worked with the students on drills and activities on Tuesdays and Thursdays. Each instructor met the students for an hour each day for a total of 20 classroom hours at the end of the intervention.

The students in the control group studied from *Alif Baa with DVDs: Introduction to Arabic Letters and Sounds* by Kristen Brustad, Mahmoud Al-Batal, and Abbas Al-Tonsi (2004). The textbook introduced the students to the letters and sounds of Arabic without the use of phonological terms or discussions of the main phonemic rules that govern the pronunciation of the consonants of Arabic compared to the pronunciation of

the English consonants. However, the textbook had many repetition and dictation drills and activities. The textbook had an accompanying DVD that the students used for listening activities. The textbook covers the letters of Arabic based on their alphabetical order.

The students in the experimental group studied from the same textbook, as well as a website that the researcher developed for the students in the experimental group to use besides the *Alif Baa* textbook. The content on the website addressed the following topics: (a) International Phonetic Alphabet, (b) quick introduction to the letters of Arabic, (c) brief introduction to speech mechanism, (d) terminology used when describing speech sounds, (e) the vowels of English, (f) the vowels of Arabic, (g) the consonants of English, and (h) the consonants of Arabic, which were organized based on their manner of articulation. The website provided descriptions of the sounds of Arabic in terms of their place and manner of articulations and the status of the vocal folds during the production of the sound. There was an illustration for each consonant showing the areas of the mouth involved in the production of the sound. There were also phonemic transcriptions for the examples provided in the *Alif Baa* textbook.

Pre-test

The pre-test consisted of two sections: sound recognition and sound production. Students took both tests online and submitted data to the researcher's online service. Below is a description of each section with analysis of the results.

Sound Recognition

The sound recognition pre-test consisted of 40 items that tested the students' abilities to recognize certain consonants (questions 1 to 36), with three items (questions

37 to 39) that tested their abilities to recognize the vowels of Arabic, and one question (question 40) to select the level of difficulty of the test on a scale of 1 (very easy) to 5 (very hard). Each of the first 36 items presented the students with a minimal pair that contrasted two close sounds in Arabic. Those minimal pairs were selected in a way that tested the students' abilities to recognize the close consonants in three positions: word-initial, word-medial, and word-final. The students were asked to click on a speaker icon next to the minimal pair. Only one word was recorded. The students were instructed to select the word they heard. If the students were not sure or did not know, they were asked to select the "I don't know" option.

An independent two-sample t-Test was used to analyze the data collected from the sound recognition post-test. The control group scored an average of 85% on the sound recognition post-test, while the experimental group scored an average of 95% on the same test. This results in a mean difference of 10%, with the students in the experimental group scoring higher than the students in the control group. Below is a detailed examination of the items on the test with the results.

1) Voiceless glottal fricative /h/ vs voiceless epiglottal fricative /ʜ/

Items 3, 15, and 27 tested the students' abilities to recognize the difference between the voiceless glottal fricative /h/ and the voiceless epiglottal fricative /ʜ/ in three positions, word-initially, word-medially, and word-finally, respectively. Students in the experimental and control groups scored equally in that all the students in each group selected the "Not Sure" option. See table 1.

Table 1

Voiceless glottal fricative /ħ/ vs voiceless epiglottal fricative /ʜ/

No	Arabic	IPA	Correct	Control		Experimental	
				#	Percentage	#	Percentage
1	هَجَر	haʒar		0	0%	0	0%
2	حَجَر	ʜaʒar	X	0	0%	0	0%
	Not Sure			24	100%	22	100%
1	بَحْر	baʜr		0	0%	0	0%
2	بَهْر	bahr	X	0	0%	0	0%
	Not Sure			24	100%	22	100%
1	نوح	nuʜ	X	0	0%	0	0%
2	نوه	nuh		0	0%	0	0%
	Not Sure			24	100%	22	100%

2) Voiced denti-alveolar stop /d̪/ vs voiced denti-alveolar velarized stop /d̪ˤ/

Items 8, 20, and 32 tested the students' abilities to recognize the difference between the voiced denti-alveolar stop /d̪/ and the voiced denti-alveolar velarized stop /d̪ˤ/ in three positions, word-initially, word-medially, and word-finally, respectively. Students in the experimental and control groups scored equally in that all the students in each group selected the "Not Sure" option. See table 2.

Table 2

Voiced denti-alveolar stop /d̪/ vs voiced denti-alveolar velarized stop /d̪ˤ/

No	Arabic	IPA	Correct	Control		Experimental	
				#	Percentage	#	Percentage
1	دار	d̪ær		0	0%	0	0%
2	ضـار	d̪ˤær	X	0	0%	0	0%
	Not Sure			24	100%	22	100%
1	أداه	ʔad̪æh	X	0	0%	0	0%
2	أضـاه	ʔad̪ˤæh		0	0%	0	0%
	Not Sure			24	100%	22	100%
1	سـاد	sæd̪	X	0	0%	0	0%
2	سـاض	sæd̪ˤ		0	0%	0	0%
	Not Sure			24	100%	22	100%

3) Voiced velar fricative /ɣ/ vs voiceless velar stop /k/

Items 12, 24, and 36 tested the students' abilities to recognize the difference between the voiced velar fricative /ɣ/ and the voiceless velar stop /k/ in three positions, word-initially, word-medially, and word-finally, respectively. Students in the experimental and control groups scored equally in that all the students in each group selected the "Not Sure" option. See table 3.

Table 3

Voiced velar fricative /ɣ/ vs voiceless velar stop /k/

No	Arabic	IPA	Correct	Control		Experimental	
				#	Percentage	#	Percentage
1	غـاب	ɣæb	X	0	0%	0	0%
2	كـاب	kæb		0	0%	0	0%
	Not Sure			24	100%	22	100%
1	مـغيـال	mɪɣjæl		0	0%	0	0%
2	مـكيـال	mɪkjæl	X	0	0%	0	0%
	Not Sure			24	100%	22	100%
1	سـميـك	samik	X	0	0%	0	0%
2	سـميـغ	samiɣ		0	0%	0	0%
	Not Sure			24	100%	22	100%

4) Voiced denti-alveolar velarized stop /d̪ˤ/ vs voiced inter-dental velarized fricative /ðˤ/

Items 5, 17, and 29 tested the students' abilities to recognize the difference between the voiced denti-alveolar velarized stop /d̪ˤ/ and the voiced inter-dental velarized fricative /ðˤ/ in three positions, word-initially, word-medially, and word-finally, respectively. Students in the experimental and control groups scored equally in that all the students in each group selected the "Not Sure" option. See table 4.

Table 4

Voiced denti-alveolar velarized stop /d̪ˤ/ vs voiced inter-dental velarized fricative /ðˤ/

No	Arabic	IPA	Correct	Control		Experimental	
				#	Percentage	#	Percentage
1	ضاع	d̪ˤæʕ	X	0	0%	0	0%
2	ظاع	ðˤæʕ		0	0%	0	0%
	Not Sure			24	100%	22	100%
1	وضع	waḍˤʕ	X	0	0%	0	0%
2	وظع	waðˤʕ		0	0%	0	0%
	Not Sure			24	100%	22	100%
1	أبيض	ʔabjad̪ˤ		0	0%	0	0%
2	أبيظ	ʔabjaðˤ	X	0	0%	0	0%
	Not Sure			24	100%	22	100%

5) Voiceless alveolar fricative /s/ vs voiceless alveolar velarized fricative /sˤ/

Items 7, 19, and 31 tested the students' abilities to recognize the difference between the voiceless alveolar fricative /s/ and the voiceless alveolar velarized fricative /sˤ/ in three positions, word-initially, word-medially, and word-finally, respectively. Students in the experimental and control groups scored equally in that all the students in each group selected the "Not Sure" option. See table 5.

Table 5

Voiceless alveolar fricative /s/ vs voiceless alveolar velarized fricative /sˤ/

No	Arabic	IPA	Correct	Control		Experimental	
				#	Percentage	#	Percentage
1	سيف	sajf		0	0%	0	0%
2	صيف	sˤajf	X	0	0%	0	0%
	Not Sure			24	100%	22	100%
1	مسرور	masrur	X	0	0%	0	0%
2	مصرور	masˤrur		0	0%	0	0%
	Not Sure			24	100%	22	100%
1	قوس	qaws	X	0	0%	0	0%
2	قوص	qawsˤ		0	0%	0	0%
	Not Sure			24	100%	22	100%

6) Voiceless epiglottal fricative /ʜ/ vs voiceless velar fricative /x/

Items 4, 16, and 28 tested the students' abilities to recognize the difference between the voiceless epiglottal fricative /ʜ/ and the voiceless velar fricative /x/ in three positions, word-initially, word-medially, and word-finally, respectively. Students in the experimental and control groups scored equally in that all the students in each group selected the "Not Sure" option. See table 6.

Table 6

Voiceless epiglottal fricative /ʜ/ vs voiceless velar fricative /x/

No	Arabic	IPA	Correct	Control		Experimental	
				#	Percentage	#	Percentage
1	حمار	ʜɪmær		0	0%	0	0%
2	خمار	xɪmær	X	0	0%	0	0%
	Not Sure			24	100%	22	100%
1	بحر	baʜr		0	0%	0	0%
2	بخر	baxr	X	0	0%	0	0%
	Not Sure			24	100%	22	100%
1	مناخ	mʊnæx	X	0	0%	0	0%
2	مناح	mʊnæʜ		0	0%	0	0%
	Not Sure			24	100%	22	100%

7) Voiced velar fricative /ɣ/ vs voiced velar stop /g/

Items 6, 18, and 30 tested the students' abilities to recognize the difference between the voiced velar fricative /ɣ/ and the voiced velar stop /g/ in three positions, word-initially, word-medially, and word-finally, respectively. Students in the experimental and control groups scored equally in that all the students in each group selected the "Not Sure" option. See table 7.

Table 7

Voiced velar fricative /ɣ/ vs voiced velar stop /g/

No	Arabic	IPA	Correct	Control		Experimental	
				#	Percentage	#	Percentage
1	غريب	ɣarib	X	0	0%	0	0%
2	جريب	garib		0	0%	0	0%
	Not Sure			24	100%	22	100%
1	مغرب	maɣrıb	X	0	0%	0	0%
2	مجرب	magrıb		0	0%	0	0%
	Not Sure			24	100%	22	100%
1	بلغ	balaɣ	X	0	0%	0	0%
2	بلج	balag		0	0%	0	0%
	Not Sure			24	100%	22	100%

8) Voiceless glottal stop /ʔ/ vs voiced epiglottal fricative /ʕ/

Items 1, 13, and 25 tested the students' abilities to recognize the difference between the voiceless glottal stop /ʔ/ and the voiced epiglottal fricative /ʕ/ in three positions, word-initially, word-medially, and word-finally, respectively. Students in the experimental and control groups scored equally in that all the students in each group selected the "Not Sure" option. See table 8.

Table 8

Voiceless glottal stop /ʔ/ vs voiced epiglottal fricative /ʕ/

No	Arabic	IPA	Correct	Control		Experimental	
				#	Percentage	#	Percentage
1	أمل	ʔamal	X	0	0%	0	0%
2	عمل	ʕamal		0	0%	0	0%
	Not Sure			24	100%	22	100%
1	سأي	saʔj		0	0%	0	0%
2	سـعـي	saʕj	X	0	0%	0	0%
	Not Sure			24	100%	22	100%
1	نـوع	nawʕ	X	0	0%	0	0%
2	نـوء	nawʔ		0	0%	0	0%
	Not Sure			24	100%	22	100%

9) Voiceless uvular stop /q/ vs voiceless velar stop /k/

Items 11, 23, and 35 tested the students' abilities to recognize the difference between the voiceless uvular stop /q/ and the voiceless velar stop /k/ in three positions, word-initially, word-medially, and word-finally, respectively. Students in the experimental and control groups scored equally in that all the students in each group selected the "Not Sure" option. See table 9.

Table 9

Voiceless uvular stop /q/ vs voiceless velar stop /k/

No	Arabic	IPA	Correct	Control		Experimental	
				#	Percentage	#	Percentage
1	قلب	qalb		0	0%	0	0%
2	كلب	kalb	X	0	0%	0	0%
	Not Sure			24	100%	22	100%
1	مكلوب	maklub		0	0%	0	0%
2	مقلوب	maqlub	X	0	0%	0	0%
	Not Sure			24	100%	22	100%
1	أفاق	ʔafæq	X	0	0%	0	0%
2	أفاك	ʔafæk		0	0%	0	0%
	Not Sure			24	100%	22	100%

10) Voiced inter-dental velarized fricative /ðˤ/ vs voiced inter-dental fricative /ð/

Items 9, 21, and 33 tested the students' abilities to recognize the difference between the voiced inter-dental velarized fricative /ðˤ/ and the voiced inter-dental fricative /ð/ in three positions, word-initially, word-medially, and word-finally, respectively. Students in the experimental and control groups scored equally in that all the students in each group selected the "Not Sure" option. See table 10.

Table 10

Voiced inter-dental velarized fricative /ðˤ/ vs voiced inter-dental fricative /ð/

No	Arabic	IPA	Correct	Control		Experimental	
				#	Percentage	#	Percentage
1	ظل	ðˤal		0	0%	0	0%
2	ذل	ðal	X	0	0%	0	0%
	Not Sure			24	100%	22	100%
1	مظاق	maðˤæq	X	0	0%	0	0%
2	مذاق	maðæq		0	0%	0	0%
	Not Sure			24	100%	22	100%
1	شعوذ	ʃaʕwað	X	0	0%	0	0%
2	شعوظ	ʃaʕwaðˤ		0	0%	0	0%
	Not Sure			24	100%	22	100%

11) Voiceless velar fricative /x/ vs voiceless velar stop /k/

Items 2, 14, and 26 tested the students' abilities to recognize the difference between the voiceless velar fricative /x/ and the voiceless velar stop /k/ in three positions, word-initially, word-medially, and word-finally, respectively. Students in the experimental and control groups scored equally in that all the students in each group selected the "Not Sure" option. See table 11.

Table 11

Voiceless velar fricative /x/ vs voiceless velar stop /k/

No	Arabic	IPA	Correct	Control		Experimental	
				#	Percentage	#	Percentage
1	خير	xajr	X	0	0%	0	0%
2	كير	kajr		0	0%	0	0%
	Not Sure			24	100%	22	100%
1	نكبة	nakbah	X	0	0%	0	0%
2	نخبة	naxbah		0	0%	0	0%
	Not Sure			24	100%	22	100%
1	أسماك	ʔasmæk	X	0	0%	0	0%
2	أسماخ	ʔasmæx		0	0%	0	0%
	Not Sure			24	100%	22	100%

12) Voiceless denti-alveolar stop /t̪/ vs voiceless denti-alveolar velarized stop /t̪ˤ/

Items 10, 22, and 34 tested the students' abilities to recognize the difference between the voiceless denti-alveolar stop /t̪/ and the voiceless denti-alveolar velarized stop /t̪ˤ/ in three positions, word-initially, word-medially, and word-finally, respectively. Students in the experimental and control groups scored equally in that all the students in each group selected the "Not Sure" option. See table 12.

Table 12

Voiceless denti-alveolar stop /t̪/ vs voiceless denti-alveolar velarized stop /t̪ˤ/

No	Arabic	IPA	Correct	Control		Experimental	
				#	Percentage	#	Percentage
1	تين	t̪in		0	0%	0	0%
2	طين	t̪ˤin	X	0	0%	0	0%
	Not Sure			24	100%	22	100%
1	أمتار	ʔamt̪ær	X	0	0%	0	0%
2	أمطار	ʔamt̪ˤær		0	0%	0	0%
	Not Sure			24	100%	22	100%
1	نحت	naнt̪	X	0	0%	0	0%
2	نحط	naнt̪ˤ		0	0%	0	0%
	Not Sure			24	100%	22	100%

13) Front close unrounded long vowel /i/ vs front close unrounded short vowel /ɪ/

Item 37 tested the students' abilities to recognize the difference between the front close unrounded long vowel /i/ and the front close unrounded short vowel /ɪ/. Students in the experimental and control groups scored equally in that all the students in each group selected the "Not Sure" option. See table 13.

Table 13

Front close unrounded long vowel /i/ vs front close unrounded short vowel /ɪ/

No	Arabic	IPA	Correct	Control		Experimental	
				#	Percentage	#	Percentage
1	قديم	qaḍim	X	0	0%	0	0%
2	قـدِم	qaḍɪm		0	0%	0	0%
	Not Sure			24	100%	22	100%

14) Back close rounded long vowel /u/ vs back close rounded short vowel /ʊ/

Item 37 tested the students' abilities to recognize the difference between the back close rounded long vowel /u/ and the back close rounded short vowel /ʊ/. Students in the experimental and control groups scored equally in that all the students in each group selected the "Not Sure" option. See table 14.

Table 14

Back close rounded long vowel /u/ vs back close rounded short vowel /ʊ/

No	Arabic	IPA	Correct	Control		Experimental	
				#	Percentage	#	Percentage
1	سـوق	suq		0	0%	0	0%
2	سُـق	sʊq	X	0	0%	0	0%
	Not Sure			24	100%	22	100%

15) Central open unrounded long vowel /æ/ vs central open unrounded short vowel /a/

Item 37 tested the students' abilities to recognize the difference between the central open unrounded long vowel /æ/ and the central open unrounded short vowel /a/. Students in the experimental and control groups scored equally in that all the students in each group selected the "Not Sure" option. See table 15.

Table 15

Central open unrounded long vowel /æ/ vs central open unrounded short vowel /a/

No	Arabic	IPA	Correct	Control		Experimental	
				#	Percentage	#	Percentage
1	سـامـح	sæmaн		0	0%	0	0%
2	سَـمـح	samaн	X	0	0%	0	0%
	Not Sure			24	100%	22	100%

Sound Production

The subjects in the experimental and control groups scored equally on the sound recognition pre-test in that they all selected the "Not Sure" option. Background information from the subjects showed that none of them had previous knowledge of the sounds and letters of Arabic. Therefore, the researcher did not conduct a pre-test sound production test.

Post-test

After the five-week intervention, the students in the experimental and control groups took a post-test that consisted of two sections: (1) sound recognition, and (2) sound production. Below are the results of both sections.

Sound Recognition

The sound recognition post-test was identical to the sound recognition pre-test that the students took before the intervention. The students took the test online during the first week after intervention. Below are the results of the sound recognition post-test.

An independent two-sample t-Test determined if there was an experimental important difference between the means of the two groups in the pre-test and post-test. The control group scored an average of 85%, while the experimental group scored of an average of 95%. Thus, the mean difference was 10%, with the students in the experimental group scoring higher than the students in the control group. Test of equality of means resulted in a t-Value of -3.03, and test of homogeneity of variance resulted in 2-Tail probability of 0.16. Below is a breakdown of the results for each item independently.

1) Voiceless glottal fricative /h/ vs voiceless epiglottal fricative /ʜ/

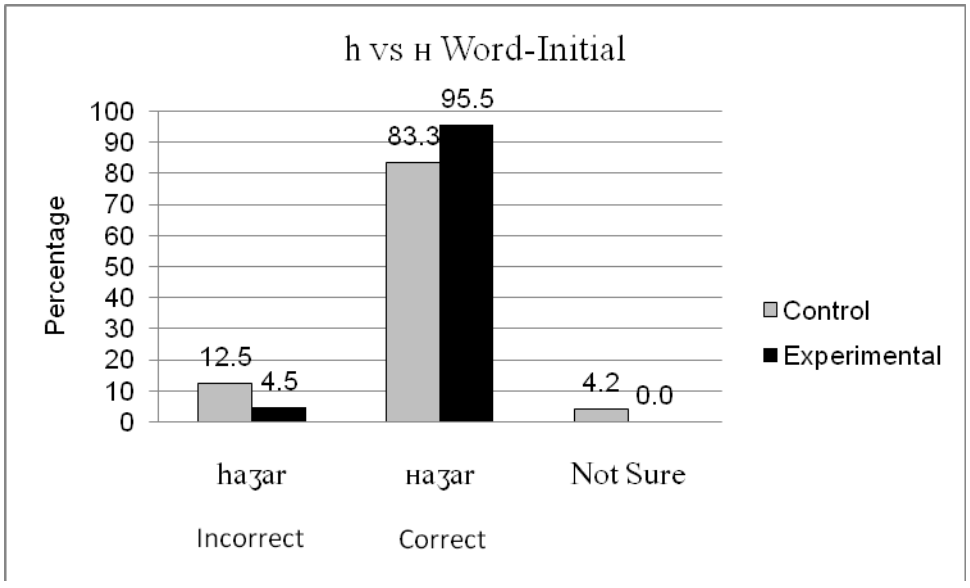

Figure 1. Voiceless glottal fricative /h/ vs voiceless epiglottal fricative /ʜ/ in word-initial position.

Item 3 on the test examined the students' abilities to differentiate between the voiceless glottal fricative /h/ and the voiceless epiglottal fricative /ʜ/ at the beginning of the utterances haʒar and ʜaʒar. Of the students in the experimental group, 96% correctly chose the utterance ʜaʒar, while 83% of the students in the control group selected the correct response. This results in a 13% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

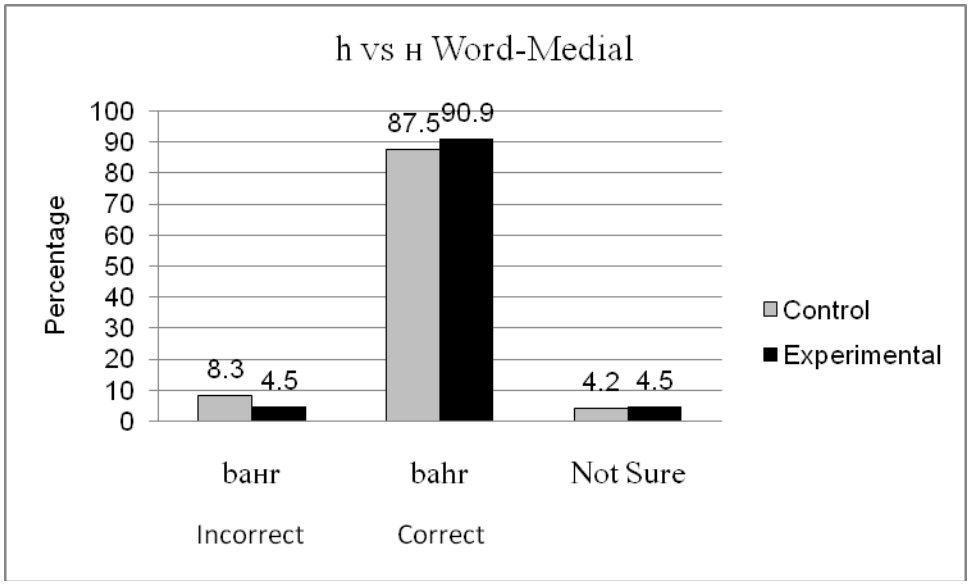

Figure 2. Voiceless glottal fricative /h/ vs voiceless epiglottal fricative /ʜ/ in word-medial position.

Item 15 on the test examined the students' abilities to differentiate between the voiceless glottal fricative /h/ and the voiceless epiglottal fricative /ʜ/ in the middle of the utterances baʜr and bahr. Of the students in the experimental group, 91% correctly chose the utterance bahr, while 88% of the students in the control group selected the correct response. This results in a 3% difference between the students in the experimental group

and the students in the control group, with the students in the experimental group scoring higher.

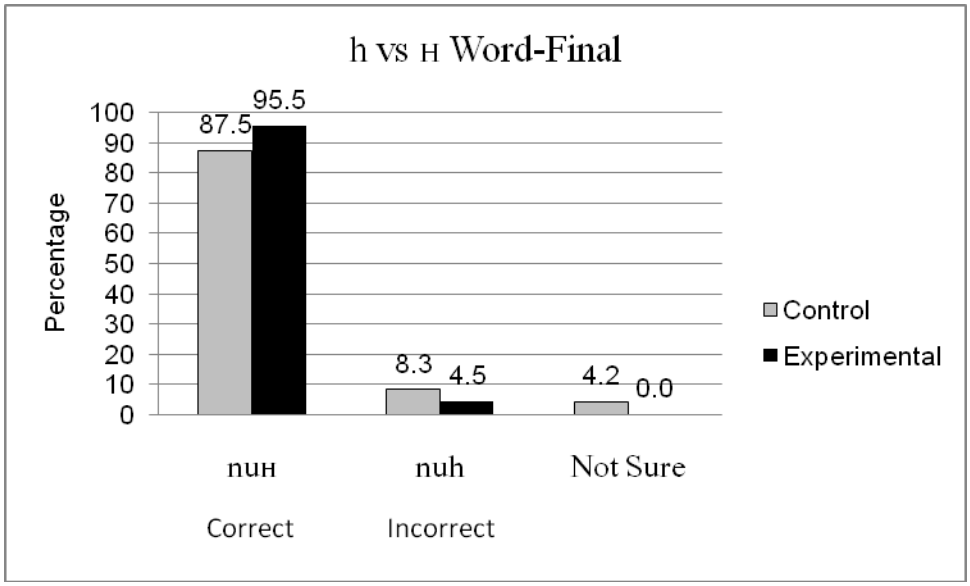

Figure 3. Voiceless glottal fricative /h/ vs voiceless epiglottal fricative /ʜ/ in word-final position.

Item 27 on the test examined the students' abilities to differentiate between the voiceless glottal fricative /h/ and the voiceless epiglottal fricative /ʜ/ at the end of the utterances nuʜ and nuh. Of the students in the experimental group, 96% correctly chose the utterance nuʜ, while 88% of the students in the control group selected the correct response. This results in an 8% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

2) Voiced denti-alveolar stop /d̪/ vs voiced denti-alveolar velarized stop /d̪ˠ/

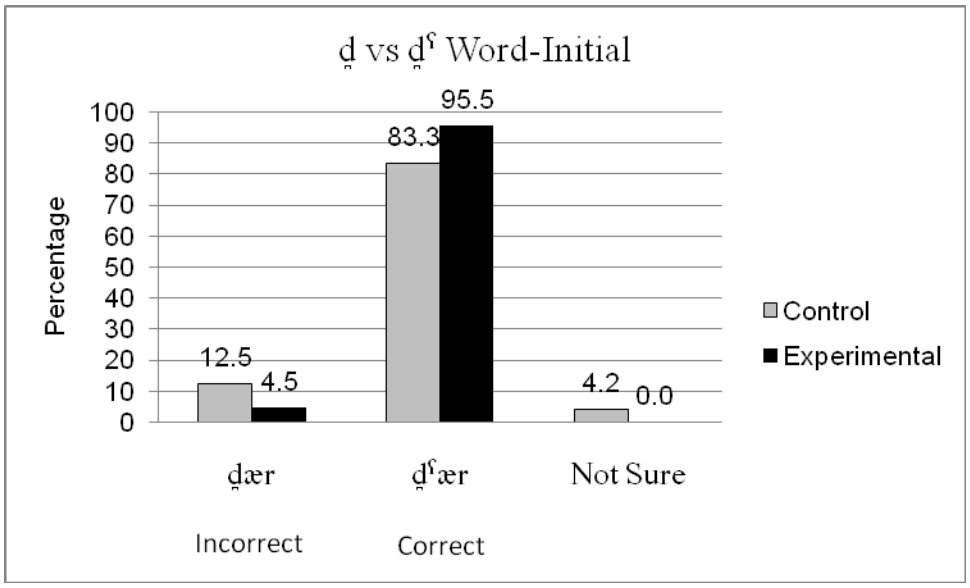

Figure 4. Voiced denti-alveolar stop /d̪/ vs voiced denti-alveolar velarized stop /d̪ˠ/ in word-initial position.

Item 8 on the test examined the students' abilities to differentiate between the voiced denti-alveolar stop /d̪/ and the voiced denti-alveolar velarized stop /d̪ˠ/ at the beginning of the utterances d̪ær and d̪ˠær. Of the students in the experimental group, 96% correctly chose the utterance d̪ˠær, while 83% of the students in the control group selected the correct response. This results in a 13% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

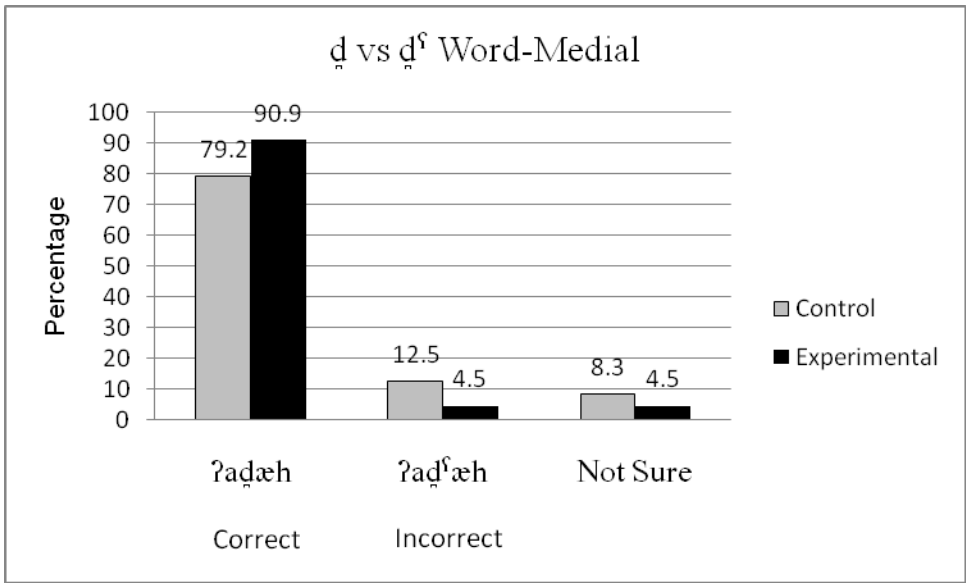

Figure 5. Voiced denti-alveolar stop /ḍ/ vs voiced denti-alveolar velarized stop /ḍˤ/ in word-medial position.

Item 20 on the test examined the students' abilities to differentiate between the voiced denti-alveolar stop /ḍ/ and the voiced denti-alveolar pharyngealized stop /ḍˤ/ in the middle of the utterances ʔaḍæh and ʔaḍˤæh. Of the students in the experimental group, 91% correctly chose the utterance ʔaḍæh, while 79% of the students in the control group selected the correct response. This results in a 12% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

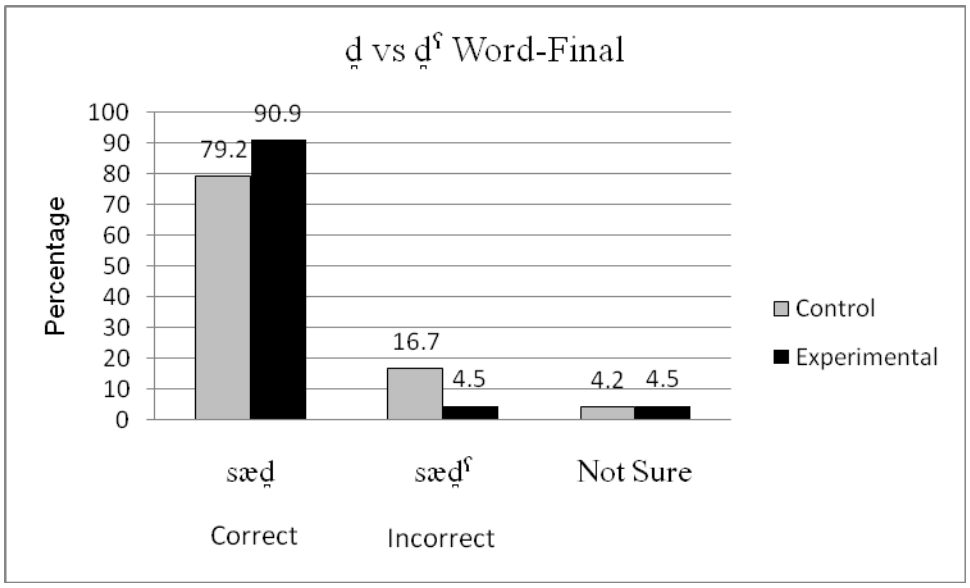

Figure 6. Voiced denti-alveolar stop /d̪/ vs voiced denti-alveolar velarized stop /d̪ˤ/ in word-final position.

Item 32 on the test examined the students' abilities to differentiate between the voiced denti-alveolar stop /d̪/ and the voiced denti-alveolar pharyngealized stop /d̪ˤ/ at the end of the utterances sæd̪ and sæd̪ˤ. Of the students in the experimental group, 91% correctly chose the utterance sæd̪, while 79% of the students in the control group selected the correct response. This results in a 12% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

3) Voiced velar fricative /ɣ/ vs voiceless velar stop /k/

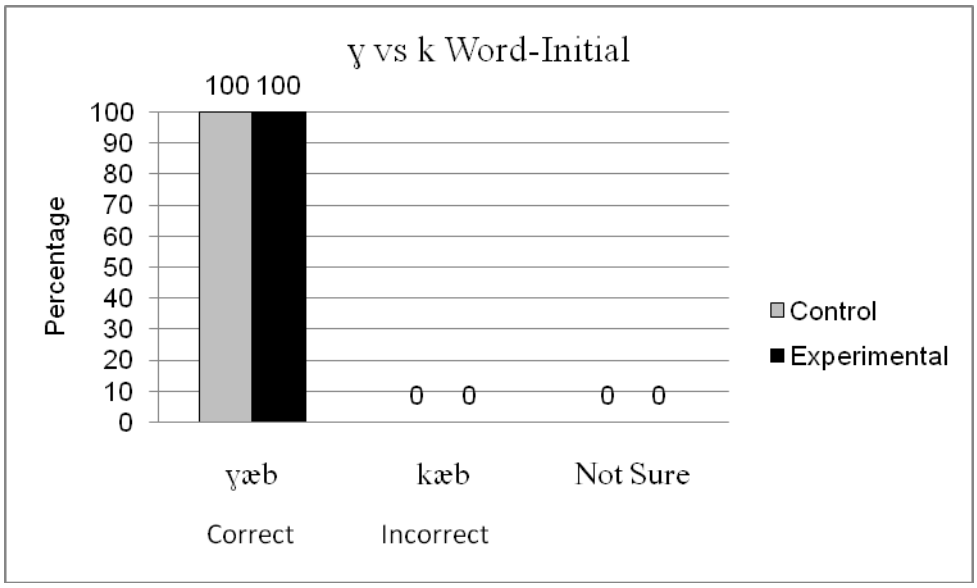

Figure 7. Voiced velar fricative /ɣ/ vs voiceless velar stop /k/ in word-initial position.

Item 12 on the test examined the students' abilities to differentiate between the voiced velar fricative /ɣ/ and the voiceless velar stop /k/ at the beginning of the words ɣæb and kæb. Both the experimental group and control groups scored equally on this item in that all the subjects correctly chose the utterance ɣæb.

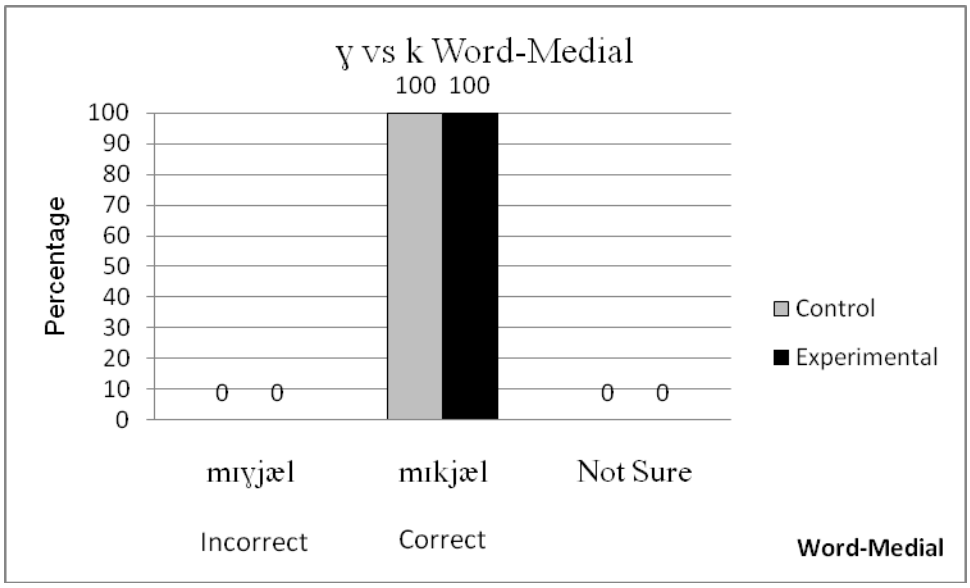

Figure 8. Voiced velar fricative /ɣ/ vs voiceless velar stop /k/ in word-medial position.

Item 24 on the test examined the students' abilities to differentiate between the voiced velar fricative /ɣ/ and the voiceless velar stop /k/ at the beginning of the words mɪɣjæl and mɪkjæl. Both the experimental group and control groups scored equally on this item in that all the subjects correctly chose the utterance mɪkjæl.

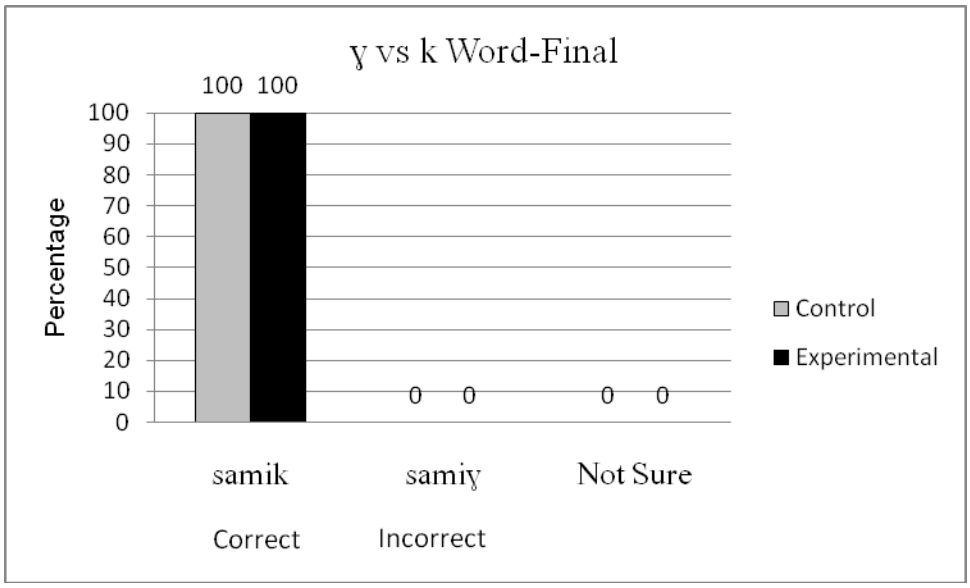

Figure 9. Voiced velar fricative /ɣ/ vs voiceless velar stop /k/ in word-final position.

Item 36 on the test examined the students' abilities to differentiate between the voiced velar fricative /ɣ/ and the voiceless velar stop /k/ at the beginning of the utterances samik and samiɣ. Both the experimental group and control groups scored equally on this item in that all the subjects correctly chose the utterance samik.

4) Voiced denti-alveolar velarized stop /d̪ˠ/ vs voiced inter-dental velarized fricative /ðˠ/

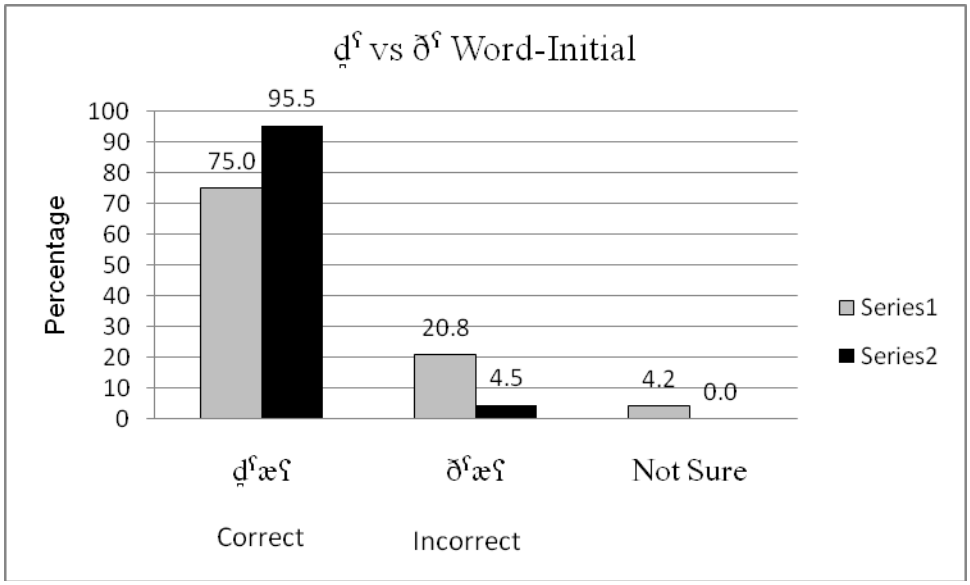

Figure 10. Voiced denti-alveolar velarized stop /d̪ˠ/ vs voiced inter-dental velarized fricative /ðˠ/ in word-initial position.

Item 5 on the test examined the students' abilities to differentiate between the voiced denti-alveolar pharyngealized stop /d̪ˠ/ and the voiced inter-dental pharyngealized fricative /ðˠ/ at the beginning of the utterances d̪ˠæˤ and ðˠæˤ. Of the students in the experimental group, 96% correctly chose the utterance d̪ˠæˤ, while 75% of the students in the control group selected the correct response. This results in a 21% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

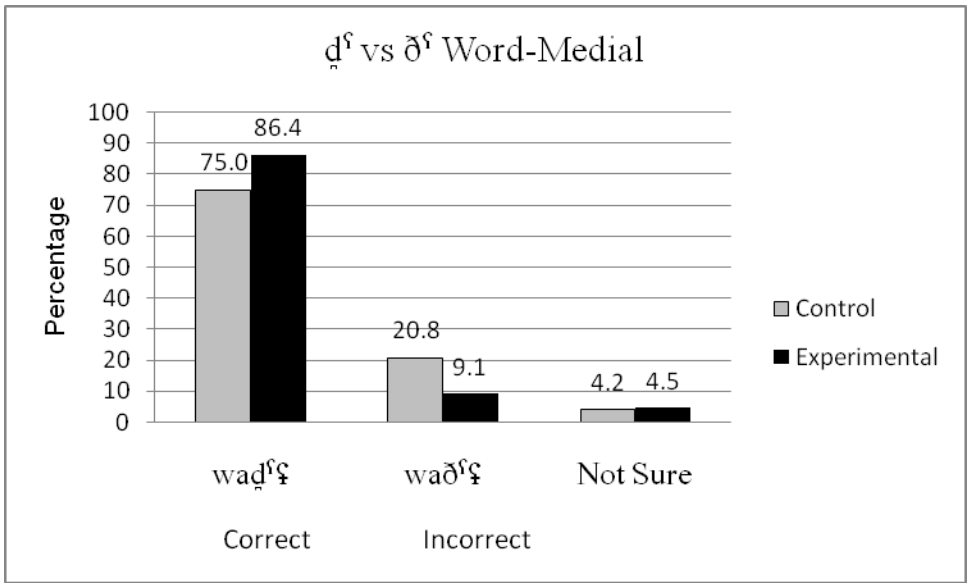

Figure 11. Voiced denti-alveolar velarized stop /d̪ˤ/ vs voiced inter-dental velarized fricative /ðˤ/ in word-medial position.

Item 17 on the test examined the students' abilities to differentiate between the voiced denti-alveolar pharyngealized stop /d̪ˤ/ and the voiced inter-dental pharyngealized fricative /ðˤ/ in the middle of the utterances waḏˤɣ and waðˤɣ. Of the students in the experimental group, 86% correctly chose the utterance waḏˤɣ, while 75% of the students in the control group selected the correct response. This results in an 11% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

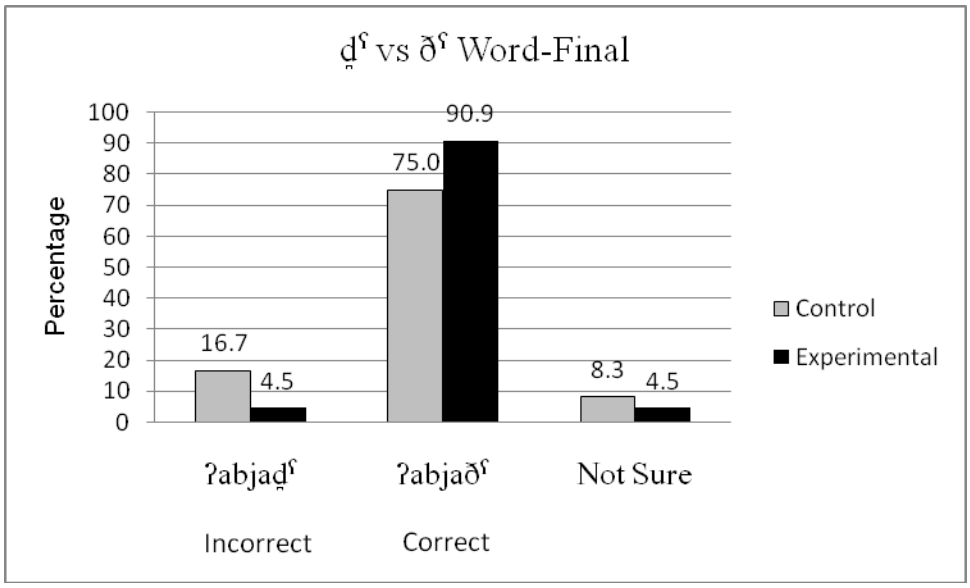

Figure 12. Voiced denti-alveolar velarized stop /d̪ˤ/ vs voiced inter-dental velarized fricative /ðˤ/ in word-final position.

Item 29 on the test examined the students' abilities to differentiate between the voiced denti-alveolar pharyngealized stop /d̪ˤ/ and the voiced inter-dental pharyngealized fricative /ðˤ/ at the end of the utterances ʔabjad̪ˤand ʔabjaðˤ. Of the students in the experimental group, 91% correctly chose the utterance ʔabjaðˤ, while 75% of the students in the control group selected the correct response. This results in a 16% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

5) Voiceless alveolar fricative /s/ vs voiceless alveolar velarized fricative /sˤ/

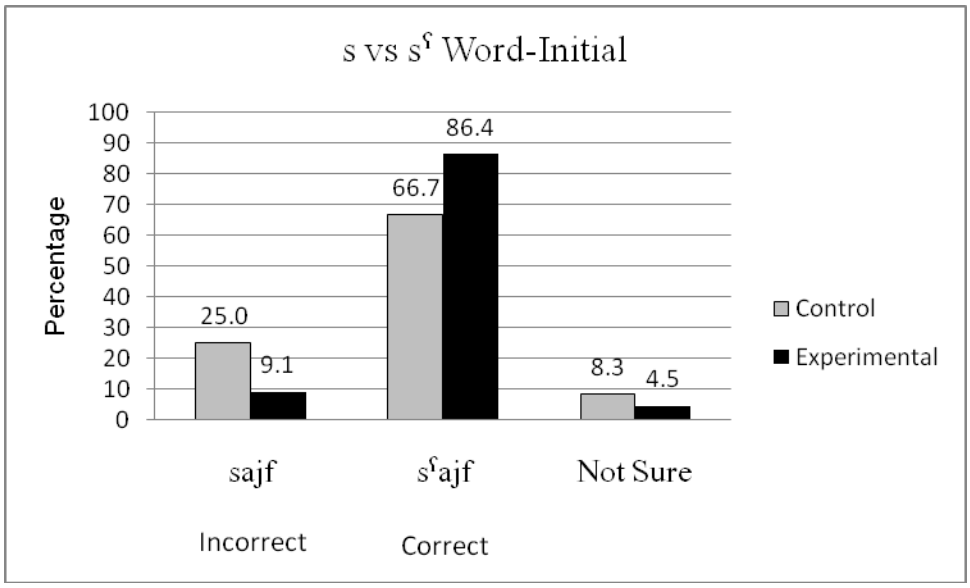

Figure 13. Voiceless alveolar fricative /s/ vs voiceless alveolar velarized fricative /sˤ/ in word-initial position.

Item 7 on the test examined the students' abilities to differentiate between the voiceless alveolar fricative /s/ and the voiceless alveolar pharyngealized fricative /sˤ/ at the beginning of the utterances sajf and sˤajf. Of the students in the experimental group, 86% correctly chose the utterance sˤajf, while 67% of the students in the control group selected the correct response. This results in a 19% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

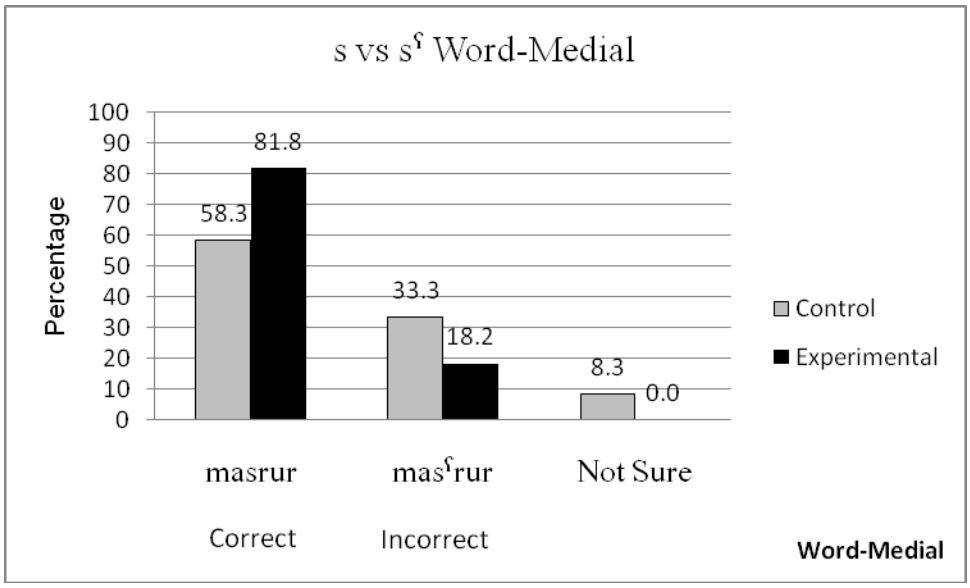

Figure 14. Voiceless alveolar fricative /s/ vs voiceless alveolar velarized fricative /sˤ/ in word-medial position.

Item 19 on the test examined the students' abilities to differentiate between the voiceless alveolar fricative /s/ and the voiceless alveolar pharyngealized fricative /sˤ/ at the beginning of the utterances masrur and masˤrur. Of the students in the experimental group, 82% correctly chose the utterance masrur, while 58% of the students in the control group selected the correct response. This results in about 24% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

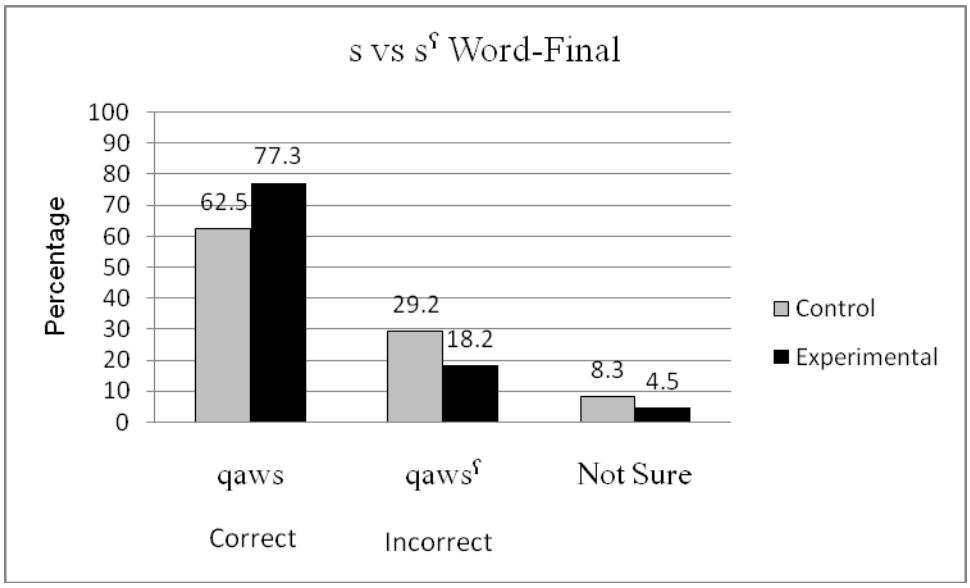

Figure 15. Voiceless alveolar fricative /s/ vs voiceless alveolar velarized fricative /sˤ/ in word-final position.

Item 31 on the test examined the students' abilities to differentiate between the voiceless alveolar fricative /s/ and the voiceless alveolar pharyngealized fricative /sˤ/ at the beginning of the utterances qaws and qawsˤ. Of the students in the experimental group, 77% correctly chose the utterance qaws, while 63% of the students in the control group selected the correct response. This results in about 14% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

6) Voiceless epiglottal fricative /ʜ/ vs voiceless velar fricative /x/

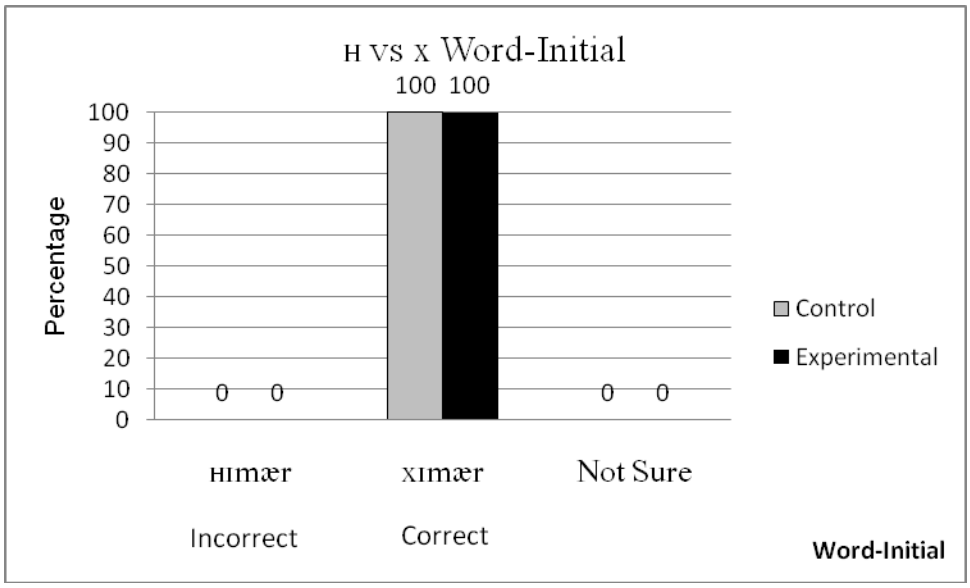

Figure 16. Voiceless epiglottal fricative /ʜ/ vs voiceless velar fricative /x/ in word-initial position.

Item 4 on the test examined the students' abilities to differentiate between the voiceless epiglottal fricative /ʜ/ and the voiceless velar fricative /x/ at the beginning of the utterances ʜɪmær and xɪmær. Both the experimental group and control groups scored equally on this item in that all the subjects correctly chose the utterance xɪmær.

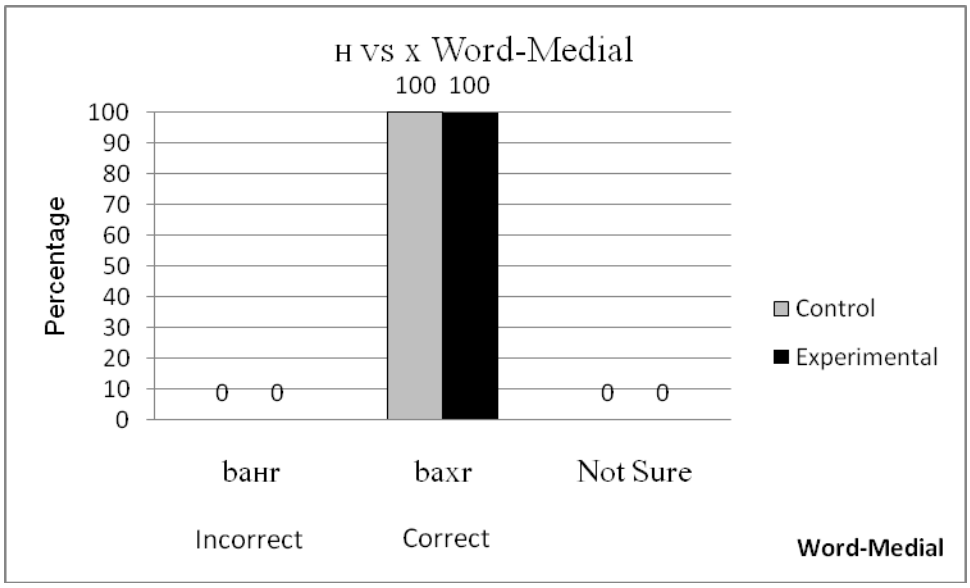

Figure 17. Voiceless epiglottal fricative /ʜ/ vs voiceless velar fricative /x/ in word-medial position.

Item 16 on the test examined the students' abilities to differentiate between the voiceless epiglottal fricative /ʜ/ and the voiceless velar fricative /x/ in the middle of the words baʜr and baxr. Both the experimental group and control groups scored equally on this item in that all the subjects correctly chose the utterance baxr.

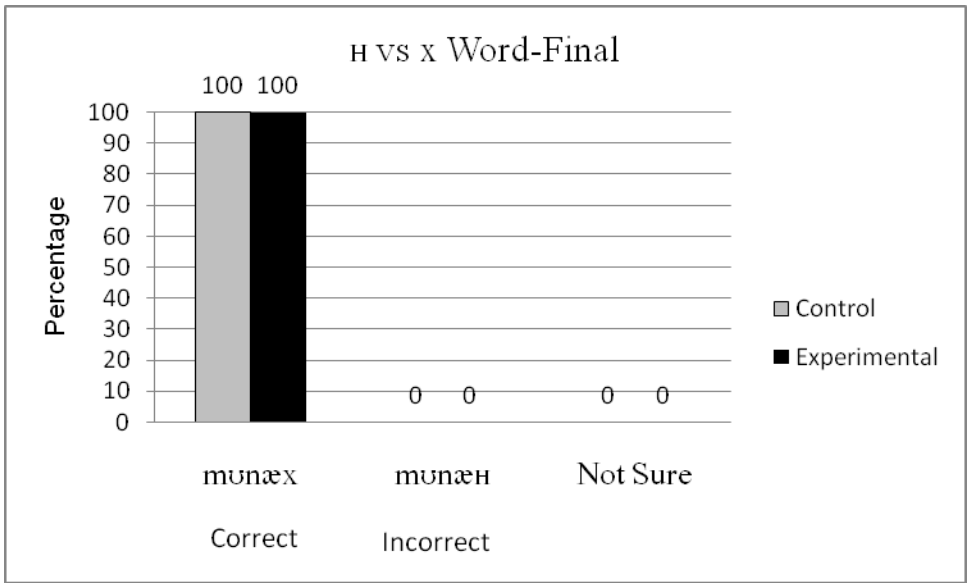

Figure 18. Voiceless epiglottal fricative /ʜ/ vs voiceless velar fricative /x/ in word-final position.

Item 28 on the test examined the students' abilities to differentiate between the voiceless epiglottal fricative /ʜ/ and the voiceless velar fricative /x/ at the end of the utterances mʊnæx and mʊnæʜ. Both the experimental group and control groups scored equally on this item in that all the subjects correctly chose the utterance mʊnæx.

7) Voiced velar fricative /ɣ/ vs voiced velar stop /g/

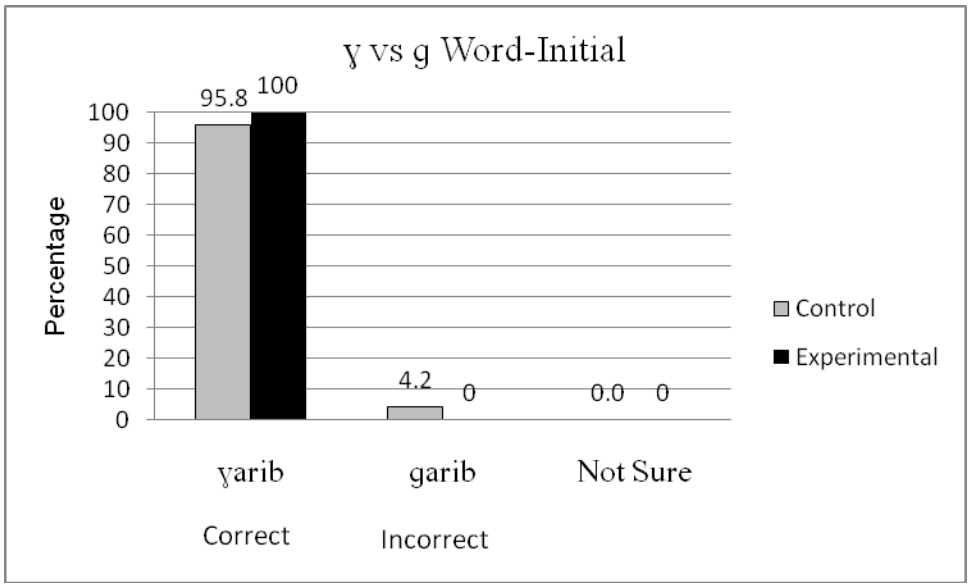

Figure 19. Voiced velar fricative /ɣ/ vs voiced velar stop /g/ in word-initial position.

Item 6 on the test examined the students' abilities to differentiate between the voiced velar fricative /ɣ/ and the voiced velar stop /g/ at the beginning of the utterances ɣarib and garib. Of the students in the experimental group, 100% correctly chose the utterance ɣarib, while 96% of the students in the control group selected the correct response. This results in a 4% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

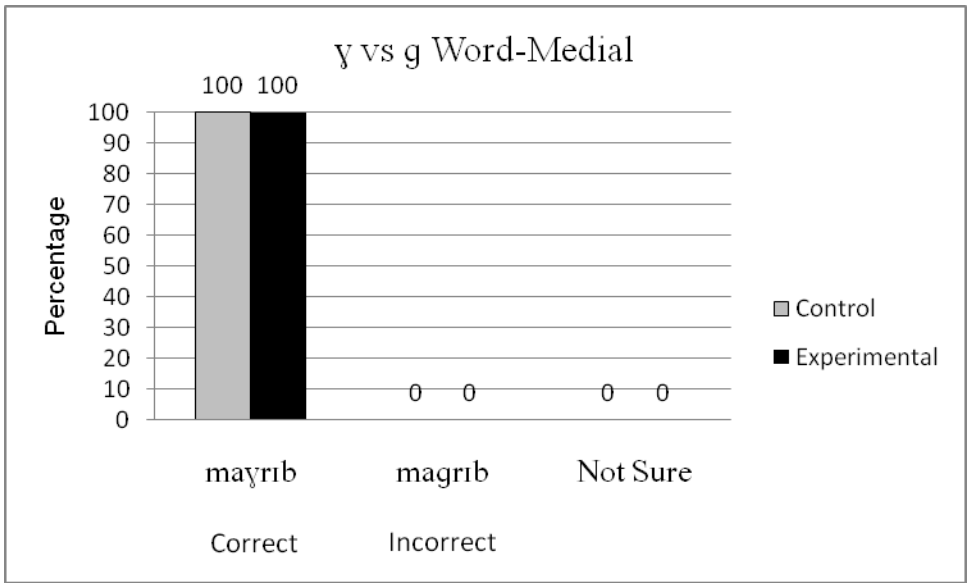

Figure 20. Voiced velar fricative /ɣ/ vs voiced velar stop /g/ in word-medial position.

Item 18 on the test examined the students' abilities to differentiate between the voiced velar fricative /ɣ/ and the voiced velar stop /g/ at the beginning of the utterances mayrıb and magrıb. Both the experimental group and control groups scored equally on this item in that all the subjects correctly chose the utterance mayrıb.

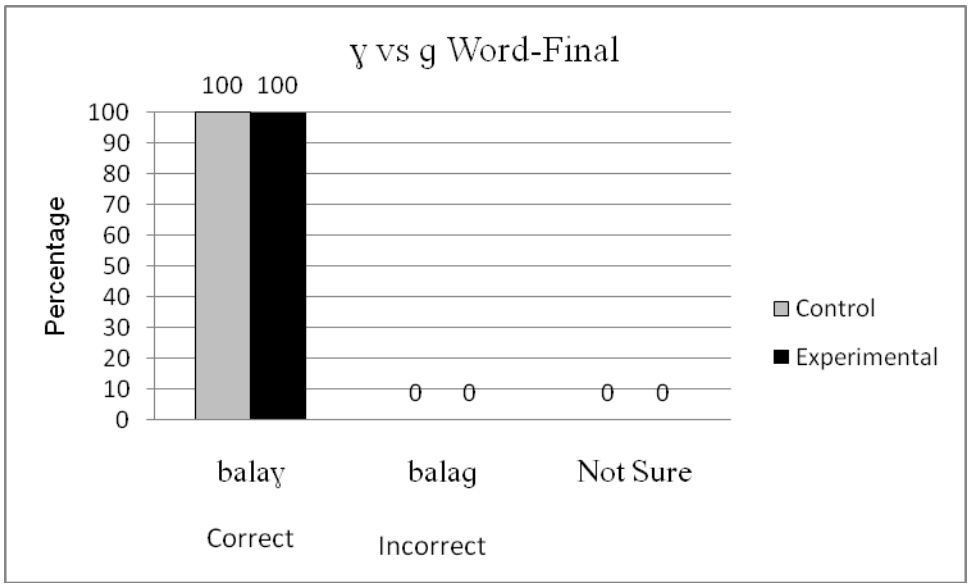

Figure 21. Voiced velar fricative /ɣ/ vs voiced velar stop /g/ in word-final position.

Item 30 on the test examined the students' abilities to differentiate between the voiced velar fricative /ɣ/ and the voiced velar stop /g/ at the end of the utterances balaɣ and balag. Both the experimental group and control groups scored equally on this item in that all the subjects correctly chose the utterance balaɣ.

8) Voiceless glottal stop /ʔ/ vs voiced epiglottal fricative /ʕ/

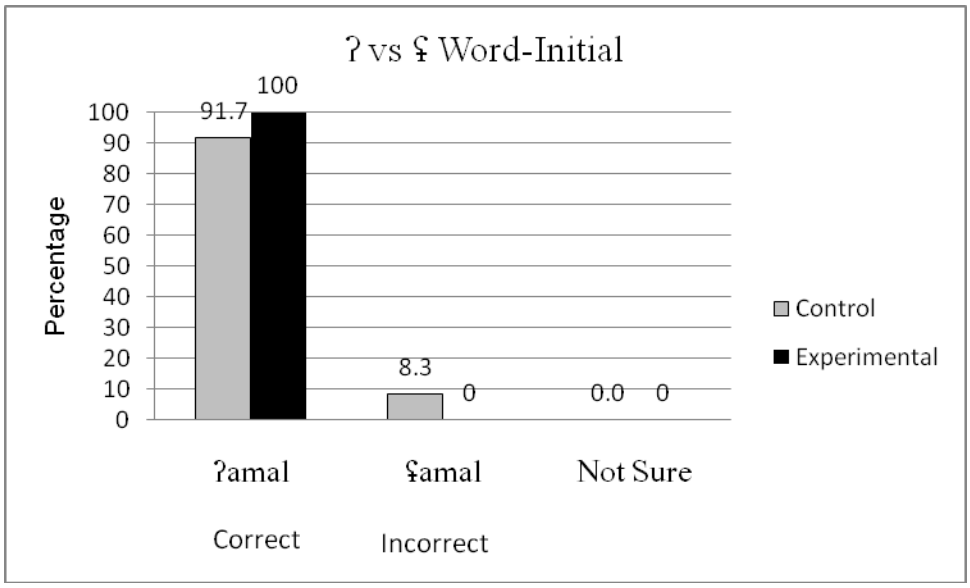

Figure 22. Voiceless glottal stop /ʔ/ vs voiced epiglottal fricative /ʕ/ in word-initial position.

Item 1 on the test examined the students' abilities to differentiate between the voiceless glottal stop /ʔ/ and the voiced epiglottal fricative /ʕ/ at the beginning of the utterances ʔamal and ʕamal. Of the students in the experimental group, 100% correctly chose the utterance ʔamal, while 92% of the students in the control group selected the correct response. This results in an 8% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

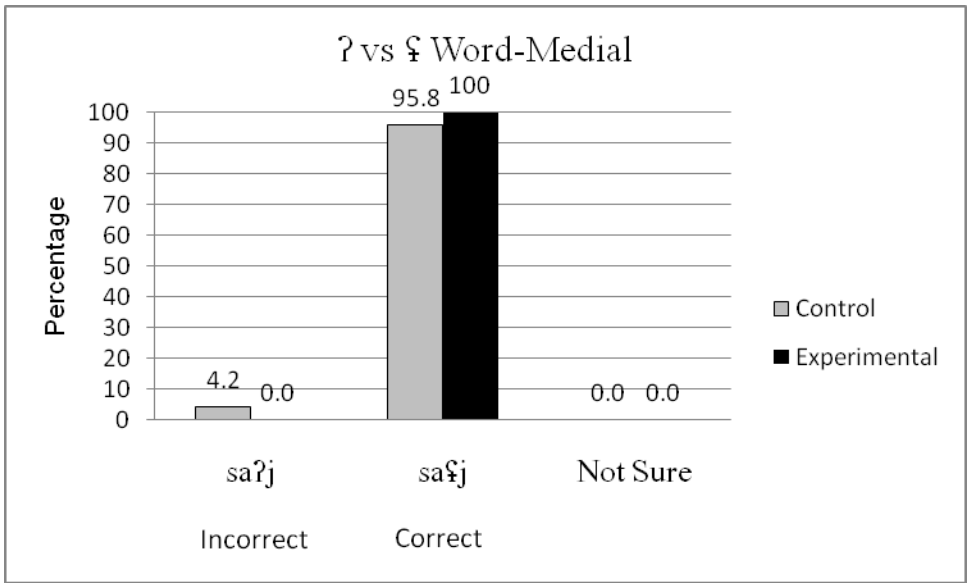

Figure 23. Voiceless glottal stop /ʔ/ vs voiced epiglottal fricative /ʕ/ in word-medial position.

Item 13 on the test examined the students' abilities to differentiate between the voiceless glottal stop /ʔ/ and the voiced epiglottal fricative /ʕ/ in the middle of the utterances saʔj and saʕj. Of the students in the experimental group, 100% correctly chose the utterance saʕj, while 96% of the students in the control group selected the correct response. This results in a 4% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

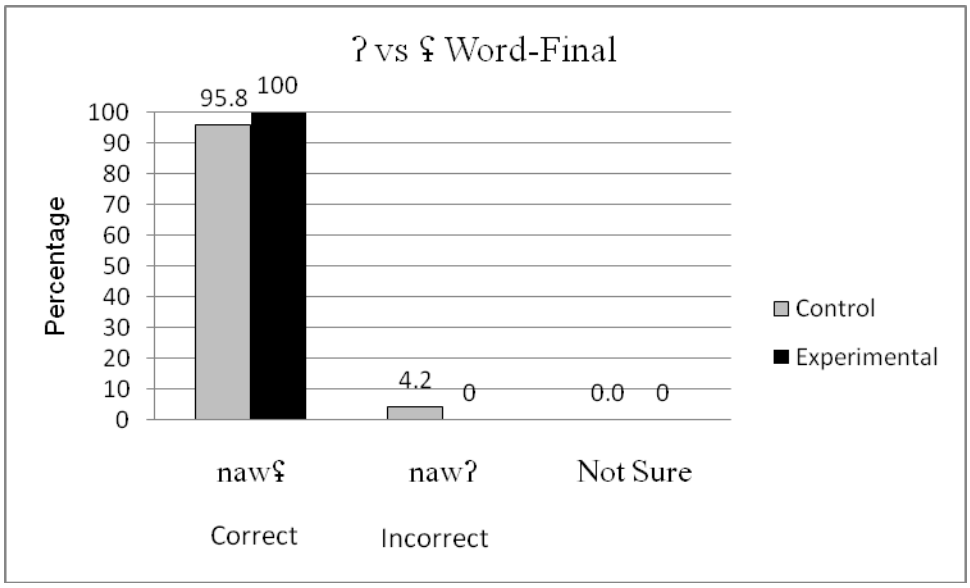

Figure 23. Voiceless glottal stop /ʔ/ vs voiced epiglottal fricative /ʕ/ in word-final position.

Item 25 on the test examined the students' abilities to differentiate between the voiceless glottal stop /ʔ/ and the voiced epiglottal fricative /ʕ/ at the end of the utterances nawʕ and nawʔ. Of the students in the experimental group, 100% correctly chose the utterance nawʕ, while 96% of the students in the control group selected the correct response. This results in a 4% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

9) Voiceless uvular stop /q/ vs voiceless velar stop /k/

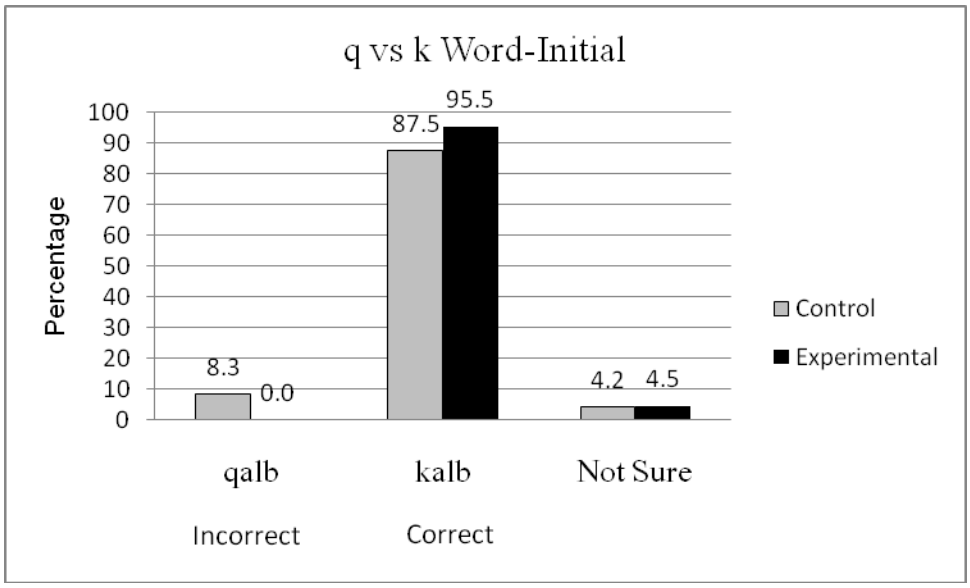

Figure 24. Voiceless uvular stop /q/ vs voiceless velar stop /k/ in word-initial position.

Item 11 on the test examined the students' abilities to differentiate between the voiceless uvular stop /q/ and the voiceless velar stop /k/ at the beginning of the utterances qalb and kalb. Of the students in the experimental group, 96% correctly chose the utterance kalb, while 88% of the students in the control group selected the correct response. This results in an 8% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

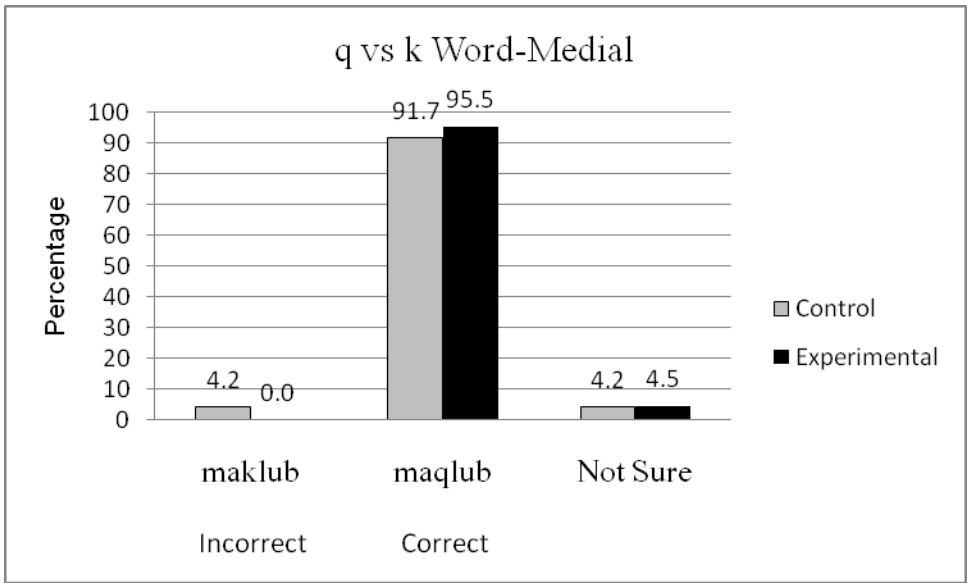

Figure 25. Voiceless uvular stop /q/ vs voiceless velar stop /k/ in word-medial position.

Item 23 on the test examined the students' abilities to differentiate between the voiceless uvular stop /q/ and the voiceless velar stop /k/ in the middle of the utterances maklub and maqlub. Of the students in the experimental group, 96% correctly chose the utterance maqlub, while 92% of the students in the control group selected the correct response. This results in a 4% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

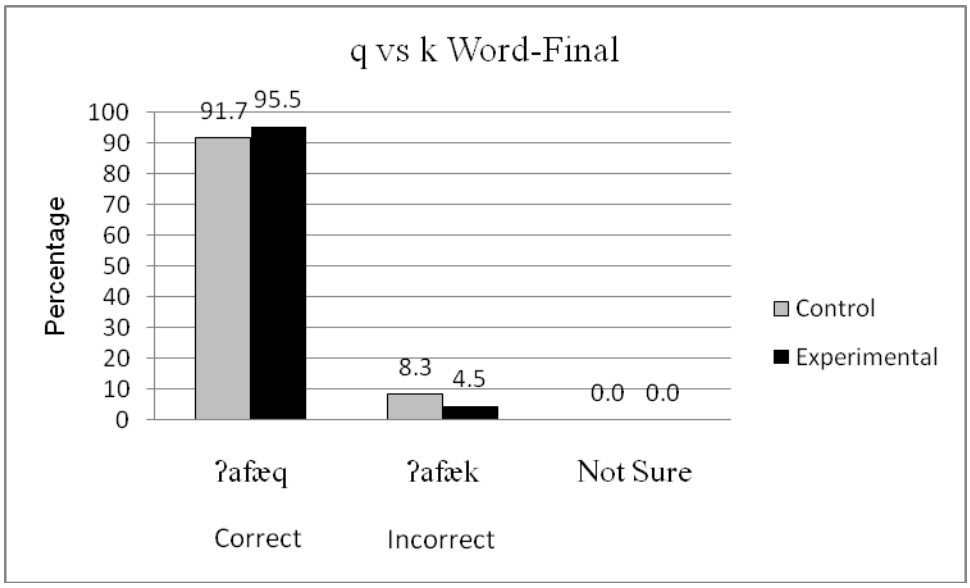

Figure 26. Voiceless uvular stop /q/ vs voiceless velar stop /k/ in word-final position.

Item 35 on the test examined the students' abilities to differentiate between the voiceless uvular stop /q/ and the voiceless velar stop /k/ at the end of the utterances ʔafæq and ʔafæk. Of the students in the experimental group, 96% correctly chose the utterance ʔafæq, while 92% of the students in the control group selected the correct response. This results in a 4% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

10) Voiced inter-dental velarized fricative /ðˠ/ vs voiced inter-dental fricative /ð/

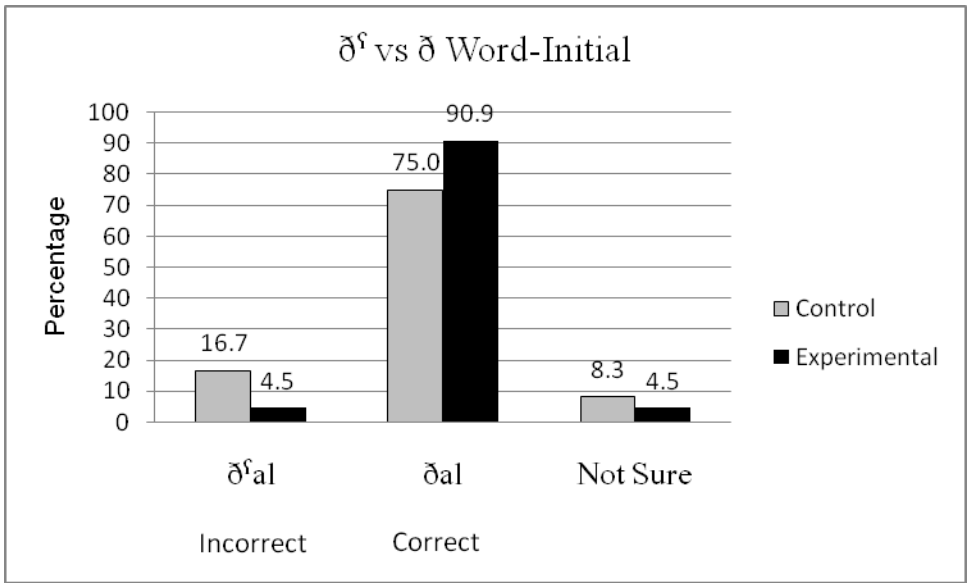

Figure 27. Voiced inter-dental velarized fricative /ðˠ/ vs voiced inter-dental fricative /ð/ in word-initial position.

Item 9 on the test examined the students' abilities to differentiate between the voiced inter-dental pharyngealized fricative /ðˠ/ and the voiced inter-dental fricative /ð/ at the beginning of the utterances ðˠal and ðal. Of the students in the experimental group, 91% correctly chose the utterance ðal, while 75% of the students in the control group selected the correct response. This results in a 16% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

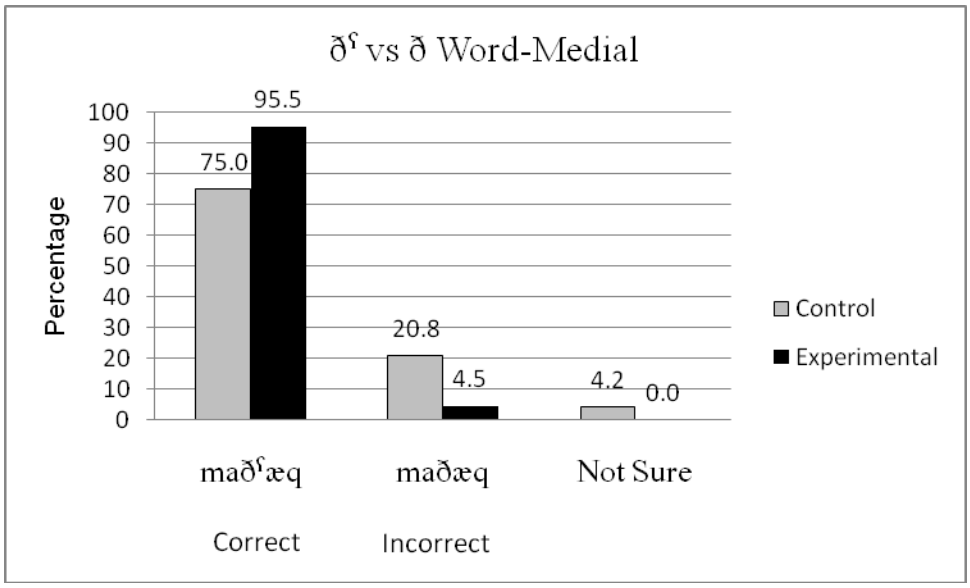

Figure 28. Voiced inter-dental velarized fricative /ðˠ/ vs voiced inter-dental fricative /ð/ in word-medial position.

Item 21 on the test examined the students' abilities to differentiate between the voiced inter-dental pharyngealized fricative /ðˠ/ and the voiced inter-dental fricative /ð/ in the middle of the utterances maðˠæq and maðæq. Of the students in the experimental group, 96% correctly chose the utterance maðˠæq, while 75% of the students in the control group selected the correct response. This results in a 21% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

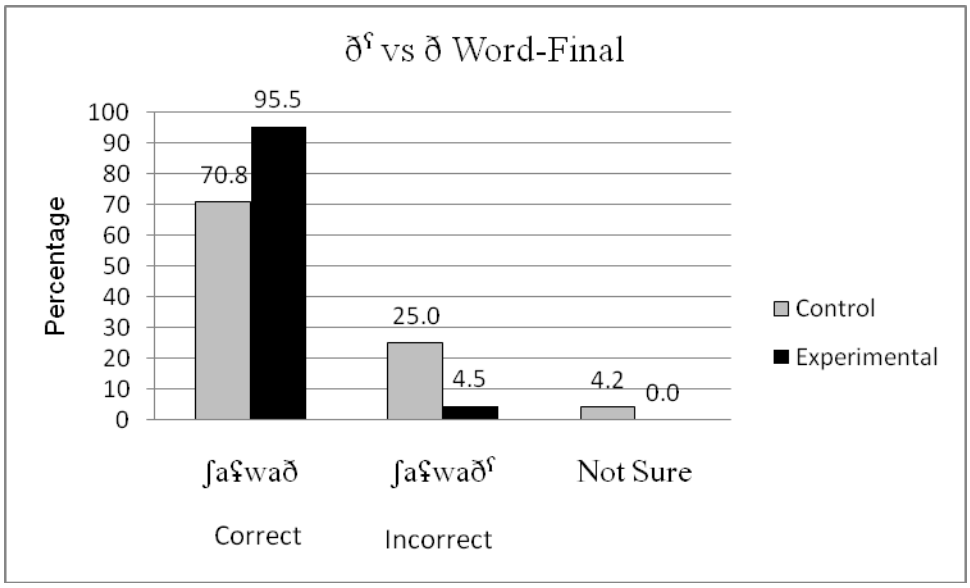

Figure 29. Voiced inter-dental velarized fricative /ðˠ/ vs voiced inter-dental fricative /ð/ in word-final position.

Item 33 on the test examined the students' abilities to differentiate between the voiced inter-dental pharyngealized fricative /ðˠ/ and the voiced inter-dental fricative /ð/ at the end of the utterances ʃaɬwað and ʃaɬwaðˠ. Of the students in the experimental group, 96% correctly chose the utterance ʃaɬwað, while 71% of the students in the control group selected the correct response. This results in a 25% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

11) Voiceless velar fricative /x/ vs voiceless velar stop /k/

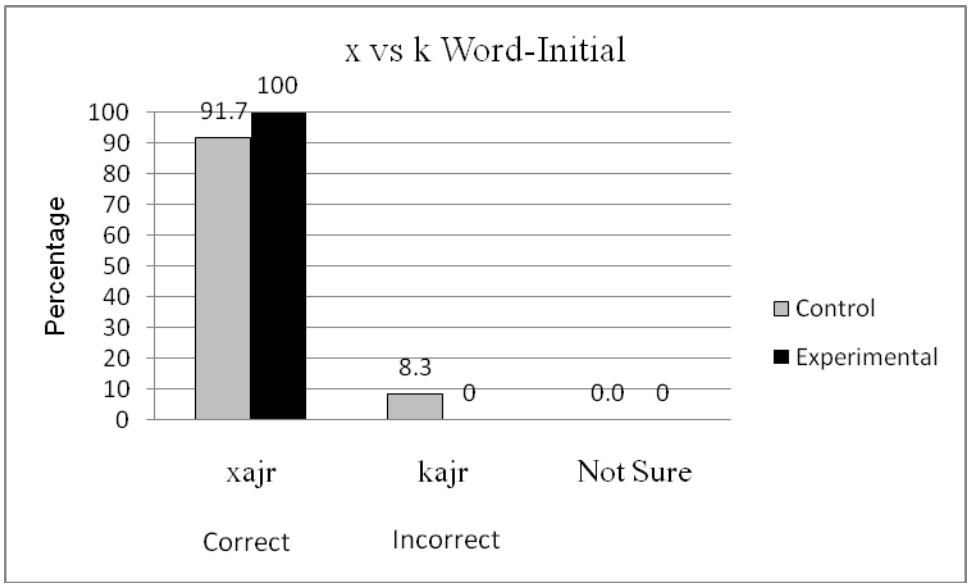

Figure 30. Voiceless velar fricative /x/ vs voiceless velar stop /k/ in word-initial position.

Item 2 on the test examined the students' abilities to differentiate between the voiceless velar fricative /x/ and the voiceless velar stop /k/ at the beginning of the utterances xajr and kajr. Of the students in the experimental group, 100% correctly chose the utterance xajr, while 92% of the students in the control group selected the correct response. This results in an 8% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

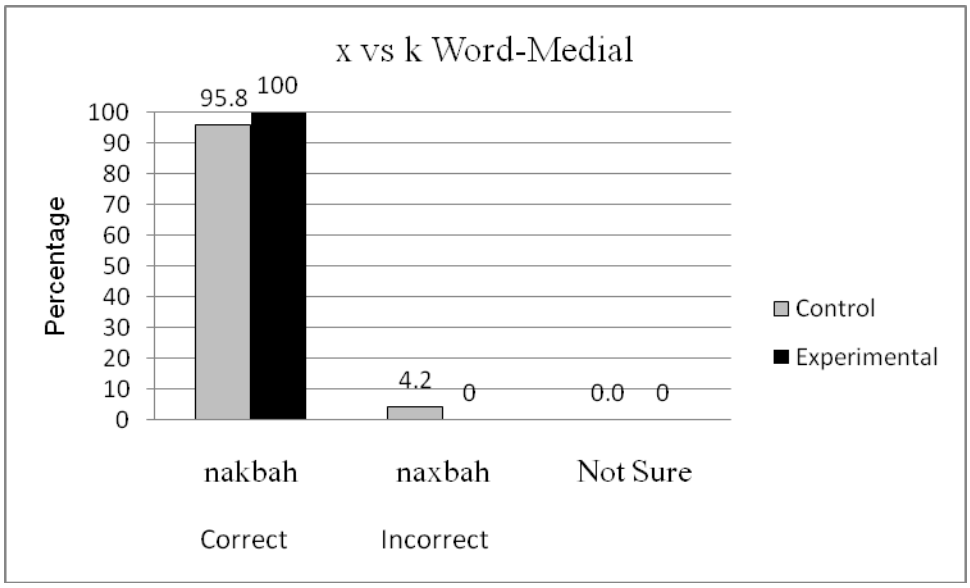

Figure 31. Voiceless velar fricative /x/ vs voiceless velar stop /k/ in word-medial position.

Item 14 on the test examined the students' abilities to differentiate between the voiceless velar fricative /x/ and the voiceless velar stop /k/ in the middle of the utterances nakbah and naxbah. Of the students in the experimental group, 100% correctly chose the utterance nakbah, while 96% of the students in the control group selected the correct response. This results in a 4% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

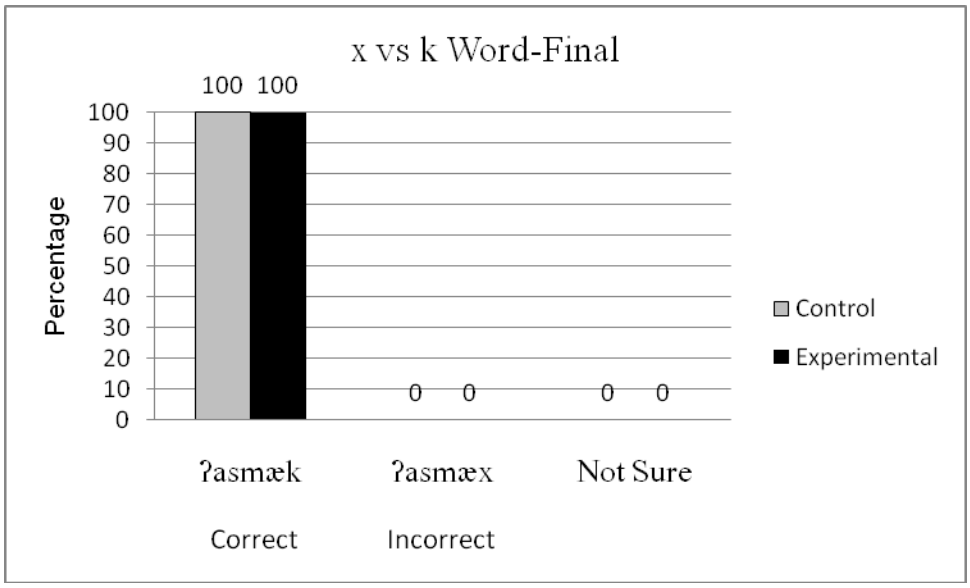

Figure 32. Voiceless velar fricative /x/ vs voiceless velar stop /k/ in word-final position.

Item 26 on the test examined the students' abilities to differentiate between the voiceless velar fricative /x/ and the voiceless velar stop /k/ at the end of the utterances ʔasmæk and ʔasmæx. Both the experimental group and control groups scored equally on this item in that all the subjects correctly chose the utterance ʔasmæk.

12) Voiceless denti-alveolar stop /t̪/ vs voiceless denti-alveolar velarized stop /t̪ˠ/

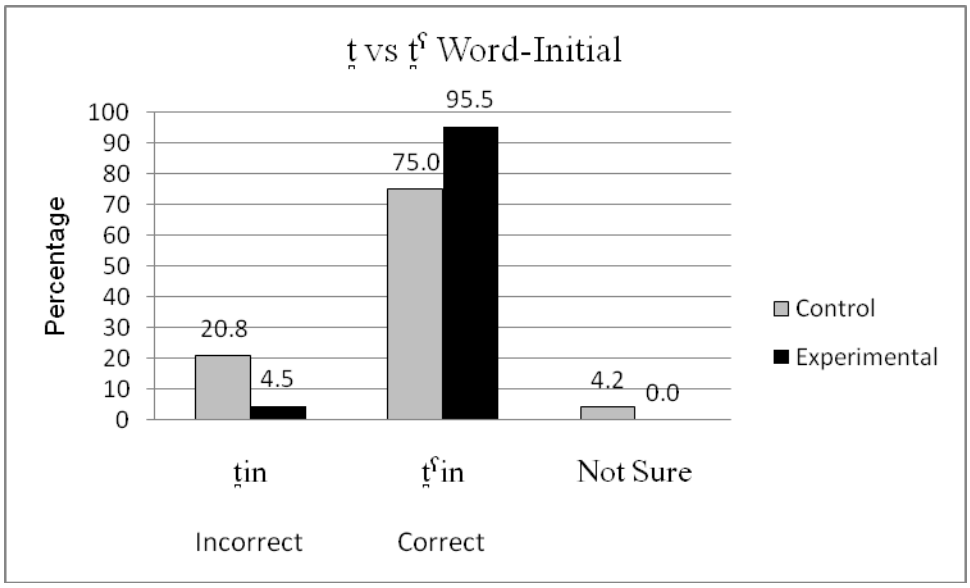

Figure 33. Voiceless denti-alveolar stop /t̪/ vs voiceless denti-alveolar velarized stop /t̪ˠ/ in word-initial position.

Item 10 on the test examined the students' abilities to differentiate between the voiceless denti-alveolar stop /t̪/ and the voiceless denti-alveolar velarized stop /t̪ˠ/ at the beginning of the utterances t̪in and t̪ˠin. Of the students in the experimental group, 96% correctly chose the utterance t̪ˠin, while 75% of the students in the control group selected the correct response. This results in a 21% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

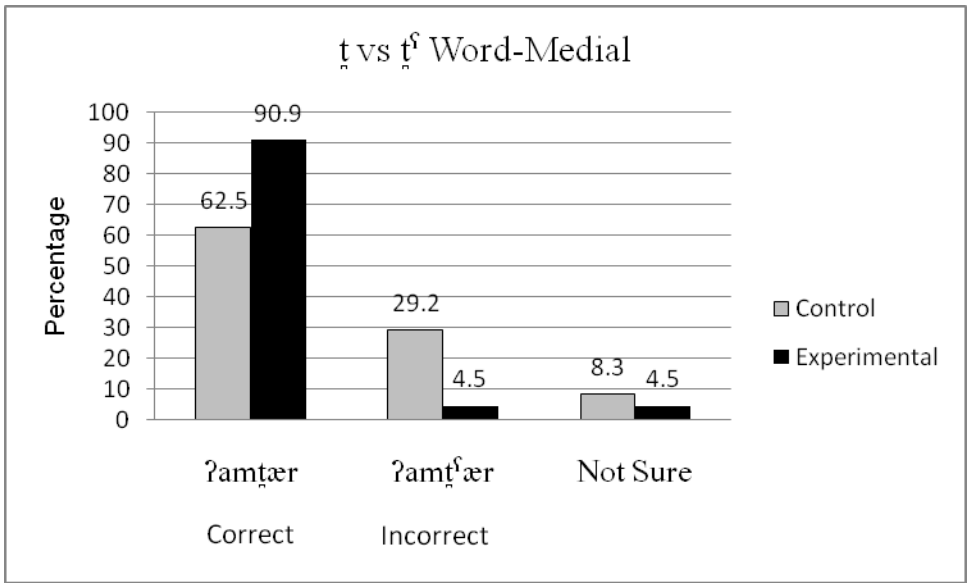

Figure 34. Voiceless denti-alveolar stop /t̪/ vs voiceless denti-alveolar velarized stop /t̪ˤ/ in word-medial position.

Item 22 on the test examined the students' abilities to differentiate between the voiceless denti-alveolar stop /t̪/ and the voiceless denti-alveolar velarized stop /t̪ˤ/ in the middle of the utterances ʔamt̪ær and ʔamt̪ˤær. Of the students in the experimental group, 91% correctly chose the utterance ʔamt̪ær, while 63% of the students in the control group selected the correct response. This results in a 28% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

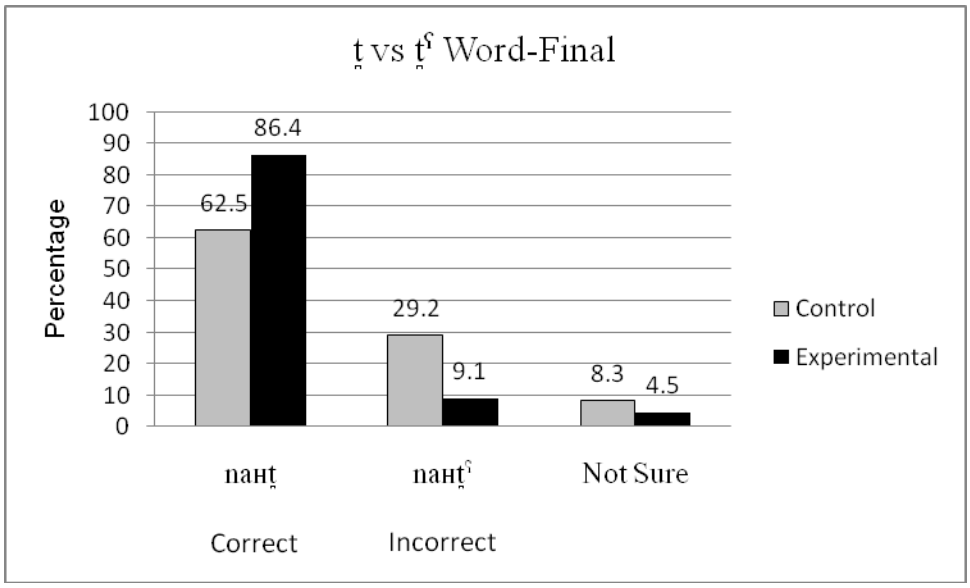

Figure 35. Voiceless denti-alveolar stop /t̪/ vs voiceless denti-alveolar velarized stop /t̪ˤ/ in word-final position.

Item 34 on the test examined the students' abilities to differentiate between the voiceless denti-alveolar stop /t̪/ and the voiceless denti-alveolar velarized stop /t̪ˤ/ at the end of the utterances naнt̪ and naнt̪ˤ. Of the students in the experimental group, 86% correctly chose the utterance naнt̪, while 63% of the students in the control group selected the correct response. This results in a 23% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

13) Front close unrounded long vowel /i/ vs front close unrounded short vowel /ɪ/

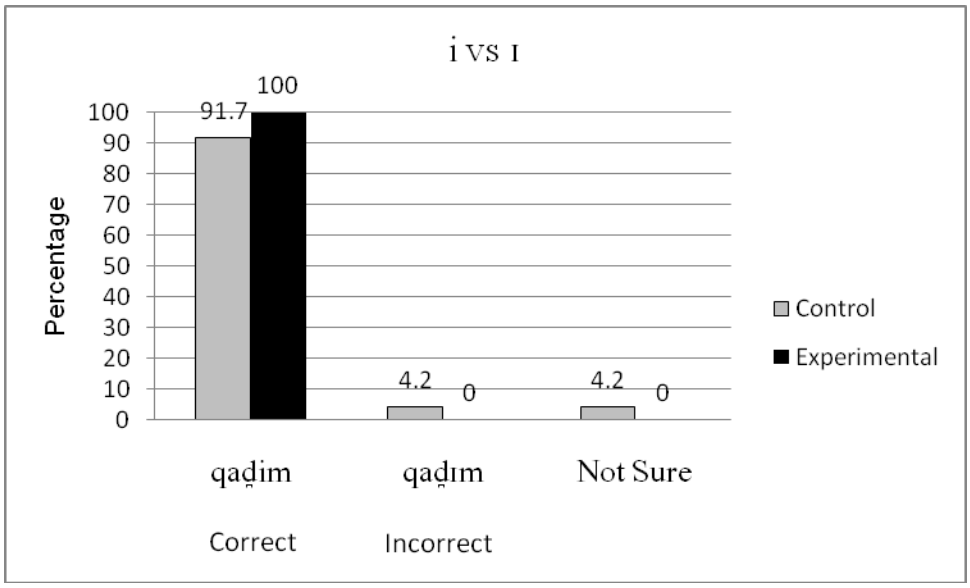

Figure 36. Front close unrounded long vowel /i/ vs front close unrounded short vowel /ɪ/.

Item 37 on the test examined the students' abilities to differentiate between the front close unrounded long vowel /i/ and the front close unrounded short vowel /ɪ/ at the beginning of the utterances qaḍim and qaḍım. Of the students in the experimental group, 100% correctly chose the utterance qaḍim, while 92% of the students in the control group selected the correct response. This results in an 8% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

14) Back close rounded long vowel /u/ vs back close rounded short vowel /ʊ/

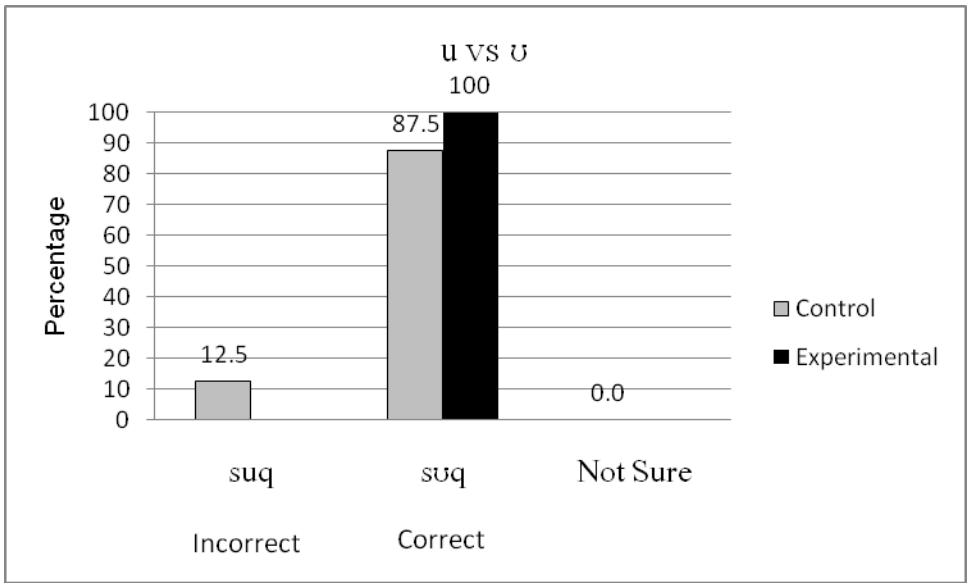

Figure 37. Back close rounded long vowel /u/ vs back close rounded short vowel /ʊ/.

Item 38 on the test examined the students' abilities to differentiate between the back close rounded long vowel /u/ and the back close rounded short vowel /ʊ/ at the beginning of the utterances suq and sʊq. Of the students in the experimental group, 100% correctly chose the utterance sʊq, while 88% of the students in the control group selected the correct response. This results in a 12% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

15) Central open unrounded long vowel /æ/ vs central open unrounded short vowel /a/

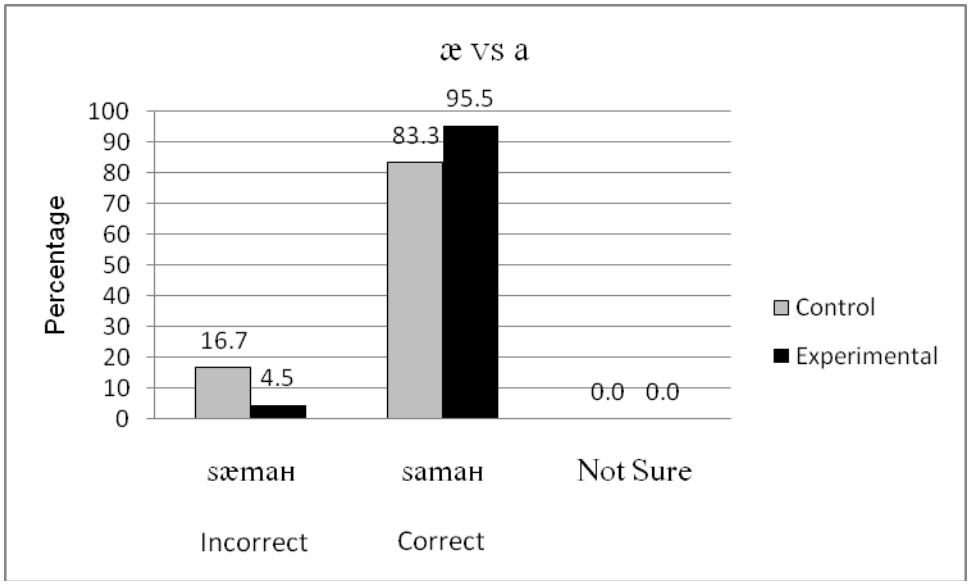

Figure 38. Central open unrounded long vowel /æ/ vs central open unrounded short vowel /a/.

Item 39 on the test examined the students' abilities to differentiate between the central open unrounded long vowel /æ/ and the central open unrounded short vowel /a/ at the beginning of the utterances sæman and saman. Of the students in the experimental group, 96% correctly chose the utterance saman, while 83% of the students in the control group selected the correct response. This results in a 13% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher.

On the sound recognition post-test, the students in the experimental group received an average of 95% of correct responses, while the students in the control group received an average of 85%. There was a 10% difference in the percentage of the total

correct responses between the two groups, with the students in the experimental group scoring higher.

Sound Production

The sound production post-test consisted of a list of Arabic words for the students to read aloud. The students were directed to download the list from the researcher's website, record the words digitally, and submit the audio file(s) through the same website. The list consisted of 84 words divided into 28 categories. Each category consisted of three words and aimed at testing the intended consonant in three positions: word-initially, word-medially, and word-finally. For example, the first category consisted of the three words: أُسود /ʔʊsud̪/, سأل /saʔal/, and شاء /ʃæʔ/, in which the glottal stop was being tested word-initially, word-medially, and word-finally. The students were not aware of which consonant was being tested, and phonemic transcription was not shown on the list.

Three native speakers of Arabic were asked to judge the sound production accuracy. This type of evaluation provided inter-rater reliability to the study. The evaluators were asked to use their "native ear judgment." Each evaluator had a list of the target sounds and marked *one* if the target sound was pronounced accurately or *zero* if the target sound was not produced. The evaluators did not look at one another's list during the evaluation process. The researcher collected the lists with the scores at the end of the evaluation process and compared the scores.

There was an agreement among the three evaluators on the scores for the sound production post-test except for the voiceless denti-alveolar stop [t̪] and the voiceless alveolar stop [t], as well as the voiced denti-alveolar stop [d̪] and the voiced alveolar stop

[d]. The evaluators reported that it was not easy for them to distinguish whether the denti-alveolar or the alveolar sound was produced. Therefore, the production of either the denti-alveolar or its alveolar counterpart was counted as a positive response. Below are results of the sound production post-test.

1. /ʔ/ – Glottal Stop as represented by the Arabic letter ء

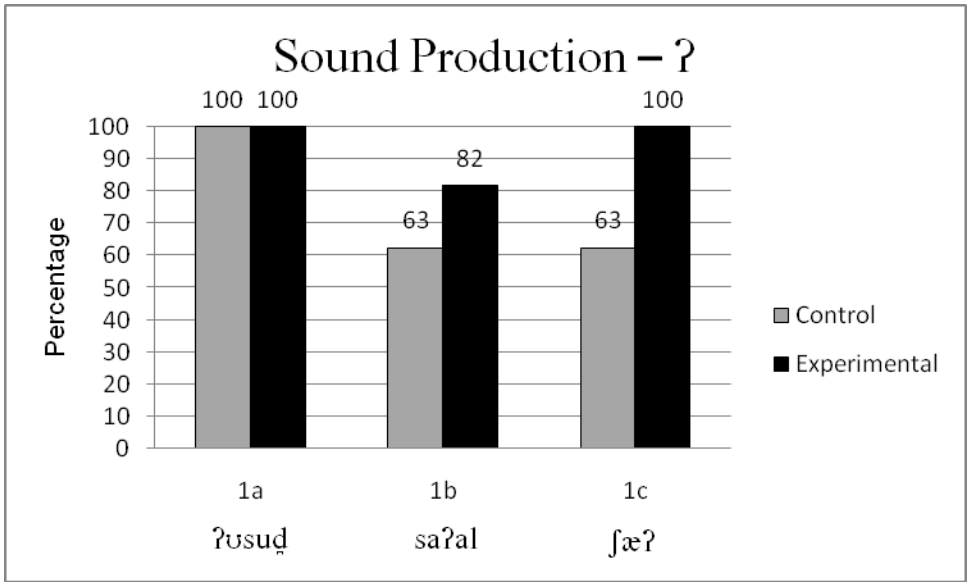

Figure 39. Results of sound production post-test for the glottal stop [ʔ].

Item 1 on the test examined the students' abilities to produce the glottal stop /ʔ/ as represented by the Arabic letter ء in three positions: word-initially, word-medially, and word-finally. All the students in both the groups correctly produced the glottal stop /ʔ/ at the beginning of the word أسود ʔʊsud̪.

Of the students in the experimental group, 82% correctly produced the glottal stop /ʔ/ in the middle of the word سأل saʔal, while 63% of the students in the control group correctly produced this sound. This results in a 19% difference between the students in the experimental group and the students in the control group, with the students in the

experimental group scoring higher. Most of the students in both the groups who did not produce the target sound /ʔ/ used the long open vowel /æ/ in place of /-aʔa-/.

On the other hand, all the students in the experimental group correctly produced the glottal stop /ʔ/ at the end of the word شاء ʃæʔ, while 63% of the students in the control group correctly produced this sound. This results in a 37% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the glottal stop /ʔ/ at the end of the word شاء ʃæʔ simply prolonged the vowel /æ/ and deleted the glottal stop.

2. /b/ – Voiced Bilabial Stop as represented by the Arabic letter ب

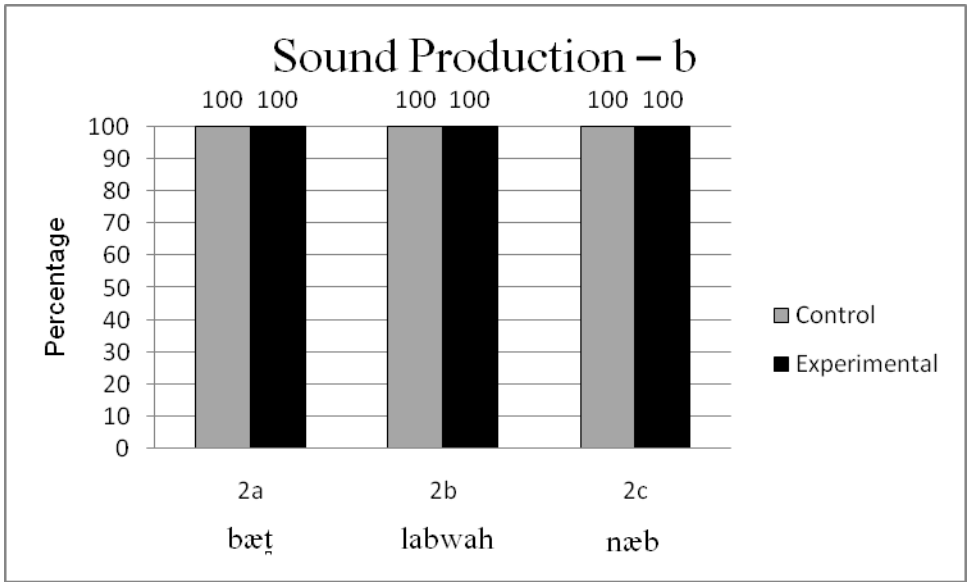

Figure 40. Results of sound production post-test for the voiced bilabial stop [b].

Item 2 on the test examined the students' abilities to produce the voiced bilabial stop /b/ as represented by the Arabic letter ب in three positions: word-initially, word-medially, and word-finally. All the students in both the groups correctly produced the

voiced bilabial stop /b/ in the three positions in the words بات bæt̪, لَبْوَة labwah, and ناب næb.

3. /t̪/ – Voiceless Denti-alveolar Stop as represented by the Arabic letter ت

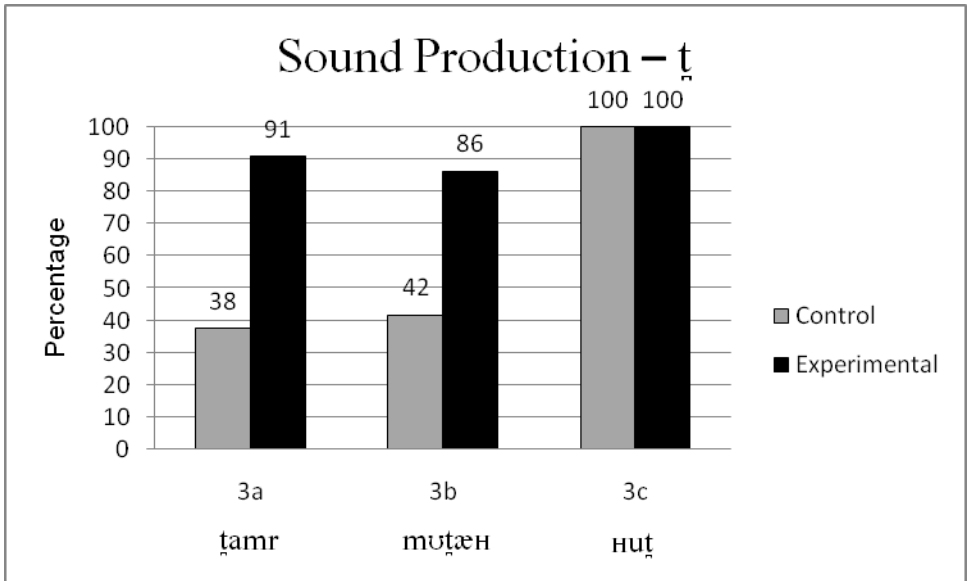

Figure 41. Results of sound production post-test for the voiceless denti-alveolar stop [t̪].

Item 3 on the test examined the students' abilities to produce the voiceless denti-alveolar stop /t̪/ as represented by the Arabic letter ت in three positions: word-initially, word-medially, and word-finally. However, the evaluators in this study were not always able to distinguish the voiceless denti-alveolar stop [t̪] and the voiceless alveolar stop [t]. Therefore, the production of either the denti-alveolar [t̪] the alveolar [t] was counted as a positive response.

Ninety-one percent of the students in the experimental group produced either the denti-alveolar stop [t̪] or the voiceless alveolar stop [t] at the beginning of the word تَمْر t̪amr, whereas 38% of the students in the control group produced either of these stops.

Most of the students who did not produce either of the expected sounds used the aspirated stop [t^h].

Of the students in the experimental group, 86% produced either the denti-alveolar stop [t̪] or the voiceless alveolar stop [t] in the middle of the word مُتاح mʊt̪æʜ, while 42% of the students in the control group produced this sound. This results in a 44% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce either the denti-alveolar stop [t̪] or the voiceless alveolar stop [t] used the flap [ɾ].

All the students in both the groups produced either the denti-alveolar stop [t̪] or the voiceless alveolar stop [t] at the end of the word حُوت ʜut̪.

4. /θ/ – Voiceless Inter-dental Fricative as represented by the Arabic letter ث

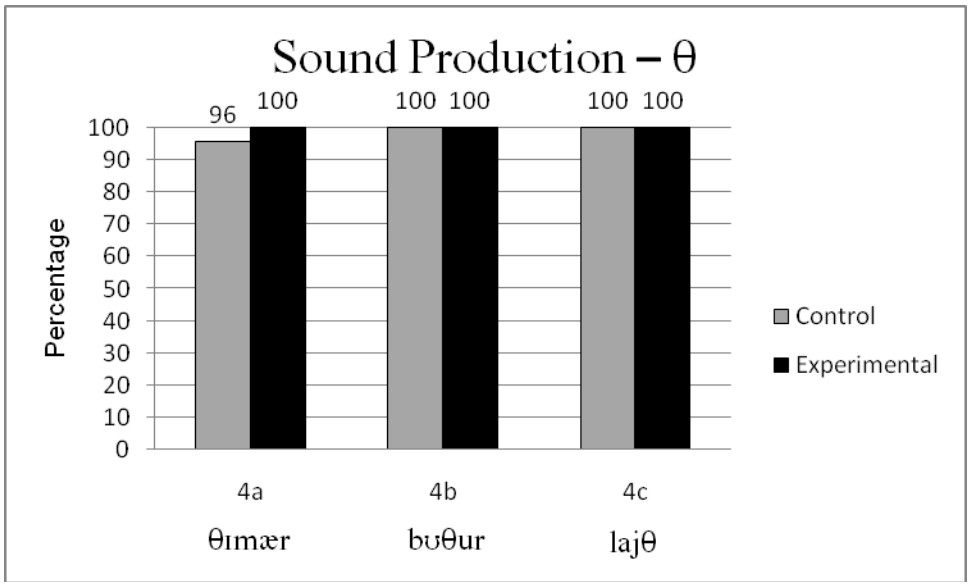

Figure 42. Results of sound production post-test for the voiceless inter-dental fricative [θ].

Item 4 on the test examined the students' abilities to produce the voiceless inter-dental fricative /θ/ as represented by the Arabic letter ث in three positions: word-initially, word-medially, and word-finally. All the students in experimental group correctly produced the voiceless fricative /θ/ at the beginning of the word ثِمار θɪmær, whereas 96% of the students in the control group produced this sound correctly. Those who did not produce the expected sound used the voiceless alveolar stop [t] instead. All the students in both the groups correctly produced the voiceless inter-dental fricative /θ/ in the middle of the word بُثور bʊθur, as well as at the end of the word لَيْث lajθ.

5. /ʒ/ – Voiced Post-alveolar Fricative as represented by the Arabic letter ج

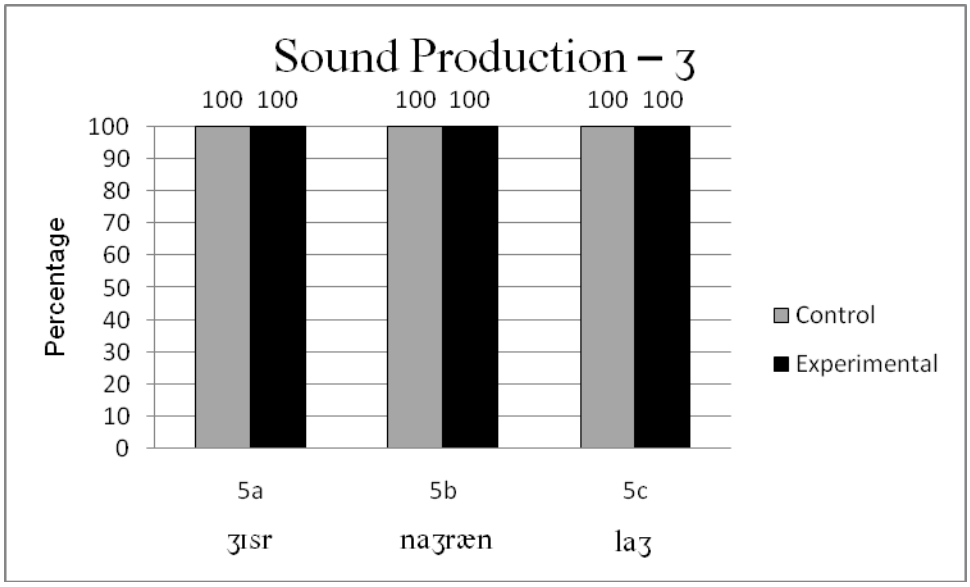

Figure 43. Results of sound production post-test for the voiced post-alveolar fricative [ʒ].

Item 5 on the test examined the students' abilities to produce the voiced post-alveolar fricative /ʒ/ as represented by the Arabic letter ج in three positions: word-

initially, word-medially, and word-finally. All the students in both the groups correctly produced the expected sound in the three positions.

6. /ʜ/ – Voiceless Epiglottal Fricative as represented by the Arabic letter ح

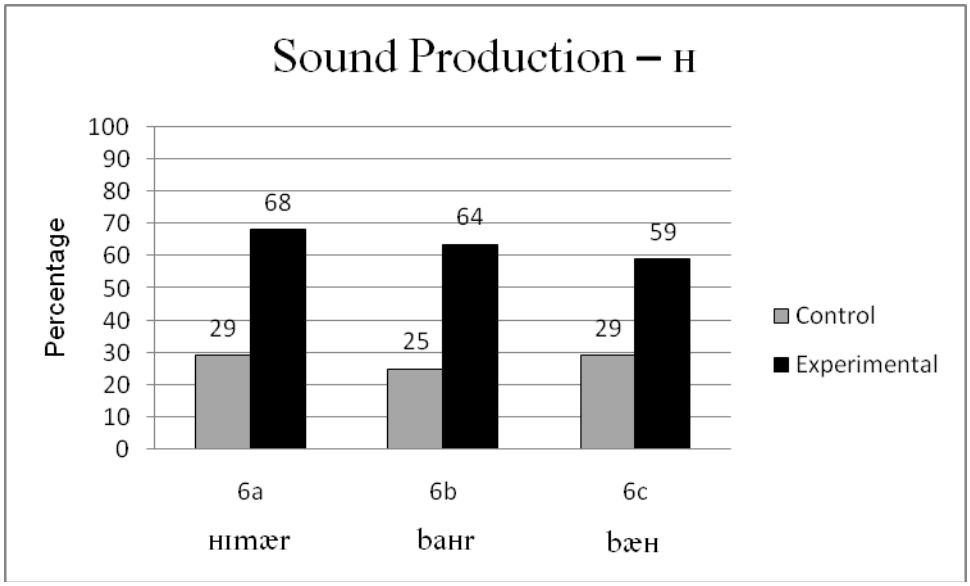

Figure 44. Results of sound production post-test for the voiceless epiglottal fricative [ʜ].

Item 6 on the test examined the students' abilities to produce the voiceless epiglottal fricative /ʜ/ as represented by the Arabic letter ح in three positions: word-initially, word-medially, and word-finally. Sixty-eight percent of the students in the experimental group correctly produced the epiglottal fricative /ʜ/ at the beginning of the word حمار ʜɪmær, while 29% of the students in the control group produced this sound. This results in a 39% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiceless epiglottal fricative /ʜ/ used the glottal fricative /h/ instead.

Of the students in the experimental group, 64% correctly produced the voiceless epiglottal fricative /ʜ/ in the middle of the word بَحْر baʜr, while 25% of the students in the control group correctly produced this sound. This results in a 39% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiceless epiglottal fricative /ʜ/ used the glottal fricative /h/ instead.

On the other hand, 59% of the students in the experimental group produced the expected voiceless epiglottal fricative /ʜ/ at the end of the word باح bæʜ, whereas 29% of the students in the control group correctly produced the expected sound. This results in a 30% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiceless epiglottal fricative /ʜ/ used the glottal fricative /h/ instead.

7. /x/ – Voiceless Velar Fricative as represented by the Arabic letter خ

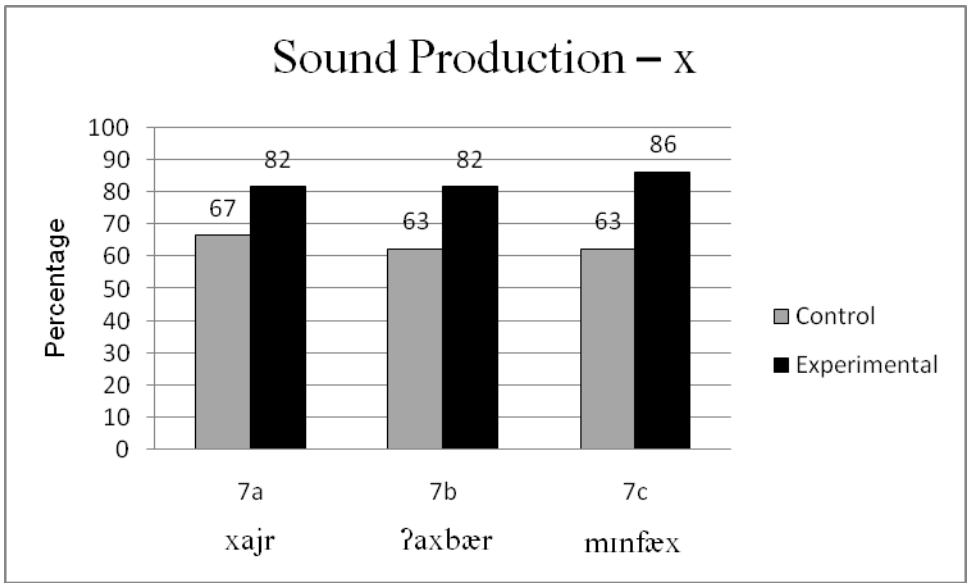

Figure 45. Results of sound production post-test for the voiceless velar fricative [x].

Item 7 on the test examined the students' abilities to produce the voiceless velar fricative /x/ as represented by the Arabic letter خ in three positions: word-initially, word-medially, and word-finally. Eighty-two percent of the students in the experimental group correctly produced the voiceless velar fricative /x/ at the beginning of the word خَيْر xajr, while only 67% of the students in the control group produced this sound. This results in a 15% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiceless velar fricative /x/ used the voiceless velar stop /k/ instead.

Of the students in the experimental group, 82% correctly produced the voiceless velar fricative /x/ in the middle of the word أَخْبَار ʔaxbær, while 63% of the students in the control group correctly produced this sound. This results in a 19% difference between

the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiceless velar fricative /x/ used the voiceless velar stop /k/ instead.

On the other hand, 86% of the students in the experimental group produced the expected voiceless velar fricative /x/ at the end of the word مِنْفاخ mɪnfæx, whereas 63% of the students in the control group correctly produced the expected sound. This results in a 23% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiceless velar fricative /x/ used the voiceless velar stop /k/ instead.

8. /ḍ/ – Voiced Denti-alveolar Stop as represented by the Arabic letter ﺩ

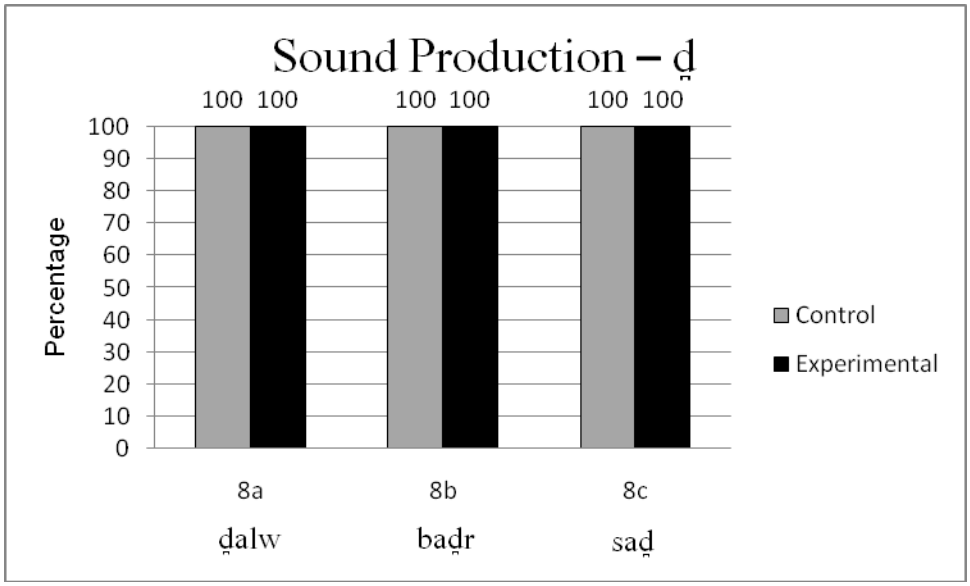

Figure 46. Results of sound production voiced denti-alveolar stop [ḍ].

Item 8 on the test examined the students' abilities to produce the voiced denti-alveolar stop /ḍ/ as represented by the Arabic letter ﺽ in three positions: word-initially,

word-medially, and word-finally. However, the evaluators in this study were not always able to distinguish the voiced denti-alveolar stop /d̪/ and the voiced alveolar stop /d/. Therefore, the production of either the denti-alveolar [d̪] the alveolar [d] was counted as a positive response. All the students in both the groups produced either the voiced denti-alveolar stop [d̪] or the alveolar [d] word-initially, word-medially, and word-finally.

9. /ð/ – Voiced Inter-dental Fricative as represented by the Arabic letter ذ

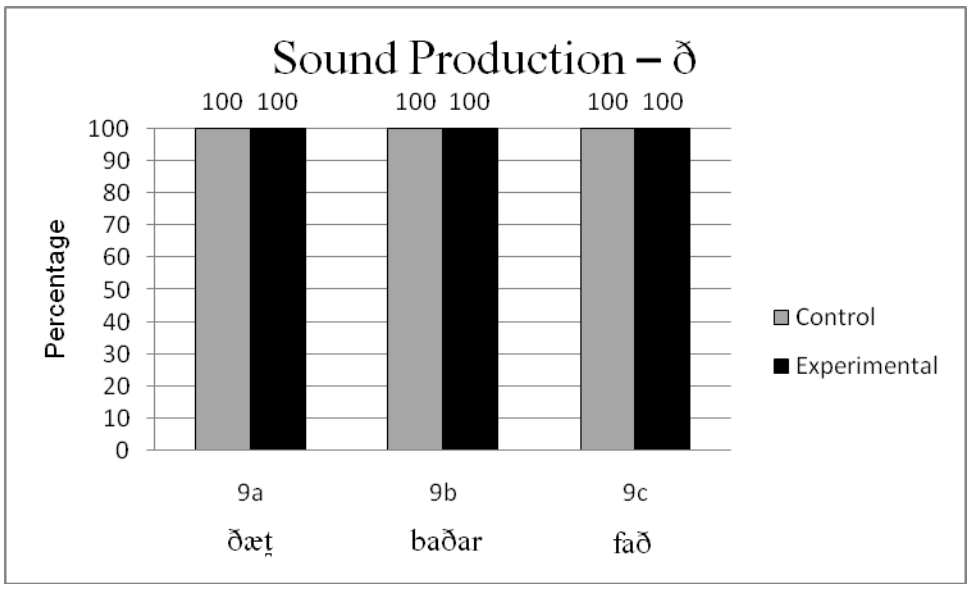

Figure 47. Results of sound production post-test for the voiced inter-dental fricative [ð].

Item 9 on the test examined the students' abilities to produce the voiced inter-dental fricative /ð/ as represented by the Arabic letter ذ in three positions: word-initially, word-medially, and word-finally in the words ذات ðæt̪, بَـذَر baðar, and فَـذ fað respectively. All the students in both the groups produced the voiced inter-dental fricative /ð/ word-initially, word-medially, and word-finally.

10. /r/ – Voiced Alveolar Trill as represented by the Arabic letter ر

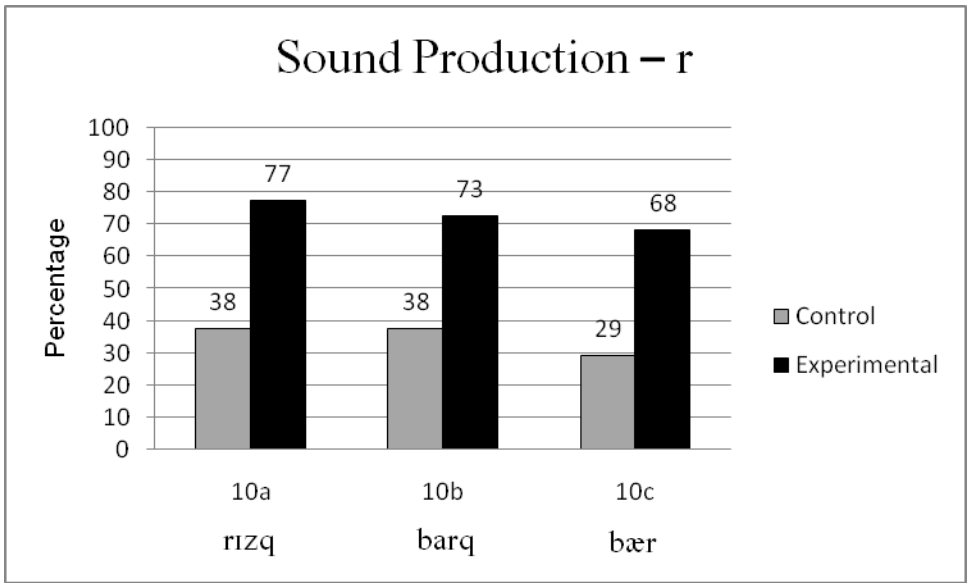

Figure 48. Results of sound production post-test for the voiced alveolar trill [r].

Item 10 on the test examined the students' abilities to produce the voiced alveolar trill /r/ as represented by the Arabic letter ر in three positions: word-initially, word-medially, and word-finally. Seventy-seven percent of the students in the experimental group correctly produced the voiced alveolar trill /r/ at the beginning of the word رِزْق rɪzq, while 38% of the students in the control group produced this sound. This results in a 39% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiced alveolar trill [r] used the approximant [ɹ] instead.

Of the students in the experimental group, 73% correctly produced the voiced alveolar trill /r/ in the middle of the word بَرْق barq, while 38% of the students in the control group correctly produced this sound. This results in a 35% difference between the

students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiced alveolar trill [r] used the approximant [ɹ] instead.

On the other hand, 68% of the students in the experimental group produced the expected voiced alveolar trill /r/ at the end of the word بار bær, whereas 29% of the students in the control group correctly produced the expected sound. This results in a 39% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiced alveolar trill [r] used the approximant [ɹ] instead.

11. /z/ – Voiced Alveolar Fricative as represented by the Arabic letter ز

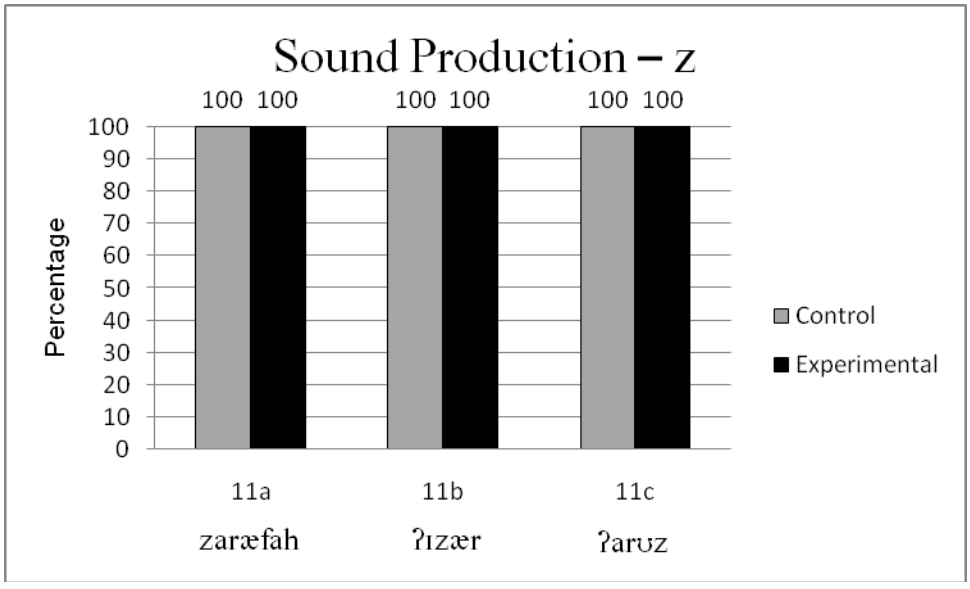

Figure 49. Results of sound production post-test for the voiced alveolar fricative [z].

Item 11 on the test examined the students' abilities to produce the voiced alveolar fricative /z/ as represented by the Arabic letter ز in three positions: word-initially, word-

medially, and word-finally in the words زَرافـة zaræfah, إزار ʔɪzær, and أرُز ʔarʊz, respectively. All the students in both the groups produced the voiced alveolar fricative /z/ word-initially, word-medially, and word-finally.

12. /s/ – Voiceless Alveolar Fricative as represented by the Arabic letter س

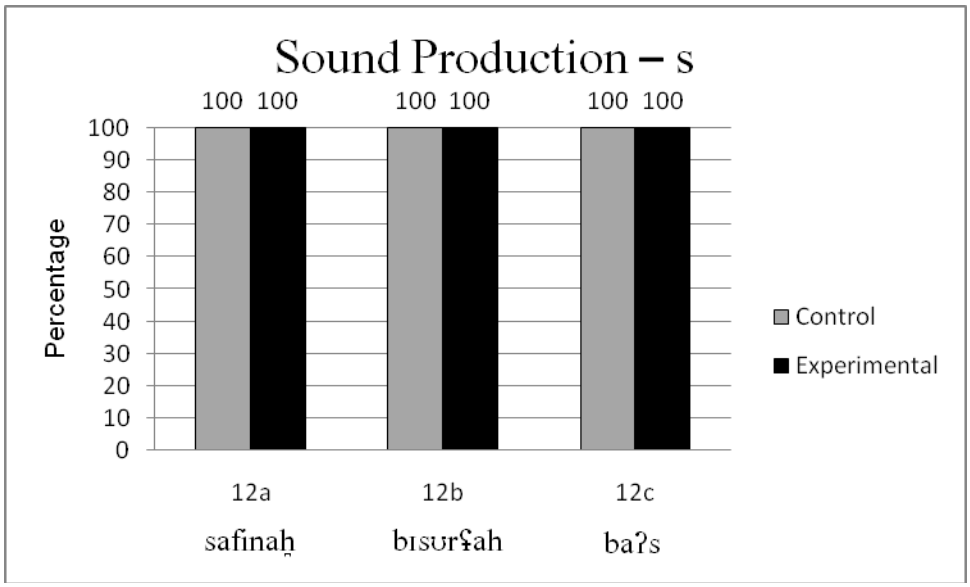

Figure 50. Results of sound production post-test for the voiceless alveolar fricative [s].

Item 12 on the test examined the students' abilities to produce the voiceless alveolar fricative as represented by the Arabic letter س in three positions: word-initially, word-medially, and word-finally. and word-finally in the words سَفينـة safinah, بِسُرعة bɪsʊrʕah, and بـأس baʔs, respectively. All the students in both the groups produced the voiced alveolar fricative /z/ word-initially, word-medially, and word-finally.

13. /ʃ/ – Voiceless Post-alveolar Fricative as represented by the Arabic letter ش

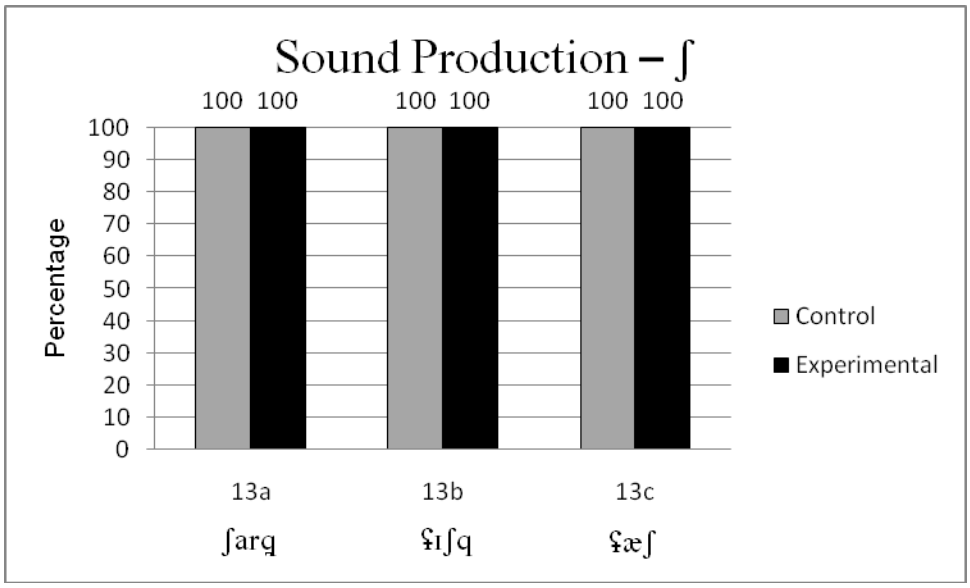

Figure 51. Results of sound production post-test for the voiceless post-alveolar fricative [ʃ].

Item 13 on the test examined the students' abilities to produce the voiceless post-alveolar fricative /ʃ/ as represented by the Arabic letter ش in three positions: word-initially, word-medially, and word-finally. and word-finally in the words شَـرق ʃarq, عِشْق ʕɪʃq, and عـاش ʕæʃ, respectively. All the students in both the groups produced the voiceless post-alveolar fricative /ʃ/ word-initially, word-medially, and word-finally.

14. /sˤ/ – Voiceless Pharyngealized Alveolar Fricative as represented by the Arabic letter ص

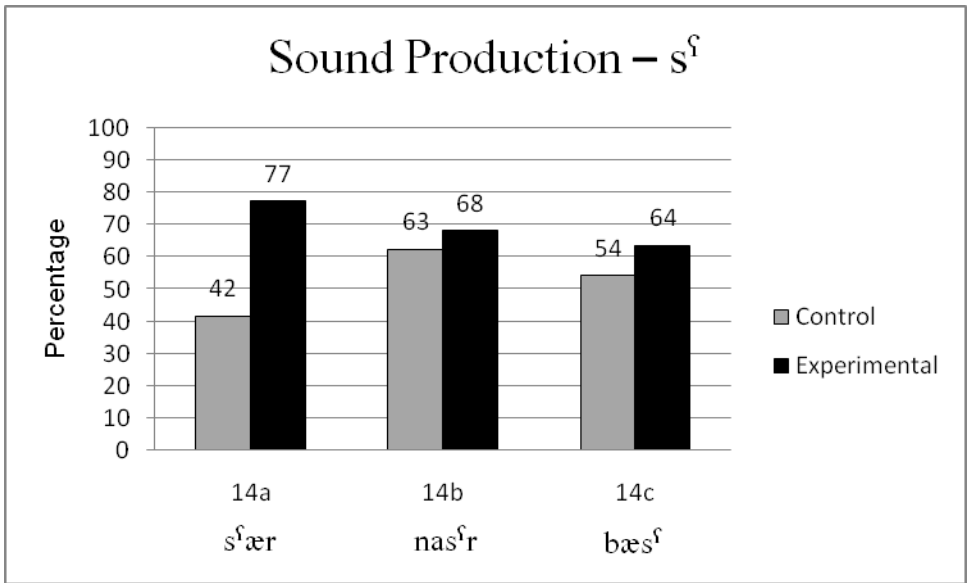

Figure 52. Results of sound production post-test for the voiceless pharyngealized alveolar fricative [sˤ].

Item 14 on the test examined the students' abilities to produce the voiceless pharyngealized alveolar fricative /sˤ/ as represented by the Arabic letter ص in three positions: word-initially, word-medially, and word-finally. Seventy-seven percent of the students in the experimental group correctly produced the voiceless pharyngealized alveolar fricative /sˤ/ at the beginning of the word صـار sˤær, while 42% of the students in the control group produced this sound. This results in a 35% difference between the students in the experimental group and the students in the control group with the students in the experimental group scoring higher. Most of the students who did not produce the voiceless pharyngealized alveolar fricative /sˤ/ used the voiceless alveolar fricative /s/ instead.

Of the students in the experimental group, 68% correctly produced the voiceless epiglottal fricative /ʜ/ in the middle of the word نَصْر nasˤr, while 63% of the students in the control group correctly produced this sound. This results in a 5% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiceless pharyngealized alveolar fricative /sˤ/ used the voiceless alveolar fricative /s/ instead.

On the other hand, 64% of the students in the experimental group produced the expected voiceless epiglottal fricative /ʜ/ at the end of the word باص bæsˤ, whereas 54% of the students in the control group correctly produced the expected sound. This results in a 10% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiceless pharyngealized alveolar fricative /sˤ/ used the voiceless alveolar fricative /s/ instead.

15. /d̪ˤ/ – Voiced Pharyngealized Denti-alveolar Stop as represented by the Arabic letter ض

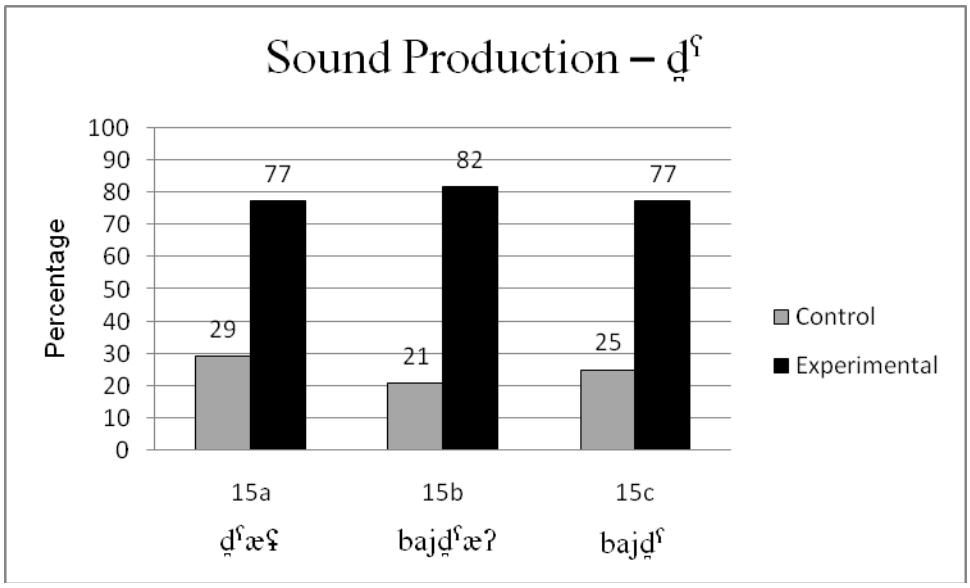

Figure 53. Results of sound production post-test for the voiced pharyngealized denti-alveolar stop [d̪ˤ].

Item 15 on the test examined the students' abilities to produce the voiced pharyngealized denti-alveolar stop /d̪ˤ/ as represented by the Arabic letter ض in three positions: word-initially, word-medially, and word-finally. Seventy-seven percent of the students in the experimental group correctly produced the epiglottal fricative /ʜ/ at the beginning of the word ضـاع d̪ˤæɬ, while 29% of the students in the control group produced this sound. This results in a 48% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the the voiced pharyngealized denti-alveolar stop /d̪ˤ/ used the the voiced alveolar stop /d/ instead.

Of the students in the experimental group, 82% correctly produced the voiced pharyngealized denti-alveolar stop /d̪ˤ/ in the middle of the word بَيْضاء bajd̪ˤæʔ, while 21% of the students in the control group correctly produced this sound. This results in a 61% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the the voiced pharyngealized denti-alveolar stop /d̪ˤ/ used the the voiced alveolar stop /d/ instead.

On the other hand, 77% of the students in the experimental group produced the expected voiced pharyngealized denti-alveolar stop /d̪ˤ/ at the end of the word بَيْض bajd̪ˤ, whereas 25% of the students in the control group correctly produced the expected sound. This results in a 52% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiced pharyngealized denti-alveolar stop /d̪ˤ/ used the voiced alveolar stop /d/ instead.

16. /t̪ˤ/ – Voiceless Pharyngealized Denti-alveolar Stop as represented by the Arabic letter ط

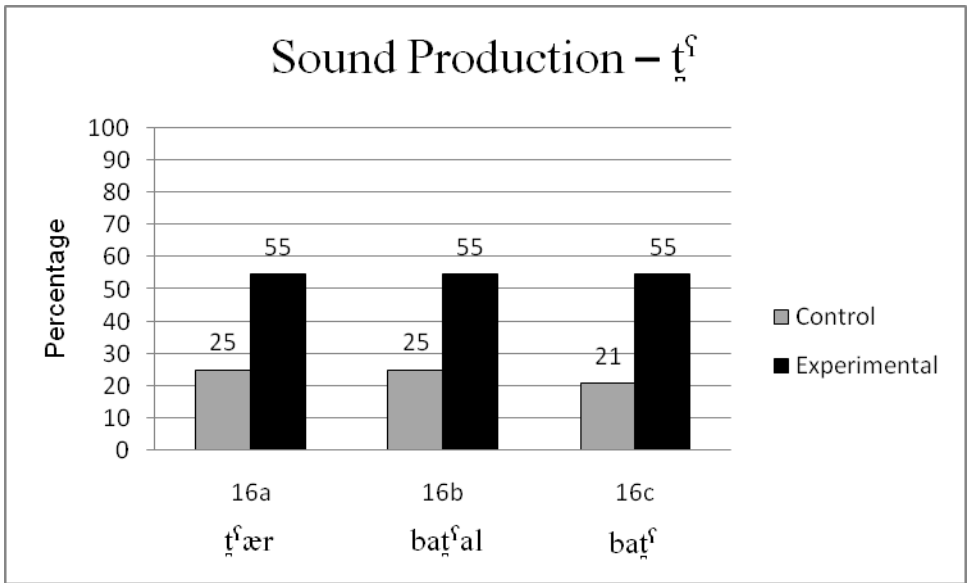

Figure 54. Results of sound production post-test for the voiceless pharyngealized denti-alveolar stop [t̪ˤ].

Item 16 on the test examined the students' abilities to produce the voiceless pharyngealized denti-alveolar stop /t̪ˤ/ as represented by the Arabic letter ح in three positions: word-initially, word-medially, and word-finally. Fifty-five percent of the students in the experimental group correctly produced the epiglottal fricative /ʜ/ at the beginning of the word طار t̪ˤær, while 25% of the students in the control group produced this sound. This results in a 30% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiceless pharyngealized denti-alveolar stop /t̪ˤ/ used the voiceless alveolar stop /t/ instead.

Of the students in the experimental group, 55% correctly produced the voiceless pharyngealized denti-alveolar stop /t̪ˤ/ in the middle of the word بَطل baṯˤal, while 25% of the students in the control group correctly produced this sound. This results in a 30% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiceless pharyngealized denti-alveolar stop /t̪ˤ/ used the voiceless alveolar stop /t/ instead.

On the other hand, 55% of the students in the experimental group produced the expected voiceless pharyngealized denti-alveolar stop /t̪ˤ/ at the end of the word بَط baṯˤ, whereas 21% of the students in the control group correctly produced the expected sound. This results in a 34% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiceless pharyngealized denti-alveolar stop /t̪ˤ/ used the voiceless alveolar stop /t/ instead.

17. /ðˤ/ – Voiced Pharyngealized Inter-dental Fricative as represented by the Arabic letter ظ

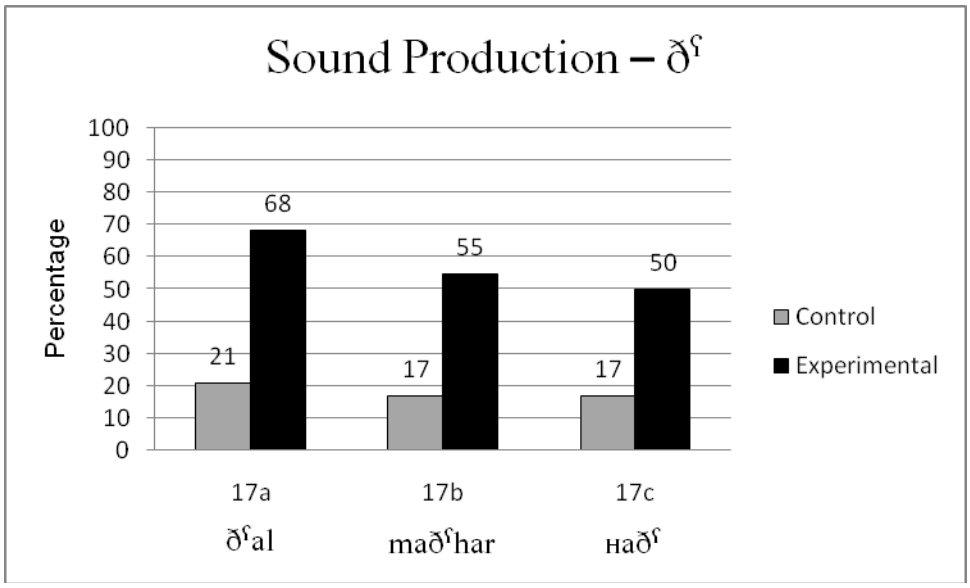

Figure 55. Results of sound production post-test for the voiced pharyngealized inter-dental fricative [ðˤ].

Item 17 on the test examined the students' abilities to produce the voiced pharyngealized inter-dental fricative /ðˤ/ as represented by the Arabic letter ض in three positions: word-initially, word-medially, and word-finally. Sixty-eight percent of the students in the experimental group correctly produced the epiglottal fricative /ʜ/ at the beginning of the word ظل ðˤal, while 21% of the students in the control group produced this sound. This results in a 47% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiced pharyngealized inter-dental fricative /ðˤ/ used the voiced inter-dental fricative /ð/ instead.

Of the students in the experimental group, 55% correctly produced the voiced pharyngealized inter-dental fricative /ðˤ/ in the middle of the word مَظْهَر maðˤhar, while 17% of the students in the control group correctly produced this sound. This results in a 38% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiced pharyngealized inter-dental fricative /ðˤ/ used the voiced inter-dental fricative /ð/ instead.

In addition, 50% of the students in the experimental group produced the expected voiced pharyngealized inter-dental fricative /ðˤ/ at the end of the word حَظ haðˤ, whereas 17% of the students in the control group correctly produced the expected sound. This results in a 33% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiced pharyngealized inter-dental fricative /ðˤ/ used the voiced inter-dental fricative /ð/ instead.

18. /ʕ/ – Voiced Epiglottal Fricative as represented by the Arabic letter ع

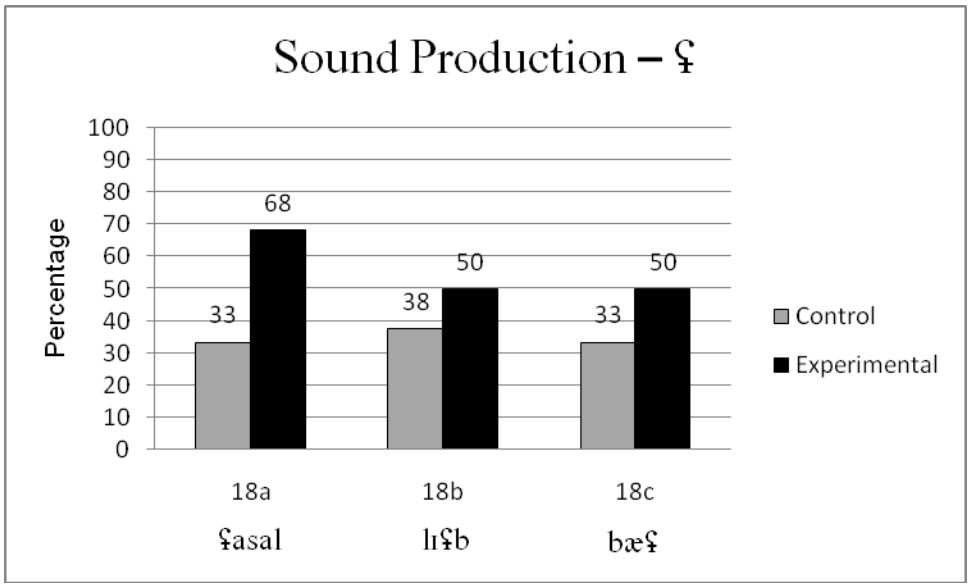

Figure 56. Results of sound production post-test for the voiced epiglottal fricative [ʕ].

Item 18 on the test examined the students' abilities to produce the voiced epiglottal fricative /ʕ/ as represented by the Arabic letter ع in three positions: word-initially, word-medially, and word-finally. Sixty-eight percent of the students in the experimental group correctly produced the epiglottal fricative /ʜ/ at the beginning of the word عَسَل ʕasal, while 33% of the students in the control group produced this sound. This results in a 35% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiced epiglottal fricative /ʕ/ used the glottal stop /ʔ/ instead.

Of the students in the experimental group, 50% correctly produced the voiced epiglottal fricative /ʕ/ in the middle of the word لِعْب lɪʕb, while 38% of the students in

the control group correctly produced this sound. This results in a 12% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiced epiglottal fricative /ʕ/ used the glottal stop /ʔ/ instead.

On the other hand, 50% of the students in the experimental group produced the expected voiced epiglottal fricative /ʕ/ at the end of the word عبـ bæʕ, whereas 33% of the students in the control group correctly produced the expected sound. This results in a 17% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiced epiglottal fricative /ʕ/ used the glottal stop /ʔ/ instead.

19. /ɣ/ – Voiced Velar Fricative as represented by the Arabic letter غ

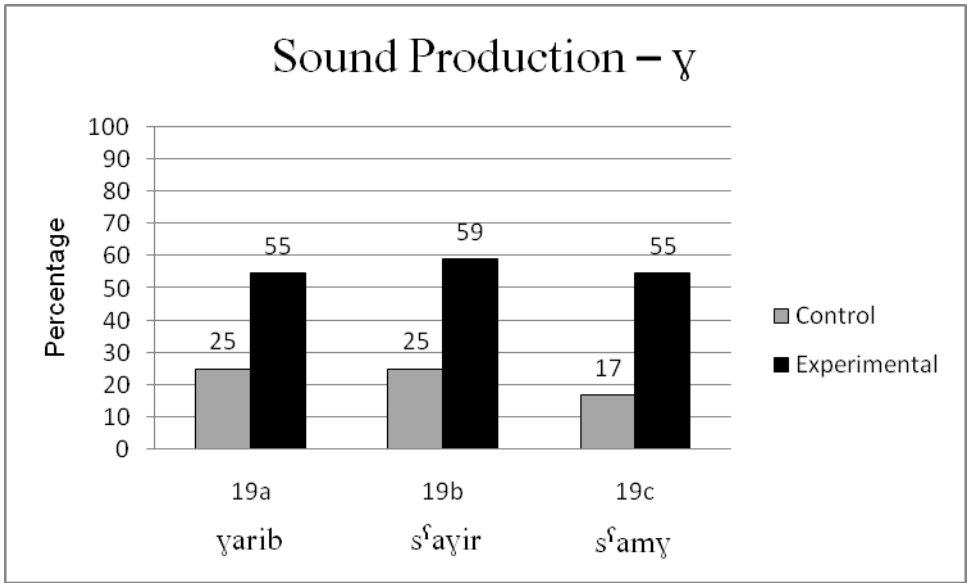

Figure 57. Results of sound production post-test for the Voiced Velar Fricative [ɣ].

Item 19 on the test examined the students' abilities to produce the voiced velar fricative /ɣ/ as represented by the Arabic letter غ in three positions: word-initially, word-medially, and word-finally. Fifty-five percent of the students in the experimental group correctly produced the epiglottal fricative /ʜ/ at the beginning of the word غَريب ɣarib, while 25% of the students in the control group produced this sound. This results in a 30% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiced velar fricative /ɣ/ used the voiced velar stop /g/ instead.

Of the students in the experimental group, 59% correctly produced the voiced velar fricative /ɣ/ in the middle of the word صَغير sˤaɣir, while 25% of the students in the control group correctly produced this sound. This results in a 34% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiced velar fricative /ɣ/ used the voiced velar stop /g/ instead.

On the other hand, 55% of the students in the experimental group produced the expected voiced velar fricative /ɣ/ at the end of the word صَمْغ sˤamɣ, whereas 17% of the students in the control group correctly produced the expected sound. This results in a 38% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiced velar fricative /ɣ/ used the voiced velar stop /g/ instead.

20. /f/ – Voiceless Labio-dental Fricative as represented by the Arabic letter ف

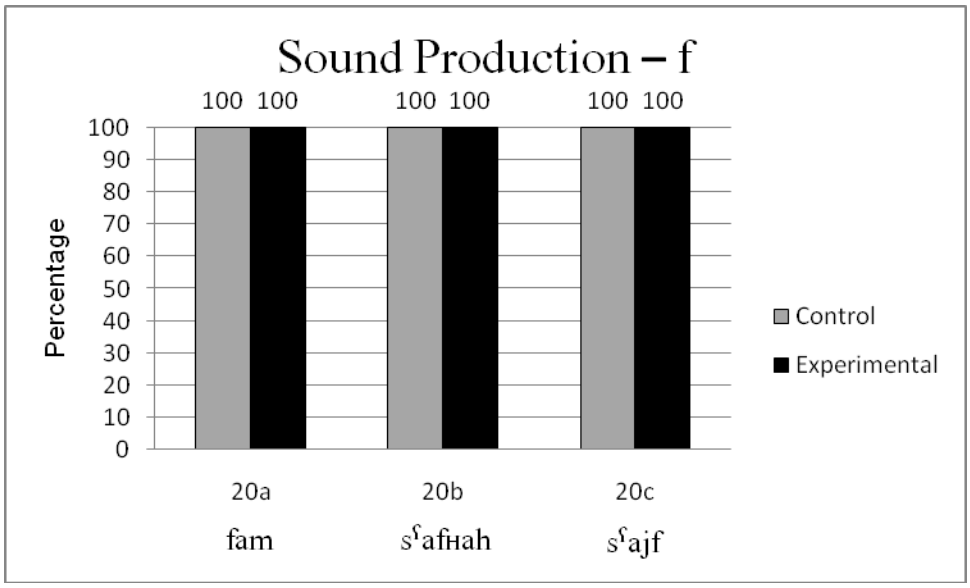

Figure 58. Results of sound production post-test for the voiceless labio-dental fricative [f].

Item 20 on the test examined the students' abilities to produce the voiceless labio-dental fricative /f/ as represented by the Arabic letter ف in three positions: word-initially, word-medially, and word-finally in the words فَم fam, صَفْحة sˤafħah, and صَيْف sˤajf respectively. All the students in both the groups produced the voiceless labio-dental fricative /f/ word-initially, word-medially, and word-finally.

21. /q/ – Voiceless Uvular Stop as represented by the Arabic letter ق

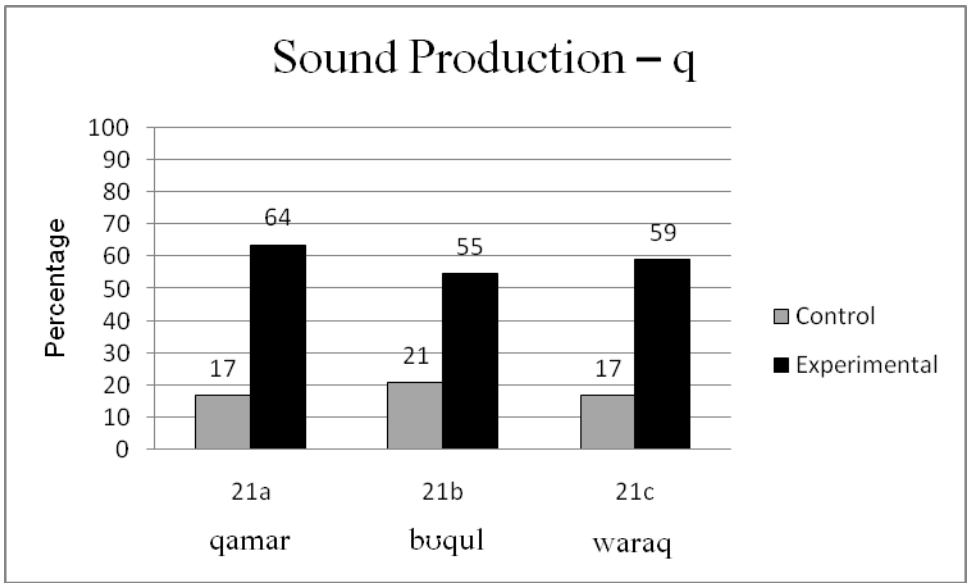

Figure 59. Results of sound production post-test for the voiceless uvular stop [q].

Item 21 on the test examined the students' abilities to produce the voiceless uvular stop /q/ as represented by the Arabic letter ق in three positions: word-initially, word-medially, and word-finally. Sixty-eight percent of the students in the experimental group correctly produced the voiceless uvular stop /q/ at the beginning of the word قَمَر qamar, while 29% of the students in the control group produced this sound. This results in a 39% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiceless uvular stop /q/ used the voiceless velar stop /k/ instead.

Of the students in the experimental group, 64% correctly produced the voiceless uvular stop /q/ in the middle of the word بُقول buqul, while 25% of the students in the

control group correctly produced this sound. This results in a 39% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiceless uvular stop /q/ used the voiceless velar stop /k/ instead.

On the other hand, 59% of the students in the experimental group produced the expected voiceless uvular stop /q/ at the end of the word وَرَق waraq, whereas 29% of the students in the control group correctly produced the expected sound. This results in a 30% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiceless uvular stop /q/ used the voiceless velar stop /k/ instead.

22. /k/ – Voiceless Velar Stop as represented by the Arabic letter ك

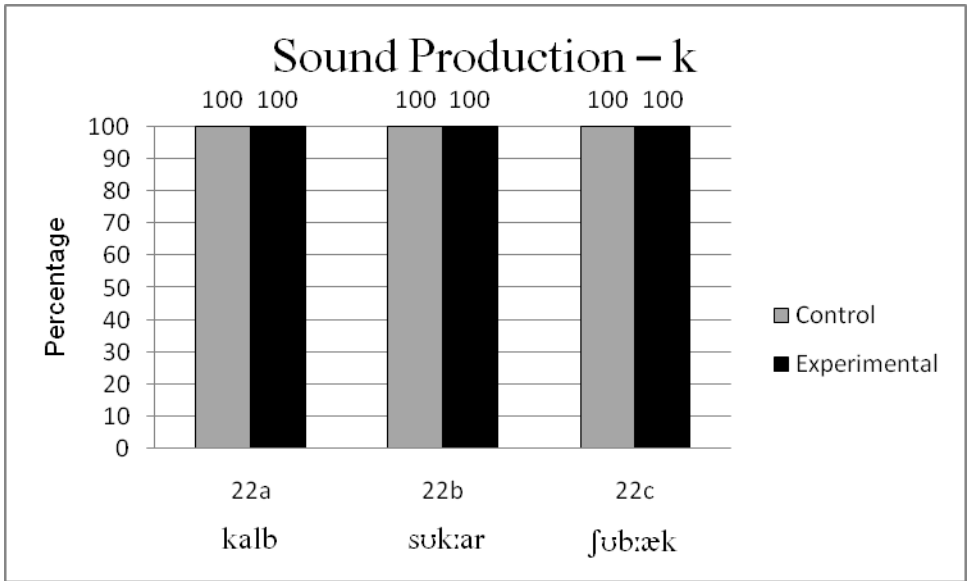

Figure 60. Results of sound production post-test for the voiceless velar stop [k].

Item 22 on the test examined the students' abilities to produce the voiceless velar stop /k/ as represented by the Arabic letter ك in three positions: word-initially, word-medially, and word-finally in the words كَلْـب kalb, سُـكَّـر sʊkːar, and شُبّـاك ʃʊbːæk, respectively. All the students in both groups produced the voiced alveolar fricative /z/ word-initially, word-medially, and word-finally.

23. /l/ – Voiced Alveolar Lateral as represented by the Arabic letter ل

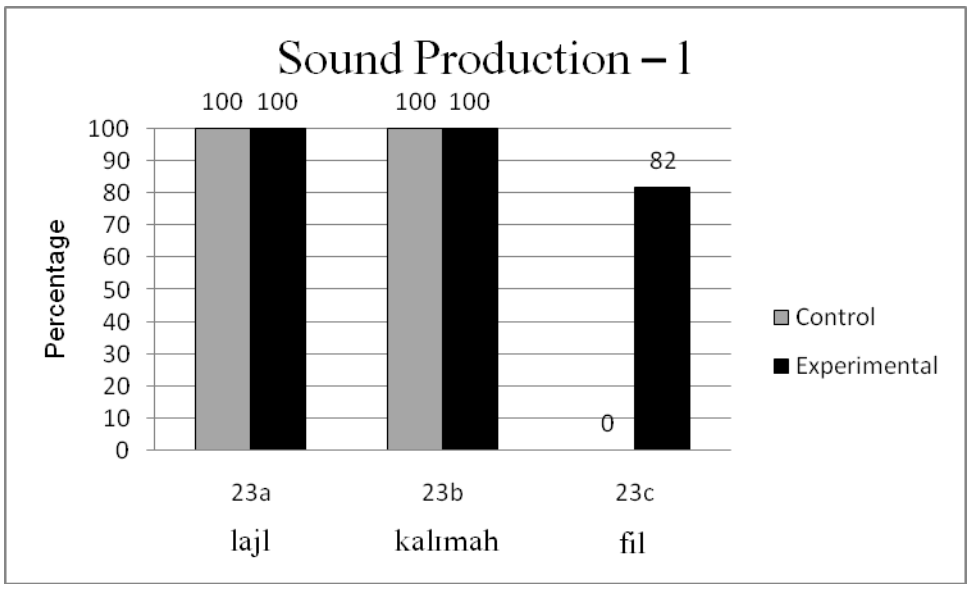

Figure 61. Results of sound production post-test for the voiced alveolar lateral [l].

Item 23 on the test examined the students' abilities to produce the voiced alveolar lateral [l] as represented by the Arabic letter ل in three positions: word-initially, word-medially, and word-finally. All the students in the experimental and control groups produced the voiced alveolar lateral [l] at the beginning of the word لَـيْل lajl and in the middle of the word كَلِمَـة kalımah.

On the other hand, 82% of the students in the experimental group correctly produced the voiced alveolar lateral [l] at the end of the word فيل fil, whereas 0% of the students in the control group produced the expected sound. This results in an 82% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiced alveolar lateral [l]used the velarized lateral [ɬ] instead.

24. /m/ – Voiced Bilabial Nasal as represented by the Arabic letter م

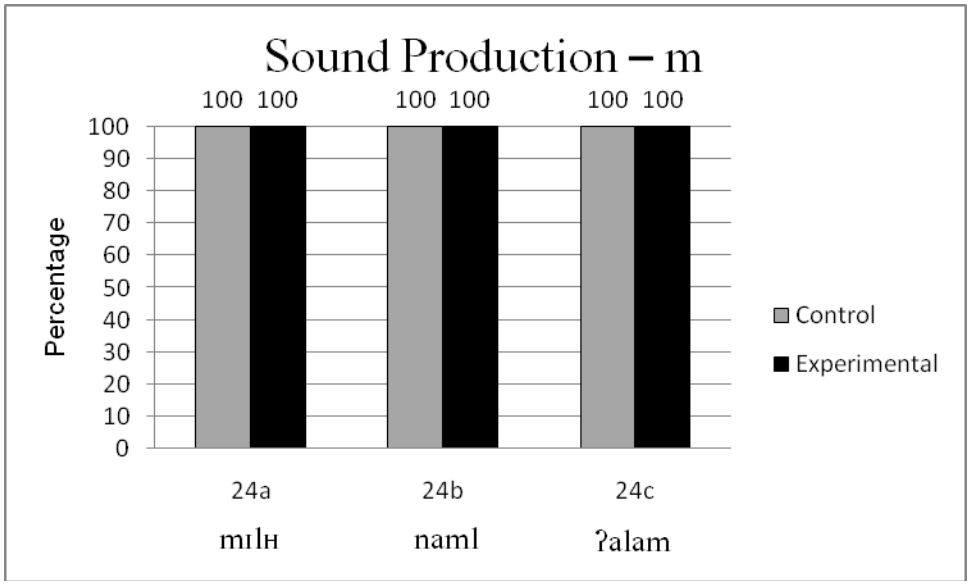

Figure 62. Results of sound production post-test for the voiced bilabial nasal [m].

Item 24 on the test examined the students' abilities to produce the voiced bilabial nasal /m/ as represented by the Arabic letter م in three positions: word-initially, word-medially, and word-finally in the words مِلْح mɪlʜ, نَمْل naml, and أَلَم ʔalam, respectively. All the students in both groups produced the voiced bilabial nasal /m/ word-initially, word-medially, and word-finally.

25. /n/ – Voiced Alveolar Nasal as represented by the Arabic letter ن

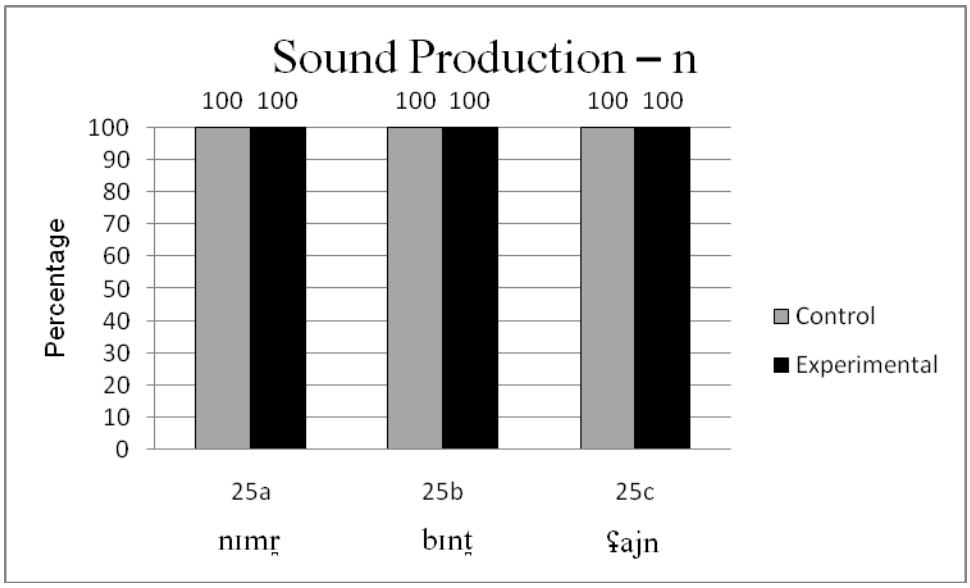

Figure 63. Results of sound production post-test for the voiced alveolar nasal [n].

Item 25 on the test examined the students' abilities to produce the voiced alveolar nasal /n/ as represented by the Arabic letter ن in three positions: word-initially, word-medially, and word-finally in the words نِمْر nɪmr, بِنْت bɪnt̪, and عَيْن ʕajn, respectively. All the students in both groups produced the voiced alveolar nasal /n/ word-initially, word-medially, and word-finally.

26. /h/ – Voiceless Glottal Fricative as represented by the Arabic letter هـ

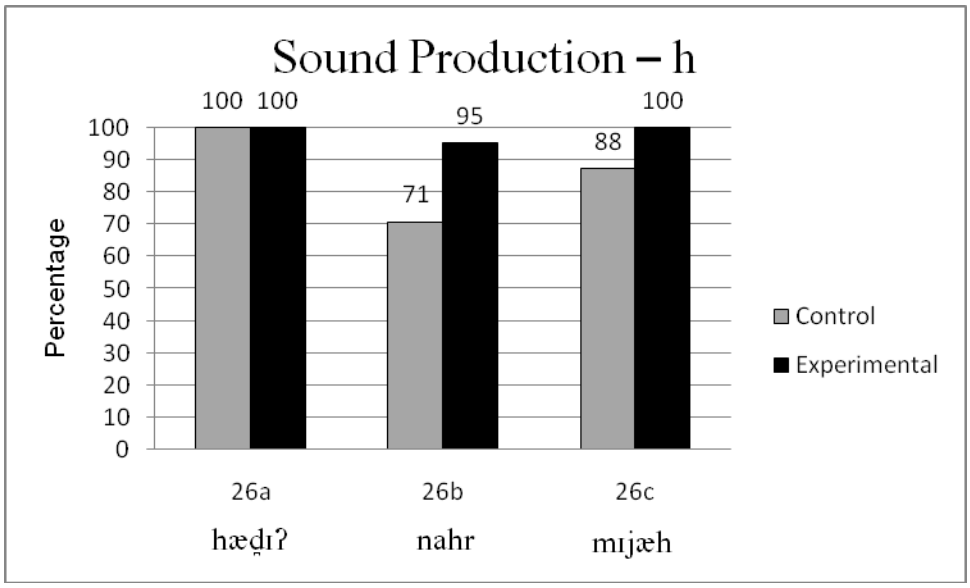

Figure 64. Results of sound production post-test for the voiceless glottal fricative [h].

Item 26 on the test examined the students' abilities to produce the voiceless glottal fricative /h/ as represented by the Arabic letter هـ in three positions: word-initially, word-medially, and word-finally. All the students in the experimental and control groups produced the voiceless glottal fricative /h/ at the beginning of the word هادئ hæḍɪʔ.

Of the students in the experimental group, 95% correctly produced the voiceless glottal fricative /h/ in the middle of the word نَهْر nahr, while 71% of the students in the control group correctly produced this sound. This results in a 24% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the glottal fricative /h/ prolonged the vowel /a/, which resulted in pronouncing the word as [næɹ].

On the other hand, 100% of the students in the experimental group produced the expected voiceless glottal fricative /h/ at the end of the word مياه mɪjæh, whereas 88% of the students in the control group correctly produced the expected sound. This results in a 12% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. Most of the students who did not produce the voiceless epiglottal fricative /ʜ/ used the glottal fricative /h/ instead.

27. /w/ – Voiced Labio-velar Semi-vowel as represented by the Arabic letter و

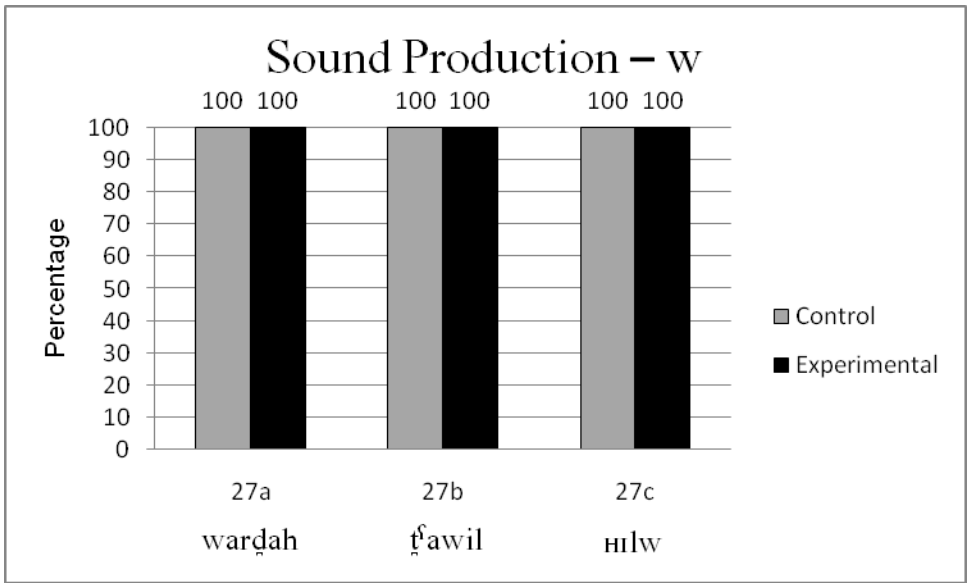

Figure 65. Results of sound production post-test for the voiced labio-velar semi-vowel [w].

Item 27 on the test examined the students' abilities to produce the voiced labio-velar semi-vowel /w/ as represented by the Arabic letter و in three positions: word-initially, word-medially, and word-finally in the words وَرْدَة warḍah, طَـويل ṭˁawil, and

حِلو hɪlw, respectively. All the students in both the groups produced the voiced labio-velar semi-vowel /w/ word-initially, word-medially, and word-finally.

28. /j/ – Voiced Palatal Semi-vowel as represented by the Arabic letter ي

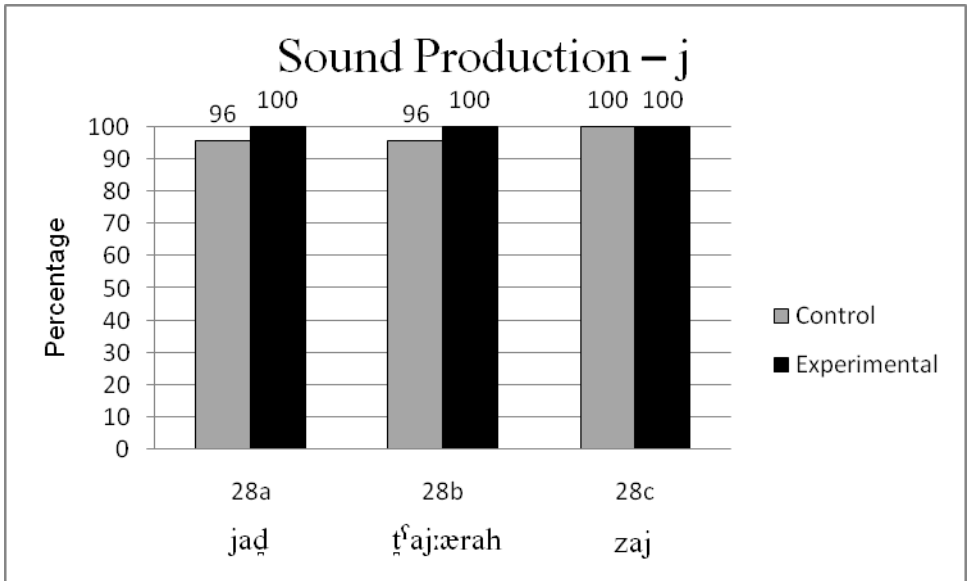

Figure 66. Results of sound production post-test for the voiced palatal semi-vowel [j].

Item 28 on the test examined the students' abilities to produce the voiced palatal semi-vowel /j/ as represented by the Arabic letter ي in three positions: word-initially, word-medially, and word-finally. Of the students in the experimental group, 100% correctly produced the voiced palatal semi-vowel /j/ at the beginning of the word يَـدّ jaḍ, whereas 96% of the students in the control group produced this sound. This results in a 4% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. The students who did not produce the voiced palatal semi-vowel /j/ used the long vowel /i/ instead.

Of the students in the experimental group, 100% correctly produced the voiced palatal semi-vowel /j/ in the middle of the word طَيّارَة tˤajːærah, while 96% of the students

in the control group correctly produced this sound. This results in a 4% difference between the students in the experimental group and the students in the control group, with the students in the experimental group scoring higher. The students who did not produce the voiced palatal semi-vowel /j/ replaced it with Ø. However, all the students in the control and experimental groups correctly produced the voiced palatal semi-vowel /j/ at the end of the word زَيّ zaj.

Qualitative Data

Students' Feedback

The researcher administered an online survey to examine responses of the subjects in the experimental group on their intervention evaluation forms. The students responded to the survey anonymously. The survey provided the researcher with qualitative data on whether the subjects thought the intervention helped them produce and recognize the sounds of Arabic or not.

Below are quotes from the students' responses to the question, "Did the course on phonetics and phonology of Arabic improve your listening and/or speaking skills in Arabic? – Explain." There are 21 positive responses and 1 negative response:

Student 1: "Yes. I think all language programs should provide instruction in linguistics of English and the other language in hand."

Student 2: "Yes. I enjoyed the course on phonology. Now I am interested in linguistics."

Student 3: "Yes. I feel like it (the intervention) gave me a better sense of how to pronounce the letters/words and how to listen better."

Student 4: “Yes. I think that I pronounce words more closely to that of a native speaker with the additional lessons on phonology.”

Student 5: “Yes. Thank you Khaled for teaching us phoenetics [*sic*] and phonology. I feel that I have a better understanding than those who did not get the extra instruction.”

Student 6: “Yes. The course made me much more aware of where I am producing the sound in my mouth to make it correct.”

Student 7: “Yes. This is a very intresting [*sic*] topic, I'm really glad you are going to write a book, and think that will help this way of learning a lot. I hope it goes well!”

Student 8: “Yes. It (the intervention) really helped me with the difference of "seh" and "saw", "teh" and "tah", etc.”

Student 9: “Yes. When you gain a greater understanding of where the placement of the mouth and tongue come into play, it makes it easier to understand the sound which is supposed to be created; this is especially helpful as Arabic and English have sounds that the other does not.”

Student 10: “Yes. It really helped with the listening. I still feel a bit unclear on some of the pronunciations when I produce them myself, but I suppose that will come in time. I thought the phonetics and phonology was very useful to learn.”

Student 11: “Yes. Thank you for including us in your study. I really enjoyed it. I find the study of linguistics very interesting and think that it is great to include in the study of Arabic.”

Student 12: “No. While I did pay more attention to the shape of my mouth, the phonetic techniques we were taught did not significantly alter my pronunciation or

understanding of most of the words on the test. I think teaching phrases and sentences to memorize is more effective than teaching grammar and sentence structure individually. In other words, I'd like to have the phrase for "where is the bathroom" down pat before learning the grammar individually and combining them to make a sentence- I guess this is the opposite approach to learning the language, but I learned French by learning phrases first and it was extremely effective."

Student 13: "Yes. I think so yes, in the end this is still up for a native speaker of arabic to decide though."

Student 14: "Yes. I am thankful to be part of this study, I don't believe it was any sort of hindrance on my learning of Arabic, and if anything, it helped greatly, thank you."

Student 15: "Yes. Taking time to understand the sounds did help, but was simultaneously frustrating because it felt like we were'nt [*sic*] learning things in the fashion forgein [*sic*] languages had previously been taught us. For example, we learned the spanish [*sic*] alphabet and numbers in grade school, and took the different letters as they came."

Student 16: "Yes. how could it not?"

Student 17: "Yes. The phonological terminology presented in class was the bare minimum, and it was not stressed, I believe it would be wise to keep it this way. too much of this would bog the students down and kill valuable class time."

Student 18: "Yes. the way i think the course on phonology helped the most was where the placement of the tongue and the manner of articulation. for example, the difference between sin and saad. there is a distinct difference that is hard to understand if not covered in-depth."

Student 19: “Yes. It helped me produce non-English sounds.”

Student 20: “Yes. comparing the sounds of English and Arabic was great. I was able to realize the difference. I wish we had a textbook besides the website.”

Student 21: “Yes. I was able to compare the way I make English sounds with the way I produce Arabic sounds. It was cool.”

Student 22: “Yes. The phonology of English and Arabic helped me a lot. I started to focus on the sounds of Arabic before saying words. I feel confident when I say Arabic words. Great job, Khaled. I’m glad I’m in the experimental group.”

Classroom Observations

To provide triangulation in the study, the regular Arabic language instructor, Mr. Samir Bitar, was asked to provide the researcher with his observations on any differences between the students in the experimental group and the students in the control group. Mr. Bitar, who worked with the students on drills and activities assigned by the researcher, wrote the following:

> The observations that can be generalized in a comparison between the Experimental and The Control group in reference to their general approach to the language and the relative instruction they received are;
>
> 1) They (students in the experimental group) fielded far more questions in all of my meetings with them.
> 2) They (students in the experimental group) repeated all instructions more frequently.
> 3) We discussed everything in more detail particularly sound articulations.
> 4) They (students in the experimental group) were able to produce and distinguish the sounds of Arabic earlier.
> 5) Over all they (students in the experimental group) had a higher level of critical thinking in their approach.

The above observations were collected at the end of the Fall semester. They are based on general observations that were conducted during and after the intervention.

Summary

Forty-six students of Arabic 101 at The University of Montana participated in the study as the control and experimental groups. Neither of the groups had background knowledge of Arabic before the intervention. The experimental group received instruction on the letters and sounds of Arabic with a phonetics and English-Arabic phonology component for a period of 20 classroom hours over a period of five weeks, whereas the control group received instruction on the letters and sounds of Arabic without the phonetics and English-Arabic phonology component for the same period of time.

The two groups took a sound recognition pre-test, sound recognition post-test, and sound production post-test. Independent two-sample t-Tests were used to analyze the data collected from the tests. Students in the experimental group responded to a survey to reflect on their views on the phonetics and English-Arabic phonology component. The following chapter provides a detailed discussion of the results.

CHAPTER FIVE

CONCLUSION

The goal of this study addressed the research question: How does student participation in an introductory course in phonetics and the phonologies of English and Arabic impact their sound recognition and sound production skills in Arabic as a foreign language? The results contribute to the field of second language instruction, in general, and speech production and recognition, in particular.

Hypothesis 1 Sound Production

The first null hypothesis stated that there will be no experimentally important or consistent mean difference ($X_1 – X_2$) between the gains in achievement in sound production test scores (X_1) of the students who participated in the phonetics and phonology course and the gains in achievement test scores in sound production (X_2) of the students who did not attend the course on phonetics and phonology. The findings rejected this hypothesis.

Discussion

It was established that 5% would constitute important difference between the experimental group, who studied the sounds and letters of Arabic with instruction on phonetics and the phonologies of English and Arabic, and the students in the control group, who studied the sounds and letters of Arabic without the phonetics and phonology component. The results determined there was an experimentally consistent and important difference between the two groups, $p < .001$, and a mean difference of 15%, with the group who studied the sounds and letters of Arabic with instruction on phonetics and the

phonologies of English and Arabic outscoring the group not receiving such instruction. Thus, the sound production null hypothesis was rejected.

There was no difference in test scores between the students in the control group and the students in the experimental group in the following cases:

1. Word-initial [ʔ]
2. Word-initial, word-medial, and word-final [b]
3. Word-final [t̪]/[t]
4. Word-medial and word-final [θ]
5. Word-initial, word-medial, and word-final [ʒ]
6. Word-initial, word-medial, and word-final [d̪]/[d]
7. Word-initial, word-medial, and word-final [ð]
8. Word-initial, word-medial, and word-final [z]
9. Word-initial, word-medial, and word-final [s]
10. Word-initial, word-medial, and word-final [ʃ]
11. Word-initial, word-medial, and word-final [f]
12. Word-initial, word-medial, and word-final [k]
13. Word-initial and word-medial [l]
14. Word-initial, word-medial, and word-final [m]
15. Word-initial, word-medial, and word-final [n]
16. Word-initial [h]

17. Word-initial, word-medial, and word-final [w]

18. Word-final [j]

Students in both the groups scored 100% on each item above on the sound production post-test. A common characteristic among these sounds is the fact that they all exist in English and Arabic in the same word positions. As suggested by the CAH, sounds that exist in L1 and L2 are not likely to create difficulties when learning the sound system of L2, resulting in positive transfer. The findings of this study supported this hypothesis.

The study suggested that some of the sound production errors committed by the students in the control group could be attributed to their lack of knowledge of the allophonic variations between the sound system of English and the sound system of Arabic. For example, the glottal stop [ʔ] exists in American English as an allophone of the voiceless alveolar stop /t/ when /t/ occurs between two vowels. It is an independent phoneme that occurs word-initially, word-medially and word-finally in Arabic. There was a 9% difference between the students in the experimental group and the students in the control group, with the students receiving instruction on phonetics and the phonologies scoring higher when producing the glottal stop /ʔ/ word-medially and a 37% difference when producing the glottal stop /ʔ/ word-finally.

Similarly, all the students in the control and experimental groups produced the voiced alveolar lateral [l] in the word-initial and word-medial positions. When it comes to the word-final position, /l/ is realized as velarized [ɬ] in English but not in Arabic. Of the students who received instruction on phonetics and the phonologies of English and

Arabic, 18% used the velarized [ɬ] at the end of the Arabic word [fil] while 100% of the students who did not receive instruction on phonetics and phonology made the same error. Such examples provide strong support to the positive results of including phonetics and phonology components in second language instruction.

Despite the fact that the voiceless inter-dental fricative [θ], represented by the Arabic letter ث, exists in both English and Arabic, 4% of the students in the control group failed to produce this sound at the word-initial position. Students used the voiceless denti-alveolar stop [t̪], as represented by the Arabic letter ت . This error could be the result of the orthographic similarities between the two Arabic letters. Identifying the effect of orthographic similarities was beyond the goal of this study.

The voiceless glottal fricative [h] occurs in English word-initially and word-medially only. However, it occurs in Arabic in all three positions. All students in the control and experimental groups produced the voiceless glottal fricative [h] in the word-initial position. However, there was a 24% difference between the scores of the students with instruction on phonetics and the phonologies outscoring the students in the control group in the word-medial position. Also, students with instruction on phonetics and the phonologies scored 12% higher than students in the control group in the word-final position.

The phonetics and phonology component in the experimental group demonstrated substantial academic gains relative to the students in the control group, especially on the sounds that do not exist in the English language or those that exist but are governed by different phonemic rules. Below is a list of the sounds that showed more than 30%

difference, with the students in the experimental group scoring higher than the students in the control group.

1. Word-initial, word-medial, and word-final [t̪ˤ]
2. Word-initial, word-medial, and word-final [ɣ]
3. Word-initial, word-medial, and word-final [ʜ]
4. Word-initial, word-medial, and word-final [ðˤ]
5. Word-initial, word-medial, and word-final [q]
6. Word-initial, word-medial, and word-final [ʕ]
7. Word-initial, word-medial, and word-final [r]
8. Word-initial [sˤ]
9. Word-medial and word-final [ʔ]
10. Word-initial and word-medial [t̪]
11. Word-initial, word-medial, and word-final [d̪ˤ]
12. Word-final [l]

The results of the sound production test emphasized the importance of including phonetics and phonology components in second language instruction. This type of instruction was strongly associated with improving students' sound production skills on the sounds that do not exist in the native language and those sounds that exist but have different allophonic distribution in the target language. Sounds that exist in both L1 and L2 in the same allophonic distribution did not create difficulty in sound production. Thus, less time could be spent on teaching those sounds. Second language instructors and

curriculum developers may find these results useful in that they may include an introduction to phonetics and L1-L2 phonology to help learners produce L2 sounds more accurately.

Hypothesis 2 Sound Recognition

The second null hypothesis stated that there will be no experimentally important or consistent mean difference ($Y_1 - Y_2$) between the gains in achievement in sound recognition test scores (Y_1) of the students who participated in the phonetics and phonology course and the gains in achievement test scores in sound recognition (Y_2) of the students who did not attend the course on phonetics and phonology (i.e., the control group). The results of the study rejected this hypothesis.

Discussion

The items on the sound recognition test examined the students' abilities to distinguish between two sounds that were expected to create confusion. Below is a list of the target sounds in the test:

1. Voiceless glottal fricative [h] vs voiceless epiglottal fricative [ʜ]
2. Voiced denti-alveolar stop [d̪] vs voiced denti-alveolar velarized stop [d̪ˠ]
3. Voiced velar fricative [ɣ] vs voiceless velar stop [k]
4. Voiced denti-alveolar velarized stop [d̪ˠ] vs voiced inter-dental velarized fricative [ðˠ]
5. Voiceless alveolar fricative [s] vs voiceless alveolar velarized fricative [sˠ]
6. Voiceless epiglottal fricative [ʜ] vs voiceless velar fricative [x]
7. Voiced velar fricative [ɣ] vs voiced velar stop [g]

8. Voiceless glottal stop [ʔ] vs voiced epiglottal fricative [ʕ]
9. Voiceless uvular stop [q] vs voiceless velar stop [k]
10. Voiced inter-dental velarized fricative [ðˠ] vs voiced inter-dental fricative [ð]
11. Voiceless velar fricative [x] vs voiceless velar stop [k]
12. Voiceless denti-alveolar stop [t̪] vs voiceless denti-alveolar velarized stop [t̪ˠ]
13. Front close unrounded long vowel [i] vs front close unrounded short vowel [ɪ]
14. Back close rounded long vowel [u] vs back close rounded short vowel [ʊ]
15. Central open unrounded long vowel [æ] vs central open unrounded short vowel [a]

From the 15 sets of sounds above, students in the experimental and control groups scored equally on only two sets, (a) the voiced velar fricative [ɣ] vs the voiceless velar stop [k] and (b) the voiceless epiglottal fricative [ʜ] vs the voiceless velar fricative [x] in the word-initial, word-medial, and word-final positions. Both the groups scored 100% on these items. Also, students in both the groups scored equally on the voiced velar fricative [ɣ] vs the voiced velar stop [g] in the word-medial and word-final positions. There was an experimentally unimportant difference in the word-initial position. Students in both the groups were able to distinguish between the sounds in each minimal pair that contrasted the sounds in these items. Thus, the results show that intervention is not associated with achievement differences in minimal pairs that distinguish each set of the above sounds.

However, the students in the experimental group scored higher than the students in the control with an average gain difference of 5% to 15% in minimal pairs that contrasted the following sounds:

1. Voiceless glottal fricative [h] vs voiceless epiglottal fricative [ʜ]
2. Voiced denti-alveolar stop [d̪] vs voiced denti-alveolar velarized stop [d̪ˤ]
3. Voiceless glottal stop [ʔ] vs voiced epiglottal fricative [ʢ]
4. Voiceless uvular stop [q] vs voiceless velar stop [k]
5. Front close unrounded long vowel [i] vs front close unrounded short vowel [ɪ]
6. Back close rounded long vowel [u] vs back close rounded short vowel [ʊ]
7. Central open unrounded long vowel [æ] vs central open unrounded short vowel [a]

The students who received instruction on phonetics and the phonologies of English and Arabic scored higher than the students in the control group in the above items with an average of 5% to 15% for each item. Each item included a contrast between a consonant that had an equivalent in English with another that did not exist in Arabic but not in English. The list also included a contrast between the short and long vowels of Arabic. Below is a list of the items in which an average gain difference of more than 15% was found.

1. Voiced denti-alveolar velarized stop [d̪ˤ] vs voiced inter-dental velarized fricative [ðˤ]
2. Voiceless alveolar fricative [s] vs voiceless alveolar velarized fricative [sˤ]

3. Voiced inter-dental velarized fricative [ðˤ] vs voiced inter-dental fricative [ð]

4. Voiceless denti-alveolar stop [t̪] vs voiceless denti-alveolar velarized stop [t̪ˤ]

The four items included the four pharyngealized consonants in Arabic, [d̪ˤ], [t̪ˤ], [sˤ], and [ðˤ]. None of these sounds exists in English. In agreement with the CAH, these sounds need to be emphasized in the process of second language instruction. The results of this study show that the intervention benefited the students in the experimental group, who received instruction on phonetics and the phonologies of English and Arabic, in that experimentally important and consistent differences were found between the control group and experimental group, with the students in the experimental group scoring higher. Thus, the findings of the sound recognition post-test provided further support that indicated second language instruction based on phonological knowledge of the sound systems of L1 and L2 is more efficient and associated with higher academic gains than not including phonetics and phonology components in the curriculum.

Qualitative Component

An online survey allowed the students in the experimental group to reflect on their experience during the intervention stating how they felt about the phonetics and phonology components added to the Arabic 101 course. The findings determined 1 out of 22 participants or less than 5% had negative views. All learners do not learn in the same way, and it is acknowledged that differences among learners are unavoidable in second language acquisition (Ellis, 1994). Burgess & Spencer (2000) stated that

> Most language-learners need to learn how to pronounce the sounds of the TL, rather than to learn to any great extent about those sounds. It must be admitted, of course, that there are language learners who do need to learn about the phonology

> of the TL too; e.g. non-native speakers intending to teach the TL, or those otherwise needing to theorize about the TL. But for the vast generality of learners of language for general purposes, knowledge of phonology as such will usually need to extend only to an ability to benefit from whatever phonemic script and word-stress marking are used in their dictionary. (p. 192)

The remainder of the students in the experimental group indicated that being introduced to phonetics and the phonologies of English and Arabic made them: (a) more confident when they use Arabic, (b) become more motivated to learn Arabic, (c) aware of which parts of the tongue and mouth to use when producing the sounds of Arabic, and (d) improve their listening and speaking skills in Arabic.

The observations provided by the regular Arabic language instructor indicated the students in the experimental group receiving instruction in phonetics and the phonologies "were able to produce and distinguish the sounds of Arabic earlier" and more effectively than the students in the control group. The instructor further added that the students in the experimental group asked more questions than the students in the control group and that they "had a higher level of critical thinking in their approach." Though these observations are subjective and not based on empirical research, these findings support the conclusion that students who received instruction on phonetics and the phonologies of English and Arabic are more aware of the mechanism of speech production, which could also be linked to creating a level of awareness that is expanded to other areas related to second language learning.

Summary

This study investigated whether explicit instruction in phonetics and the phonologies of English and Arabic would help English-speaking adults learning Arabic improve their Arabic sound production and recognition skills in a college level Arabic 101 course. This investigation examined whether teaching American learners of Arabic linguistic knowledge to transcribe, describe, and differentiate among the speech sounds of English and Arabic would help them produce and recognize the sounds of Arabic more accurately, leading to enhanced listening and speaking skills in Arabic as a second language.

Forty-six students of Arabic 101 at The University of Montana participated in the study as the control and experimental groups. The experimental group received instruction on the letters and sounds of Arabic with a phonetics and English-Arabic phonology component for a period of 20 classroom hours over a period of five weeks, whereas the control group received instruction on the letters and sounds of Arabic without the phonetics and English-Arabic phonology component for the same period of time.

None of the students had studied Arabic before taking the class; all began at the same level. However, the students receiving explicit instruction in phonetics and the phonologies of English and Arabic scored at a level exceeding the *a priori* level of experimental importance and consistency relative to the students in the control group on the sound production and sound recognition levels. This factor provides strength to the arguments presented in this dissertation for second language instruction based in phonological knowledge.

The two groups took a sound recognition pre-test, sound recognition post-test, and sound production post-test. Independent two-sample t-tests were used to analyze the data collected from the pre and posttests. Students in the experimental group responded to a survey to reflect ~~on~~ their views on the phonetics and English-Arabic phonology component.

Data analyses resulted in important (gains between groups greater than 5%) and statistically consistent differences (p-values less than .05) in the sound production and sound recognition with the students receiving instruction in phonetics and the phonologies achieving higher scores than those students who did not receive such instruction, especially for those sounds that do not exist in English or those that exist but have different allophonic distribution. Thus, the null hypotheses were rejected.

The qualitative information gathered indicated that for the most part, the students enjoyed the content discussed over the intervention period. Some students commented that they would study linguistics. Others suggested that there is a need for a textbook based on the phonetics and comparative English-Arabic phonology.

Students in the experimental group responded to a survey and reflected on their views of the phonetics and comparative English-Arabic phonologies. Of the 22 students in the experimental group, 21 (95.5%) had positive views and stated that it is important to include this type of instruction when teaching a second language.

This study was based on triangulation in that the researcher examined pre- and post-test scores, students' feedback and regular instructor's classroom observations. Moreover, three native speakers of Arabic evaluated the students' performances on the tests. There was an agreement among the three raters on all the items except those

including the voiced denti-alveolar stop [d̪] in contrast with voiced alveolar stop [d] as well as the voiceless denti-alveolar stop [t̪] in contrast with voiceless alveolar stop [t]. The researcher accepted both the denti-alveolars and alveolars and included three native speakers to evaluate the students' performance on the tests in order to provide informal interrator reliability for this study.

The findings of this study provide important and useful conclusions for foreign language programs and add to the literature base of second language instruction, particularly at the level of sound production and sound recognition. The findings strongly suggest that including an introductory component to articulatory phonetics and the phonologies of the first and target languages was associated with substantial gains in achievement regarding sound production and sound recognition skills in adult second language classrooms

Recommendations

The findings of this study provide strong support for recommending the inclusion of phonetics and phonology components in second language instruction. The students who received instruction on basic phonetics and the phonologies of the first and second languages achieved higher scores on sound recognition and sound production tests than the students who did not receive the same type of instruction. Therefore, the researcher recommends integrating phonetics and the phonologies of L1 and L2 in classroom instruction, focusing students' attention on the places and manners of articulation.

Most adult second language learners desire to achieve native-like pronunciation in the target language. In order to help them achieve this goal, language instructors should explicitly teach allophonic rules that govern the occurrence of allophones in the target

language and compare those rules to allophonic rules that exist in the first language. Instructors should also allow for more instruction and practice time for the L2 sounds that do not exist in L1.

Students who studied the sounds and letters of Arabic based on phonetics and the phonologies of English and Arabic benefited from the online component during intervention. However, students prefer to have a textbook to supplement personal instruction. Therefore, it is very important that introductory second language textbooks include an introduction to basic phonetics and comparative English-Arabic phonology. The coverage of the content could be at the level places and manners of articulation of the phonemes of Arabic as well as the allophonic rules that govern the occurrence of each allophone.

In addition, the conclusions formed by this research strongly support a recommendation for the development of two forms of texts, the most obvious of which is a student text designed for students to better understand their role in learning Arabic utilizing phonetically and phonologically based instruction. The second text is more formal and more seminal in that it would provide the philosophy and underlying reasons for the integration of phonetics and phonologies in the pedagogy of teaching Arabic. This text would be designed to better prepare the instructors of Arabic at a level that is not appropriate to the learner. The text should be more than an instructor's copy of the student text in that it would include not only a didactic purpose for the instructor, but each succeeding edition would critically review the latest related research and thereby modify as appropriate, the role of direct instruction of phonetics and phonologies in the teaching of the Arabic language. The researcher also recommends conducting workshops

and in-service training for L2 teachers, introducing them to basic phonetics and L1 vs L2 comparative phonology.

Finally, though the results of this study provided important and useful conclusions for foreign language instruction, the researcher recommends replicating this study in more than one academic institution with the use of more valid and reliable assessment tools for Arabic sound recognition and production. Studies should also provide control for variables that affect L2 learning, such as gender, motivation, and other languages learned.

Implications for Future Research

The findings in this study provide strong support for including phonetics and the phonologies of the first and target languages in the curriculum. This would allow the learners to compare the places and manners of articulation of the sounds that do not exist in the first language as well as the phonological rules that govern the distribution of allophones in the target language. These findings provide important and useful conclusions appropriate to foreign language institutes, instructors, curriculum developers, and decision-makers in the field of second language instruction. With these findings in mind, it is important to acknowledge that future research in this area will further contribute to the understanding of how to better teach foreign languages.

Second language learning is a complex area with many factors affecting it, such as personal and psychological. The variables that this study examined were the type of instruction and the test scores achieved by the participants. Thus, the design of this study did not include control for those factors that have a major impact on the second language learning, such as gender, motivation, and other foreign languages.

The results of this study are not logically generalizable to all learners of Arabic owing to the small population of learners who were available for this research. Similar research incorporating learners from a broader range of universities and instructors is strongly recommended in order to overcome limitations inherent in the present research. Intervention time was delimited to a period of five weeks, four classroom hours per week. Increasing the intervention time for instruction and practice would also contribute to controlling for variables not controlled for in this research. A related addition to the present research would be to conduct similar research utilizing the same intervention on other target languages as well as other first languages.

Another challenge that faced the researcher as well as the students was lack of a textbook on the sounds and letters of Arabic based on phonetics and the phonologies of English and Arabic with learning activities. Feedback from the students indicated that it is essential to have a textbook instead of depending on an online website with this type of instruction. Thus, the development of an appropriate textbook would enhance the ability of students to more effectively utilize the intervention and thereby allow for a better quantitative analysis of actual gains associated with the explicit instruction in phonetics and the phonologies of English and Arabic.

Due to the fact there were no valid and reliable assessment tools to examine Arabic sound recognition and sound production skills, the researcher created the assessment tools used in this study. However, the researcher acknowledges that there is a need for valid and reliable assessment tools to examine sound production and recognition skills in Arabic.

Not all Arabic language instructors in the United States have background in linguistics, particularly in English-Arabic comparative phonology. The researcher informally contacted other universities in neighboring states, but was told that instructors in those institutes did not have background in linguistics. As a result, the current study was conducted at one institution of higher education, i.e. The University of Montana, with the researcher as the phonetics and comparative phonology instructor. This occurred due to the fact that the researcher was the only native speaker of Arabic with a graduate degree in linguistics at the university level. Furthermore, he was the only qualified instructor to teach the course on the phonetics and the phonology of Arabic. The researcher recommends replicating the study at other Arabic language institutions. Having instructors with graduate degrees in linguistics is an advantage; however, it is not necessary for the instructors to have graduate degrees in linguistics to be able to teach such a course. Basic knowledge of speech mechanism and the phonologies of English and Arabic will qualify teachers of Arabic to teach the sounds and letters of Arabic based on phonetics and comparative phonology.

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APPENDICES

APPENDIX A

Permission Letter

Subject Information and Consent Form

Title: Second Language Instruction with Phonetic and Phonological Awareness: English to Arabic

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Contact:

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Special Instructions:
This consent form may contain words that are new to you. If you read any words that are not clear to you, please contact the researcher.

Purpose:
1. The purpose of the research is to examine the effects of studying the sound system of English and Arabic on improving the listening and speaking skills in Arabic.
2. You have been chosen because you are studying Arabic as a foreign language in the Fall semester 2007 at The University of Montana.

Procedures:
1. Arabic 101 is divided into 2 groups at The University of Montana: section 01 and section 02. One group will be randomly selected to learn more about the sound systems of English and Arabic besides the textbook used in class (Alif Baa), while the other group will only follow the instructional material provided in the textbook with no extra material on the sound systems of English and Arabic. The first group will be referred to as the "experimental group" and latter as the "control group."
2. In the first week of instruction, section 01 was randomly selected to constitute the control group, and section 02 was randomly selected to constitute the experimental group.
3. Students in the two groups will fill in a questionnaire that reflects factors related to second language learning, such as left- right-handedness, gender, and native language.
4. Students in the two groups will then take a pre-test in Arabic. The results of the test do not affect your grade in the ARAB 101 at all. The scores will be accessed by the researcher only and will be used for the research purposes only.
5. After about 5 to 6 weeks of instruction, students in both the groups will be given a listening and speaking test in Arabic. Your pronunciation will be digitally audio-recorded for phonological analysis. Again, the results of the test do not affect your grade in the ARAB 101 at all. The scores will be accessed by the researcher only and will be used for the research purposes only.
6. Towards the end of the Fall semester, you will take another listening and speaking test. The results of the test do not affect your grade in the ARAB 101 at all. The scores will be accessed by the researcher only and will be used for the research purposes only.
7. Students in the experimental group will complete a post-intervention survey to reflect on your experience during the course.

Benefits:
Your participation in this study may help in enabling English-speaking students of Arabic, like you, to improve their listening and speaking skills and develop a near-native pronunciation of Arabic. The exams you will take after the intervention will not affect your grade in this course.

Confidentiality:
1. Only the researcher will have access to the data collected.
2. This study is not meant to evaluate you, and it will not affect your grades.
3. If the results of this study are written in a journal or presented at a meeting, your name will not be used.
4. Your signed consent form will be stored in a cabinet separate from the data.
5. The audio files will be phonologically analyzed without any information that could identify you.
6. The audio files will then be deleted when the researcher has defended his dissertation.

Compensation for Injury:
1. The researcher does not foresee any risk in taking part in this study.
2. The following liability statement is required in all University of Montana consent forms:

> In the even that you are injured as a result of this research, you should individually seek appropriate medical treatment. If the injury is caused by the negligence of the University or any of its employees, you may be entitled to reimbursement or compensation pursuant to the Comprehensive State Insurance Plan established by the Department of Administration under the authority of M.C.A. Title 2, Chapter 9. In the event of a claim for such injury, further information may be obtained from the University's Claims representative or University Legal Counsel.
> (*Reviewed by University Legal Counsel, July 6, 1993*)

Questions:
1. You may wish to discuss this with others before you agree to take part in this study.
2. If you have any questions about the research now or during the study, contact the researcher (*see page 1 for contact information*).
3. If you have any questions regarding your rights as a research subject, you may contact the Chair of the ***I***nstitutional ***R***eview ***B***oard (IRB) through The University of Montana Research Office at 243-6670.

Participant**'s Statement of Consent:**
I have read the above description of this research study, and all my questions have been answered to my satisfaction. Furthermore, I have been assured that any future questions I may have will also be answered by the research team. I voluntarily agree to take part in this study. I understand I will receive a copy of this consent form.

Approval Expires On 9-9-08

Date Approved by UM IRB 9-10-07

Claudia D Dentler

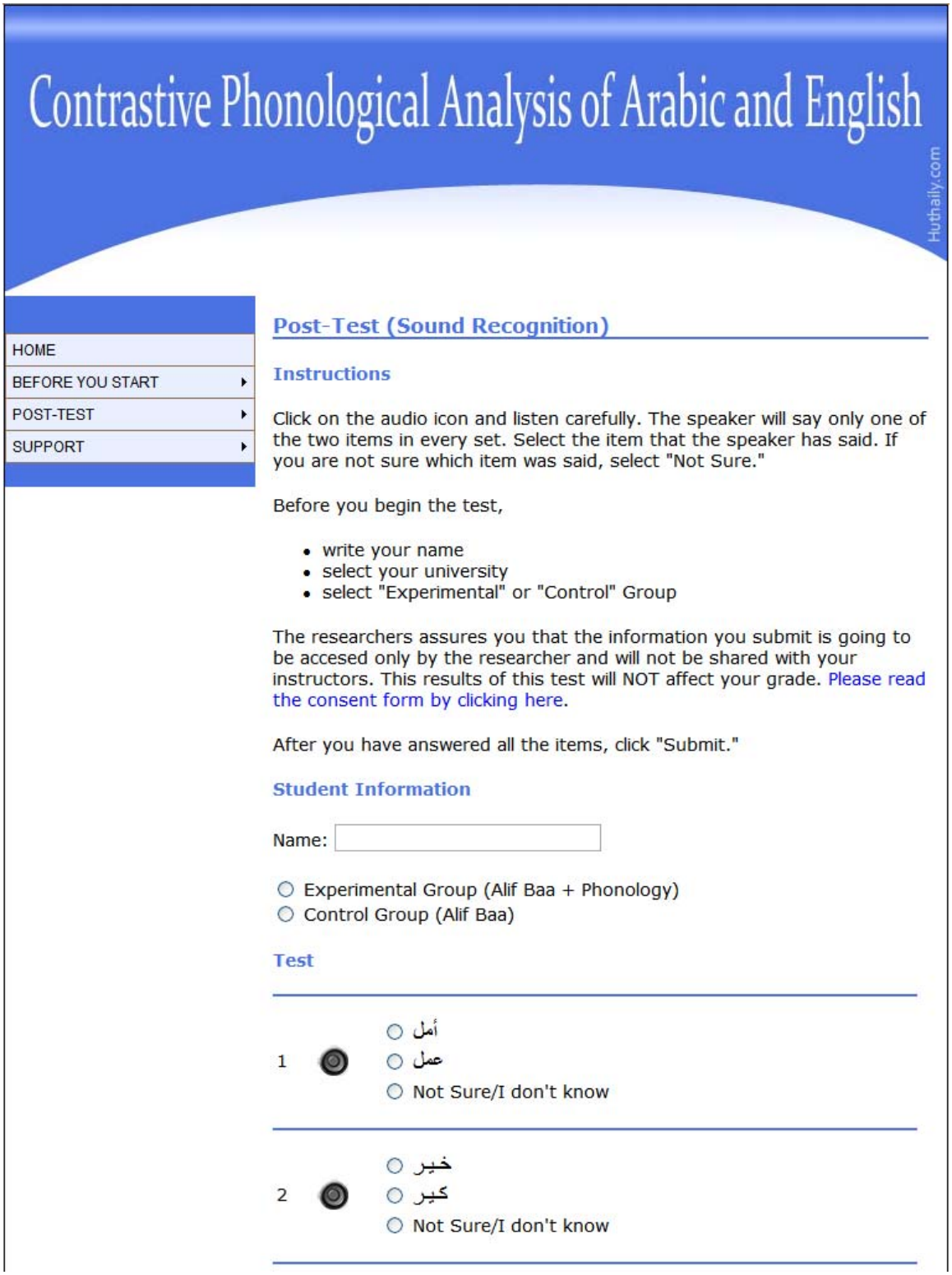
Printed (Typed) Name of the Participant

Participant's Signature

Date

APPENDIX B

Sound Recognition Pre- & Posttest


Contrastive Phonological Analysis of Arabic and English
Huthaily.com
HOME
BEFORE YOU START
POST-TEST
SUPPORT
Post-Test (Sound Recognition)
Instructions
Click on the audio icon and listen carefully. The speaker will say only one of the two items in every set. Select the item that the speaker has said. If you are not sure which item was said, select "Not Sure."
Before you begin the test,
write your name
select your university
select "Experimental" or "Control" Group
The researchers assures you that the information you submit is going to be accesed only by the researcher and will not be shared with your instructors. This results of this test will NOT affect your grade. Please read the consent form by clicking here.
After you have answered all the items, click "Submit."
Student Information
Name:
Experimental Group (Alif Baa + Phonology)
Control Group (Alif Baa)
Test
1
أمل
عمل
Not Sure/I don't know
2
خير
كير
Not Sure/I don't know

3 

- هجر
- حجر
- Not Sure/I don't know

4 

- حمار
- خمار
- Not Sure/I don't know

5 

- ضاع
- ظاع
- Not Sure/I don't know

6 

- غريب
- جريب
- Not Sure/I don't know

7 

- سيف
- صيف
- Not Sure/I don't know

8 

- دار
- ضار
- Not Sure/I don't know

9 

- ظل
- ذل
- Not Sure/I don't know

10 

- تين
- طين
- Not Sure/I don't know

11 

- قلب
- كلب
- Not Sure/I don't know

12 
- غاب
- كاب
- Not Sure/I don't know

13 
- سأي
- سعي
- Not Sure/I don't know

14 
- نكبة
- نخبة
- Not Sure/I don't know

15 
- بحر
- بهر
- Not Sure/I don't know

16 
- بحر
- بخر
- Not Sure/I don't know

17 
- وضع
- وظع
- Not Sure/I don't know

18 
- مغرب
- مجرب
- Not Sure/I don't know

19 
- مسرور
- مصرور
- Not Sure/I don't know

20 
- أداه
- أضاه
- Not Sure/I don't know

21 
- مظـاق
- مذاق
- Not Sure/I don't know

22 
- أمتـار
- أمطـار
- Not Sure/I don't know

23 
- مكلـوب
- مقلـوب
- Not Sure/I don't know

24 
- مـغيـال
- مـكيـال
- Not Sure/I don't know

25 
- نـوع
- نـوء
- Not Sure/I don't know

26 
- أسـمـاك
- أسـمـاخ
- Not Sure/I don't know

27 
- نـوح
- نـوه
- Not Sure/I don't know

28 
- مـنـاخ
- مـنـاح
- Not Sure/I don't know

29 
- أبـيـض
- أبـيـظ
- Not Sure/I don't know

30 
- بلـغ
- بلـج
- Not Sure/I don't know

31 
- قـوس
- قـوص
- Not Sure/I don't know

32 
- سـاد
- سـاض
- Not Sure/I don't know

33 
- شـعـوذ
- شـعـوظ
- Not Sure/I don't know

34 
- نـحـت
- نـحـط
- Not Sure/I don't know

35 
- أفـاق
- أفـاك
- Not Sure/I don't know

36 
- سـمـيـك
- سـمـيـغ
- Not Sure/I don't know

37 
- قـديـم
- قـدِم
- Not Sure/I don't know

38 
- سـوق
- سُـق
- Not Sure/I don't know

39 

- سـامح
- سَمـح
- Not Sure/I don't know

40. On a scale from 1 to 5 (1 being "Very Easy"; 5 being "Very Hard"), how do you evaluate this test? Select

Submit

APPENDIX C

Sound Production Posttest

Sound Production Posttest

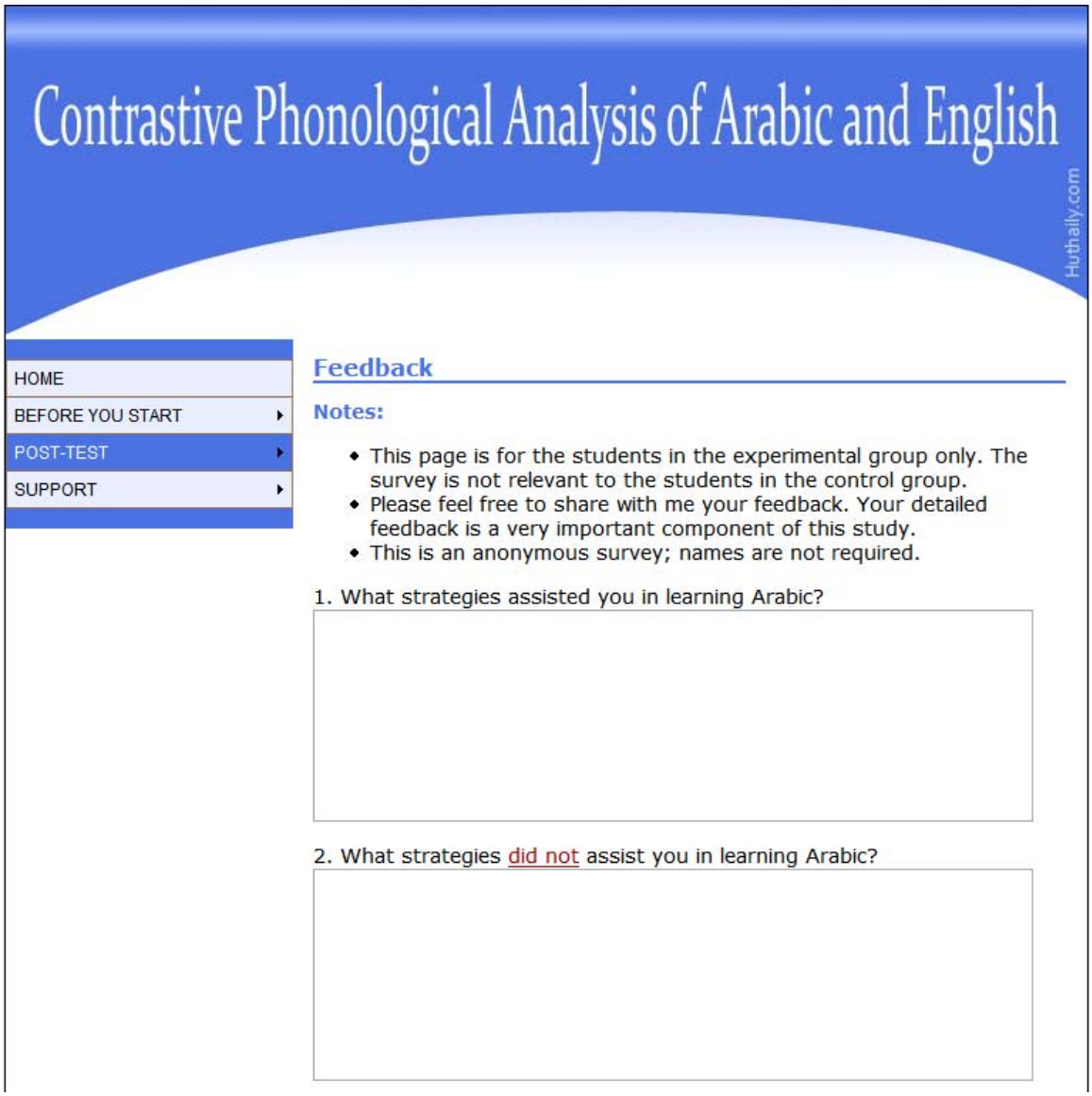
Read the following words

1.	أُسود	سَـأل	شاء
2.	بات	لَـبْوَة	ناب
3.	تَـمْـر	مِـفْـتـاح	حُـوت
4.	ثِـمـار	بُـثـور	لَـيْـث
5.	جِسْـر	نَـجْـران	لَـج
6.	حِـمـار	بَـحْـر	باح
7.	خَـيْـر	أخْـبـار	مِنْفَـاخ
8.	دَلْـو	بَـدْ ر	سَـدّ
9.	ذات	بَـذَر	فَـذّ
10.	رزْق	بَـرْق	بـار
11.	زَرافَـة	إزار	أرُزّ
12.	سَـفـيـنَـة	بِسُـرْعَـة	بـأْس
13.	شَـرْق	عِـشْـق	عـاش
14.	صار	نَـصْـر	بـاص
15.	ضاع	بَـيْـضاء	بَـيْـض
16.	طار	بَـطـل	بَطّ

17.	ظـَل	مَظْـهَـر	حَظّ
18.	عَسَل	لِـعْـب	بـاع
19.	غـَريب	صَـغـيـر	صَـمْـغ
20.	فـَمّ	صَـفـْحَـة	صَـيْـف
21.	قـَمْـر	بُـقـول	وَرَق
22.	كـَلْـب	سُـكـَّـر	شـُـبَّـاك
23.	لـَيْـل	كـَلِـمَـة	فـيـل
24.	مِـلْـح	نـَمْـل	ألَـم
25.	نِـمْـر	بِـنـْـت	عَـيْـن
26.	هـادئ	نـَـهْـر	مياه
27.	وَرْدَة	طـَويـل	حِـلـو
28.	يـَد	طـَيّـارَة	زَيّ

APPENDIX D

Survey for Experimental Group


Contrastive Phonological Analysis of Arabic and English
Huthaily.com
HOME
BEFORE YOU START
POST-TEST
SUPPORT
Feedback
Notes:
This page is for the students in the experimental group only. The survey is not relevant to the students in the control group.
Please feel free to share with me your feedback. Your detailed feedback is a very important component of this study.
This is an anonymous survey; names are not required.
1. What strategies assisted you in learning Arabic?
2. What strategies did not assist you in learning Arabic?

3. Did the course on phonetics and phonology of Arabic improve your listening and/or speaking skills in Arabic? (Select "Yes" or "No" and then elaborate.)

- ○ Yes
- ○ No

4. Will you study Arabic 102 next semester?

- ○ Yes
- ○ No

5. Would you like to add anything else that is relevant to this study?

Reset Submit

APPENDIX E

Doctoral Dissertation Time Line

DOCTORAL DISSERTATION TIME LINE

1. Gathering of Data

   From September 2007 To November 2007

2. Analysis of Data

   From October 2007 To February 2008

3. Writing of Dissertation

   From January 2008 To April 2008

4. Expected Date of Defense May 2008

5. Expected Completion Date May 2008

Student Name Khaled Huthaily

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Degree/Major Curriculum and Instruction

Dissertation Chair (print and sign) Dr. Lucy Hart Paulson

Date April 25, 2008