THE EFFECTIVENESS OF EXPLICIT PEDAGOGICAL INTERVENTION IN THE L2 PERCEPTION AND PRODUCTION OF GERMAN VOWELS

by

Adrial Debra Bryan

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THE PURDUE UNIVERSITY GRADUATE SCHOOL
STATEMENT OF COMMITTEE APPROVAL

Dr. John D. Sundquist, Chair
School of Languages and Cultures
Dr. Jessica L. Sturm
School of Languages and Cultures
Dr. Mariko Moroishi Wei
School of Languages and Cultures
Dr. Daniel J. Olson
School of Languages and Cultures

Approved by:

Dr. Jennifer William
Head of the Graduate Program

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ABSTRACT

Author: Bryan, Adrial, D. PhD
Institution: Purdue University
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Committee Chair: John D. Sundquist

The purpose of this study was twofold. Firstly, this study sought to capture second semester language students' auditory perception of German vowels. Secondly, this study sought to investigate the effectiveness of direct pronunciation instruction in enhancing learners' perception and consequent production of German vowels. Vowels were selected to be analyzed in this study, as they are the nucleus of words (Derwing, Thomson, Foote, & Munro, 2012). Front rounded vowels in German were given particular attention, as they do not exist in English, and they frequently pose as a challenge for native English-speakers to learn (O'Brien & Fagan, 2016, Hall, 2003).

This study was conducted at a large midwestern U.S. university. The project consisted of 47 participants which were divided into experimental and control groups. Throughout the duration of the study, students were administered a biographical survey, and a pre- and post-test which consisted of a listening identification exercise and speaking assessment. Participants in the test group were also offered a lesson on the German phonemic system as it relates to German vowels. Upon the completion of the study, the data analyzed did not yield any significant results. Students' scores on the perception and production exercises taken from both the pre- and post-tests remained largely stagnant. This was true for the test scores taken from the experimental and control groups. Though the study outcomes did not produce the hypothesized

results, they do underscore the need for long-term explicit pronunciation instruction in the language classroom.

CHAPTER 1: INTRODUCTION

1.1 Background

The primary goal of acquiring a second language is to have effective and meaningful communication with native-speakers. Pronunciation instruction is vital in this process, as impeccable grammar and vocabulary can be rendered incomprehensible to the listener due to the presence of a perceived accent (Miller, 2012, Martinsen & Alvord, 2011). This, in turn, inhibits communication and ultimately the initial goal of learning another language.

Although the process of reducing a perceived accent in a target language may at times seem insurmountable, growing awareness for the need of pronunciation instruction has facilitated the development of new teaching methods and a greater understanding of phonetic training in the classroom. A burgeoning rise in academic research, an increased development of phonetic textbooks (O'Brien & Fagan, 2016, Hall, 2003), and the incorporation of technology into course lessons (Mroz, 2018, McCrocklin, 2016, Offerman & Olson, 2016) have provided new means of offering directed pronunciation instruction to learners in a more global and interconnected society.

1.2 Statement of the Problem

A concern expressed by many language learners is a desire to remove their non-native pronunciation in the target language (Martinsen & Alvord, 2012). Students do not wish to stand out or portray themselves in a negative light to others within the targeted language community. The concerns of the students are valid, as the presence of an accent can inadvertently lead to complications for the learner when communicating with a native-listener (Derwing & Munro, 2009). Inaccurate pronunciation can prevent the learner from fully expressing himself or herself

in an effective manner, as the meaning behind the utterance may be lost to the listener. In certain instances, a perceived accent can also place a social marker upon the non-native speaker (Levis, 2005). The incidence of an accent can unintentionally cause the listener to draw certain conclusions about the non-native speaker (Flege, 1995).

Crucial to acquiring a more native-like pronunciation in the second language is accurate articulation of vowels. Vocalic phonemes are the nucleus of words, as such they are the principle indicators of an accent (Derwing, Thomson, Foote, & Munro, 2012). Despite their key role in word articulation, they are also among the most difficult sounds to formulate because the tongue does not make contact with the roof of the mouth (O'Brien & Fagan, 2016). The acquisition of non-native vowels may be further frustrated by interference from their first language (L1) (Lappin-Fortin & Rye, 2014). This phenomenon frequently occurs when learners inadvertently categorize the L2 phonemes according to their L1 phonetic structure (Vokic, 2010). This, in turn, causes the students to assimilate the new sounds in conformance with those already found in the L1 rather than creating a new phonemic category for the L2 features. This phenomenon most frequently occurs when sounds in the second language (L2) share a degree of similarity with those already existing in the L1. However, sounds that only exist in the L2 for the learner can also fall subject to this circumstance.

As with many languages, vowels can likewise present a challenge for learners pursuing German (O'Brien & Fagan, 2016). The German phonemic system possesses vocalic features that both share similarities with those found in English (/ɛ/, /a/) as well as those that do not bear any likeness (/œ/, /y:/) (Hall, 2003). Due to the complex nature of vowel acquisition in German for many L2 learners, examining the processes by which the language students perceive, and replicate vowel phonemes is worth investigating. To date, little research has been conducted on

German second language acquisition. The need for this research is paramount in order to address the specific concerns of German language learners who desire a greater fluency in their oral proficiency.

1.3 Research Questions and Study Design

The research questions presented in this study consider L2 learners' perception and production of German vowels. This study was modeled after Gonzalez-Bueno and Quintana-Lara (2011) in which they sought to measure L2 learners' perception and consequent production of Spanish rhotic phonemes. The first question analyzed by this study was to determine the degree of accuracy in beginner-level students' perception of German vowels. Secondly this study then sought to evaluate whether explicit pronunciation teaching strategies enhanced learners' perception and production of German vowels.

The data were collected from 47 participants enrolled in a second-semester German course at a large Midwestern U.S. university. Students were divided into either a control or experiment group. The study lasted the duration of three weeks. It was essentially composed of four main segments, a biographical survey, a pre-test, an in-class pronunciation lesson treatment, and lastly a post-test. Although ultimately this study did not confirm its hypotheses, it is hoped that this study will, nevertheless, open dialogue on the need for further research on explicit German pronunciation pedagogy.

CHAPTER 2: LITERATURE REVIEW

2.1 Overview

This chapter will discuss the importance of pronunciation instruction in language classrooms, as well as define key concepts including accent, comprehensibility and intelligibility. It will, likewise, highlight several of the contributing factors to the lack of phonetic training in lower-level language courses. Additionally, this chapter will outline several successful studies that will demonstrate the validity of incorporating pronunciation training in course development for second language learners. An introduction to modern German pronunciation will be given along with a brief description of German vowels that present problems for most native English-speakers to articulate. To conclude this chapter, a discussion on pronunciation teaching strategies will be given to illustrate means of intergrading phonetic instruction in to regular course lessons.

2.2 Accent and Fluency

2.2.1 L2 Accentedness

Before delving into the subject of second language (L2) accentedness, it is important to establish what constitutes pronunciation. According to Mroz (2018) Pronunciation is the acoustic realization of a message. As pronunciation is the means of conveying information orally, its success is based on several factors, not least of which is accentedness. It is well established that the presence of an accent is a common outgrowth from acquiring a second language (Derwing & Munro, 2005). The manifestation of an accent is a complex occurrence which impacts the speaker and listener. It, likewise, simultaneously effects the perception and production of the spoken utterances (Derwing & Munro, 2005). As defined in Kennedy and Trofimovich (2010)

accent is the listener's judgement of how closely the pronunciation utterance approaches that of a native speaker. It can also be classified as "how different a pattern of speech sounds compare to the local variety" (Derwing & Munro, 2009). Additionally, accentedness is categorized as "The phonological differences between the L2 speakers and those of a listener or of a community." (Derwing, et al., 2012).

The presence of an apparent accent can be easily recognized by native-listeners. Flege (1987) comments on the sensitivity of native listeners to different L1 backgrounds. In his article, he remarks that native speakers are highly subject to sensing deviations in phoneme articulation by non-native speakers. He asserts that listeners were able to detect an accent based on 30 milliseconds (ms) of speech. Derwing, Thomas, Foote and Munro (2012) further note that in a previous study, listeners were able to identify a L2 accent in another target language. This phenomenon underscored the sensitivity of listeners to deviations in phonemic systems; even those that are not native to them.

2.2.2 Comprehensibility and Intelligibility

Two aspects that play a crucial role in L2 accentedness are comprehensibility and intelligibility. These concepts influence the fluidity of spoken communication between the L2 speaker and the interlocutor. Comprehensibility is the listener's perceptions of the degree of difficulty in understanding a speech sample (Derwing, et al., 2012, Derwing & Munro, 2005). It is also defined as a means of measurement to assess the ease or difficulty in which the meaning of an utterance is interpreted (Offerman & Olson, 2016). In essence, comprehensibility is "the time or effort required to process utterances" (Derwing & Munro, 2009). The issue of comprehensibility is strongly interconnected with the matter of intelligibility. Often, comprehensibility occurs simultaneously with intelligibility in oral communication. Intelligibility

is “the extent to which the speaker’s intended utterance is actually understood by a listener” (Derwing & Munro, 2005). This explanation was reaffirmed in Derwing and Munro (2009). Intelligibility as well as comprehensibility are dependent upon several variables including word stress, sentence stress and intonation (Derwing, et. al., 2012). In regard to phonemic structures, vowels hold the greatest influence over intelligibility, as they are the nucleus of syllables, and as such, they have a major impact on word articulation. Following vowels, initial consonants and coda consonants effect intelligibility through sound formulation (Derwing, et. al., 2012). By addressing specific issues within a target language such as phoneme articulation, stress and intonation, it is possible that enhanced comprehensibility and intelligibility of the learner can be gained (Derwing, 2009).

2.3 Perception and L1 Filtering

The process of speech perception relates to a listener’s judgements on speech production, as they compare to language typicality. In the case of vowels, surrounding sound stimuli have been shown by Kuhl (1991) to aid listeners in determining accurate speech proto-types. According to Miller (2012), learners must first hear the phonetic features, interpret the string of sounds, and then map them correctly before attempting to replicate the phonemes observed. In order to accomplish this task, students must create phonological categories to process the sounds when acquiring a new language. These phonological categories are stored in long-term memory (Flege, 1995, Flege, Munro, & MacKay, 1995, Kuhl, 1991).

According to the Speech Learning Model, bilingual speakers create separate phonological categories for the L1 and L2 phones. The sounds are sorted by phonological constructs into either the L1 or L2 category. However, this process can be halted by the mechanism of equivalence classification. This occurs when a single phonetic category is formed to treat

perceptually connected L1 and L2 phones. These sounds, also designated as diaphones, will eventually come to resemble one another (Flege, 1995).

The formation of diaphones can also be attributed to neurological processes in how they are stored. Shoormann (2019) noted that often learners will store vocalic phonemes in the same phonological space as their L1. This occurrence leads to a filtering process, which frequently causes learners to substitute a difficult L2 phoneme with a similar one from their L1 (Lappin-Fortin & Rye, 2014). Often, the learner is unaware that he or she is subconsciously formulating their L2 phonological structures based on their L1 (Vokic, 2010). This filtering process may obstruct the learner from recognizing the divergence in their vowel perception and consequent articulation from that of a native-speaker. The method of screening through the L1 can also lead the student to make distinctions about sound articulation which are inappropriate for the L2. Likewise, filtering through the L1 can also prevent the learner from identifying pronunciation errors when they occur (McCrocklin, 2016). Interference from the L1 may also commonly lead to difficulties for the learner when mapping sounds between the L1 and L2. These challenges are not limited to vowel articulation; rather, they can permeate through the full spectrum of the phonemic system. In these circumstances, students often formulate sound-hybrids in the target language that share characteristics of both languages. As a result, these sounds cannot definitively be categorized as belonging to one language or another, as the incorrect utterances produced by the learner typically fall within a middle range between the learner's L1 and the studied language, (Lord, 2010). These pretexts, in turn, perpetuate the lingering presence of an accent in the student's L2.

2.4 Social Ramifications of a Perceived L2 Accent

The incidence of a perceived accent can often place a social marker upon the speaker. Similarly, it can also be used as a means to justify discrimination against a learner. An interlocutor can hide behind a learner's supposed accent so as to avoid interacting with the non-native speaker (Levis, 2005). The occurrence of an accent may also lead some individuals to make negative personal judgements about the learner or to misunderstand the non-native speaker's effective state. These negative reactions can be a result of the difficulties involved in understanding the learner or may be grounded in already pre-existing prejudices (Flege, 1995). Additionally, in the instances where comprehension of the non-native speaker may be frustrated by an alleged accent, both the learner and the native-listener may experience embarrassment and confusion. This, in turn, can further complicate future communication between the learner and the interlocutor (Derwing & Munro, 2009).

A person's accent can also inadvertently project a negative image of the non-native-speaker, such as noted in Hahn (2004). In her article, she captured the comments and perceptions that native English-speakers held toward non-native-speakers who produced incorrect usage of prosodic features. Her results indicated that educating students on the correct use of prosodic features will benefit the students greatly when they are forced to interact with native speakers. They will then be able to reflect a positive image of themselves and their language abilities to the native-listener.

2.5 Call for Pronunciation Instruction

The issue of L2 pronunciation pedagogy in language classrooms has been largely disregarded in curricular development and course instruction. This is found to be especially true in lower level language courses (Olson, 2014, Martinsen & Alvord, 2012, Miller, 2012, Lord,

2005). Several contributing factors for this lack of pronunciation instruction in second language education include implicit language teaching strategies used within the Communicative-Based Approach, lack of pronunciation-specific instruction materials and general attitudes toward pronunciation and accent reduction in non-native speakers.

The promotion of explicit pronunciation instruction is a relatively new phenomenon garnering attention within the last three decades of academic research. Supporters who advocate for targeted L2 pronunciation for language learners cite it as a crucial component to the language classroom, as it aids in overall higher proficiency in speech accuracy and listener comprehensibility (Olson, 2014, Derwing, et. al., 2012, Derwing & Munro, 2009). Martinsen and Alvord assent to this view in their 2012 article. They note that phonetic instruction is paramount in the language classroom, as impeccable grammar and vocabulary use can be rendered inadequate by the presence of a perceived accent. Lord states in her 2008 article "The sound system of a language is often the most salient feature in the speech of a foreigner. Speakers with perfect grammar and vocabulary will still be immediately recognized as foreigners". Miller (2012) supports this assertion by remarking that "the speaker needs to physically produce the sounds of the target language with enough accuracy to be understood." Furthermore, Lord (2005) comments on how the progress and proficiency of the learner can be frustrated by an alleged accent.

2.6 Absence of Explicit Pronunciation Instruction

Since the inception of the Communicative-Based Approach in the 1970s, language drills and other laboratory patterned exercises popular in the mid-twentieth century have declined drastically in favor of more open modes for language instruction. The Communicative-Based Approach supports the philosophy that through implicit and explicit instruction in the desired

target language, students will acquire the many facets of the studied language through focused and meaningful interactions (Savignon, 1990). Under this model, students are taught grammar structures and vocabulary through interactive lessons that are designed to accurately depict the ways in which the grammar and vocabulary are used in the L2. Yet, elements such as native-like production of prosodic features and sound articulation have been essentially omitted in the development of foreign language curricula, as they are frequently deemed non-essential for language production (Hahn, 2004, Saalfeld, 2011).

Often in Communicative-Based Approach classrooms, when pronunciation instruction was provided, it was found that teachers would rely on recasting as corrective feedback (Lyster & Ranta, 1997). This is when educators may demonstrate accurate pronunciation of a sound or word by repeating the utterance with exact articulation to the student who had made the error. This was determined by Lyster and Ranta (1997) to be the most commonly used method when compared with repetition and word elicitation for correction feedback. In their study, 55% of the instructors observed in a Montreal elementary French language immersion school used recasts to elicit student self-correction. However, this implicit form of language instruction only generated 31% of accurate student self-correction.

Though recasting aims to be an interactive means by which an educator can demonstrate accurate articulation, it fails to fully express to learners the nuances required in correct sound formulation. This is especially true in lower-level courses where students are still acquiring the basics of the targeted language. It is desirable that correct pronunciation practices begin in the introductory language courses in order to prevent the fossilization of inaccurate sound production (Miller, 2012, Saalfeld, 2011). Due to the possible complex nature of acquiring L2 phonetic features, early intervention into pronunciation training is essential. Phonetic instruction requires

a more direct form of teaching due to its set rules of formulation. Without the use of systematic instruction in sound articulation, students will be less likely to acquire a native-like production of L2 phonemes (Sturm, 2019). In order for students to grasp these phonological concepts, it is important that they be made aware of their existence. Afterward, they must then be taught to understand what they have observed (Lappin-Fortin & Rye, 2014). It is only after a student comes to recognize the unfamiliar phonetic feature that the learner can then insert the sound into their phonemic system (Miller, 2012).

Dlaska and Krekeler (2008) explored this issue through their study where research participants received phonetic training on German phonemes in an advanced undergraduate level course. The 45 study participants were then provided with a list of 43 words containing targeted phonemes comprised of selected consonants and vowels. The students were required to record themselves reading each word. They were then asked to compare their audio recordings with that of a native speaker reading the same vocabulary. In their article, Dlaska and Krakeler sought to see whether students could measure their own degree of accuracy in pronunciation, as well as self-identify sounds that contain incorrect utterances without guidance from their instructors. They found that without assistance from the lecturers, the 45 participants were only able to correctly identify 44% of the phonemes they mispronounced. However, the authors noted that the students' scores increased to 89% accuracy once they received directed feedback from the instructors.

2.6.1 Lack of Pronunciation Materials

While new studies are documenting the benefits of explicit instruction in L2 pronunciation, there does not appear to be an increase in the development of pronunciation pedagogical materials (Miller, 2012). Levis (1999) even notes that intonation is completely

absent from pronunciation pedagogy, and it is rarely found in instructional materials. In contrast, there appears to be a growing number of materials based on the instruction of vocabulary and grammar (Derwing & Munro, 2005, Lord, 2005). The lack of L2 specific pronunciation materials does not provide the teachers with a gateway in which pronunciation instruction can be incorporated into the language classroom (Mroz, 2018). This, then, forces the instructors to rely on their own intuition in teaching pronunciation, such as what should be given priority and what can be ignored (Levis, 2005). Many instructors often choose to ignore pronunciation instruction altogether instead of attempting to include it in the course curriculum because they are uncertain of the best ways to teach L2 pronunciation, as they do not have any guiding materials with examples and exercises on accurate pronunciation (Mroz, 2018). Many teachers also remark that they are nervous to approach the subject of pronunciation because of their own lack of training in L2 pronunciation (Olson, 2014). Some confess that they are concerned they will either impart their accent onto their students or that their students may more readily recognize their instructors' accents after proper training in pronunciation (Cammarata & Tedick, 2012).

As a result of the lack of specific pronunciation materials developed by language scholars, some instructors then choose to use language and pronunciation materials on the market, which are largely not founded on proven pedagogical methods. Most are based on untested methods built on perceptions that are not centered on empirical data (Derwing & Munro, 2005). The absence of pronunciation instruction materials leaves educators forced to rely on practices based on ideologies or intuition (Levis, 2005). Though these inappropriate teaching tools promise to enhance learner word articulation and language fluency, they do not yield the desired results and may leave teachers and students frustrated.

In other instances, instructors may invent new ways of teaching L2 pronunciation, such as using speech detection software much like Dragon. Because speech detection software was not originally designed to assist in L2 pronunciation instruction, these practices without directed guidance from an instructor can inhibit the learners and can provide an inaccurate reflection of their ability in the target language. Rather, they may give the teacher and the student an incorrect impression of the student's capability in the target language (Derwing & Munro, 2005). Consequently, teachers may abandon the idea of teaching pronunciation to their students because of the lack of appropriate resources (Olson, 2014).

2.6.2 Lack of Pronunciation Instruction in Lower-Level Courses

The teachers who may wish to offer pronunciation instruction to their students often cite time constraints in the classroom as barring them from focusing on pronunciation instruction (Olson, 2014). Teachers frequently remark that they are given a predetermined and fixed deadline in which certain topics must be taught in their course before the students are to be tested on them. Typically, these are topics surrounding grammar and vocabulary. Pronunciation is then left to fall by the wayside because of time limitations (Derwing, et al., 2012). In one study noted by Olson (2014), a survey was given to language instructors at three large Midwest universities. In the study, the instructors admitted that they only focused on pronunciation instruction approximately eight minutes each week. It was estimated by the surveyors that the numbers provided by instructors could have been fewer than indicated. These results underscore the lack of pronunciation instruction taught in language classrooms.

In situations when phonetic instruction is provided to students, it is often in upper level advanced language courses. Students still in the initial period of language acquisition seldom receive pronunciation training on the various phonetic features found in the L2 (Olson, 2014,

Saalfeld, 2011, Sturm, 2019). Kennedy and Trofimovich (2010) asserted that students possessing lesser L2 pronunciation skills would benefit more from quantitative phonetic training than those retaining greater language skills. In their study, they instructed an English phonetics course to 10 non-native English speakers for the duration of one semester. The students were required to complete weekly journal entries in which they assessed their oral production skills. They found in their study that advanced level students benefited more from qualitative input, whereas the authors concluded that the students with less oral proficiency would improve through explicit and systematic phonetic training.

Saalfeld (2011) corroborated this view as she expressed concern over inadequate pronunciation instruction in language courses. She remarked that the majority of the students enrolled in her upper-level Spanish phonetics course had experienced a Ceiling-Effect in their vowel production. She noted that the errors were entrenched within the learners, as they did not appear to have received corrective feedback in their lower or intermediate Spanish courses. Saalfeld surmised that the lack of emphasis in pronunciation instruction contributed to learners internalizing inaccurate articulation of Spanish vowels. She stated that without explicit pronunciation instruction from educators, learners will not realize their accent deviates from those of native-speakers. They will thusly not seek out opportunities to improve their L2 sound articulation. Saalfeld concluded her article by advocating for the incorporation of phonetic instruction in all levels of language courses, as well as making advance-level phonetic courses a curriculum requirement for language majors. She expressed her apprehension that language learners can obtain a degree in a language, though they cannot accurately formulate L2 phonemes.

2.7 Attitudes toward Pronunciation Instruction

Limited pronunciation training resources may cause some language educators to believe that teaching pronunciation is immaterial in the foreign language classroom. There are educators who argue that a non-native speaker's accent will not hinder a listener's comprehension of the speaker (Derwing & Munro, 2005). For that reason, these educators will devote more time in their classroom to teaching grammar and vocabulary, as they consider these aspects of language to be the primary features that enable a non-native learner to be understood by native listeners. These educators support the idea that accent reduction is merely a part of L2 accuracy rather than the overall fluency of the non-native speaker (Elliot, 1997).

Coinciding with the belief that the decrease of an L2 accent is irrelevant to overall language proficiency is the idea that learners will acquire a native-like accent purely through adequate input. When students do express their concerns about acquiring native-like L2 pronunciation, educators frequently recommend that the learner consider study abroad programs or find means to engage regularly with native speakers (Martinsen & Alvord, 2012). Though these strategies are valid means of obtaining a more native-like accent in the L2, they, in essence, leave the responsibility directly on the students to navigate and educate themselves on accurate sound articulation without means to verify whether their observations were correct. The idea that students will naturally acquire native-like pronunciation of the L2 strictly through study abroad permeates in mainstream language courses; nevertheless, it is not founded on contemporary academic research. Current academic studies indicate that sufficient input coupled with explicit pronunciation training enhances students' language skills.

For example, Lord (2010) followed eight students as they participated in a two-month immersion study abroad program in Mexico. Prior to study abroad, half of the participants were enrolled in a semester-long Spanish phonetics course, in which they were instructed on the

Spanish phonemic system. The remainder of the participants did not receive any explicit phonetic training. In particular, Lord sought to observe learner-progress in acquiring L2 Spanish fricatives and occlusives through explicit instruction and study abroad programs. She administered a pre- and post-test at the beginning and end of the summer study abroad program. Students were required to record themselves reading a list of words and phrases containing targeted phonetic features. She found that the students who had received explicit instruction through the phonetics class coupled with their experiences from study abroad performed higher on both language assessments than those who had only participated in the study abroad program. The results from the study indicated that student success rate on pronunciation accuracy cannot rest entirely on study abroad; rather, learner success in pronunciation proficiency also requires explicit and systematic instruction on L2 phonology by language educators.

There are those who stand by the belief that only learners of a foreign language who acquire their L2 at a young age can completely remove their L1 accent, while adult learners will always maintain their accent in the L2. Proponents of this theory adhere to the Critical Period Hypothesis. This asserts that post puberty learners will inevitably have an accent, which is often attributed to neurobiological factors related to complexities in neuromuscular coordination (Flege, 1995, Flege, et. al., 1995, Flege, 1987). As a result, many teachers will avoid teaching pronunciation in the classroom except for minor instances, such as when a student's utterance may be particularly incomprehensible. Most foreign language educators of adults view the removal of an accent as being the highest ideal, but one that is also largely unachievable because of the constraints that the L1 places on the student (Martinson & Alvord, 2012).

In his 2007 study, Birdsong contested this hypothesis by examining vowel articulation in anglophone speakers of French. In order to accurately assess learner-progression in L2 French

vowel production, Birdsong recorded 22 native English speakers reading aloud a vocabulary list which contained targeted vocalic features. At the time of the study, each of the L1 English speaking participants had been residing in Paris for approximately 5 years. They each possessed a university-level education, and none were linguists or French language educators. Birdsong then recorded 17 native speakers of French reading the same vocabulary list aloud. In addition, the author also had the participants in both groups read 2 paragraphs in French that contained nearly all of the phonetic inventory found in the French language. Afterword he randomized the audio recordings of the native English and French speakers so as to prevent rater bias. Three native speakers of French were assigned to rate the audio recordings for native-likeness. The recordings were also analyzed using the Signalyze 3.0 software, which measured voice onset time and vowel duration. The author and the raters ascertained that though some of the participants who had resided in Paris for several years did not achieve a native-like accent, there were still those participants who had attained native-like production of French phonemes. Birdsong noted that each of the Anglophone participants in his study had acquired French post-puberty, which did not appear to impede their sound articulation. He determined that native-like production of French vowels was not dependent on the initial age of language acquisition. He contended rather that learner motivation and phonetic training for task performance appeared to play a greater role in a learner's attainment of native-like pronunciation.

2.8 Principles in Pronunciation Pedagogy

While there is seemingly a myriad of explanations as to why pronunciation pedagogy has not fully assimilated into foreign language course curricula, it is important to highlight the vast benefits of including pronunciation instruction as a key component to the language classroom. In regards to including pronunciation pedagogy in the Communicative-Based Approach

classroom, it is certainly possible to offer explicit and systematic instruction of accurate pronunciation in the target language. This was demonstrated in Elliott's 1997 article in which he and other instructors offered guided instruction of Spanish pronunciation in the target language. They elicited students' pronunciation of certain phonemes and allophones using mimicking, reading and identification activities. Their results showed that students' accents can still improve through meaningful and contextualized tasks, as set forth by the Communicative-Based Approach.

The issue of whether pronunciation instruction has a role in foreign language education can certainly be a controversial topic, but the results of pronunciation instruction can yield multiple benefits for educators and learners, as "pronunciation remains crucial in effective communication" (Sturm, 2019). Researchers should consider whether accent is a part of overall fluency, as it will determine the structure of course curricula. A student's accent needs to be considered as a vital component of a learner's overall proficiency in the L2. The perception that adult learners will never acquire a native-like accent should not be used to justify the absence of pronunciation instruction in language classrooms (Birdsong, 2007).

In modern pronunciation pedagogy, there are two principles which receive great attention in academic research. The first is the Intelligibility Principle. It is viewed as the most viable teaching strategy by L2 researchers and educators (Derwing & Munro, 2009, Levis, 2005). This principle states that a person may not be able to completely remove his or her accent, but they should be comprehensible to the native-listener (Derwing & Munro, 2009, Levis, 2005). The intelligibility principle advocates teaching certain phonemic and prosodic features that may present problems for non-native speakers in impeding comprehension. According to empirical research, these items include nuclear stress, word stress and other suprasegmentals (Derwing,

Munro, & Wiebe, 1998, Foote, Trofimovich, Collins, & Soler Urzua, 2013). As a result, instructors should, in particular, set aside time to focus on such features which will not improve through input and interactions alone (Derwing, et. al., 2012). Likewise, the Intelligibility Principle also endorses placing less emphasis on those features which will not impede comprehension (Levis, 2005). Another popular teaching principle is the Nativeness Principle. Although this principle is not widely supported by academic research, it remains prevalent in language classrooms (Levis, 2005). The Nativeness principle states that a student can lose his or her L1 accent through proper exposure and exercises aimed at improving accent reduction.

The Intelligibility and Nativeness Principles requires several key components to enable student success. Firstly, the students' motivation to achieve a native-like pronunciation of the target language is paramount (Lappin-Fortin & Rye, 2014, Birdsong, 2007, Levis, 2005). The amount of time that the learner dedicates to observing and practicing the L2 phonemes will assist in determining the students' progression in sound articulation. Therefore, the students' exposure to the L2 is, likewise, critical in the development of the learners' accent, and the increased exposure to the targeted language will enhance the students' accent. Similarly, the learners' decreased exposure to the L1 will likewise aid in the students' procurement of the L2 phonemes (Levis, 2005). Lastly, the provision of sufficient explicit phonetic training is vital to the learners' L2 pronunciation proficiency (Lappin-Fortin & Rye, 2014).

Though the debate continues on whether second language pronunciation training should be included in mainstream language curricula, the full acquisition of L2 production is often expressed as a goal by learners (Lappin-Fortin & Rye, 2014). It is necessary, then, that this desire is taken under consideration by foreign language educators. This need of the L2 learners

can help in providing the platform for the introduction of explicit pronunciation instruction into the classroom.

However, before second language educators can proceed with teaching the L2, pronunciation-specific materials need to be developed that will either support the Intelligibility Principle or the Nativeness Principle. Teachers should no longer be forced to rely upon pronunciation materials that were designed around perceptions and impressions nor should they depend on their own intuition. As noted by Derwing and Munro (2009), further empirical data must be collected to develop materials based on pedagogical research that will meet students' and teachers' needs.

2.9 Modern Standardization of German

As the primary focus of this study is analyzing the perception and production of German vowels among L2 learners, it is necessary, then, to offer a brief introduction into the standardization of German, as it is the preferred form of the language. It is a common practice in language textbooks and handbooks to describe German pronunciation according to the Modern Standard German. This is a variety of speech that is often designated as the official form of the language (O'Brien & Fagan, 2016). The formation of Modern Standard German found much of it's roots in the 17th, 18th and 19th centuries. This period saw the cultivation of a super-regional written norm for the language. Jacob and Wilhelm Grimm and Conrad Duden are credited for greatly influencing the ultimate creation of the standard form of German grammar and orthography in the 19th and early 20th centuries (Freck, 1998). Despite the efforts to establish a standard written norm, the creation of the Modern Standard German in regard to pronunciation had yet to come into existence. In 1898, Theodor Siebs published his *Deutsche Buhnenaussprache,* which prescribed a standard of German pronunciation on the theatrical stage.

This prescribed form of German largely mirrored the variety of German spoken in northern Germany (Hall, 2003). At present, the dialect of German spoken in Hanover is frequently credited as being the most typical standard form of spoken German, and it is regularly heard in German media (Shoorman, 2019). Siebs's publication eventually led to the creation of additional pronunciation dictionaries throughout the 20th and 21st centuries (O'Brien & Fagan, 2016). Today, the *Duden: Aussprachewörterbuch* stands among one of the greatest authorities on Modern Standard German pronunciation.

2.10 German Vowel Pronunciation in Accordance with the Modern Standard Form

As described previously, Modern Standard German is the most widely taught and accepted form of German pronunciation. As such, it is vital that students are instructed on the articulatory patterns required to produce this preferred pronunciation. In a similar vein, vital to procuring a native-like pronunciation is accurately articulating vowels found in the target language. As stated above, vocalic phonemes are the nucleus of words; as a result, they are the principle indicators of a native or non-native-like pronunciation. Subsequently, vowels serve as a means of measurement for speaker intelligibility and listener comprehension (Derwing, et. al., 2012).

O'Brien and Fagan assert that in situations in which L2 German learners incorrectly articulate their vowels, it can often lead to miscommunication and incomprehensibility of the learner. They further state that despite the critical function that vowels play in language acquisition, they can also be among one of the most difficult sounds to articulate, as the tongue normally does not make contact with the roof of the mouth. In particular for native English-speakers acquiring German, front rounded vowels can present a challenge to pronounce, as these sounds do not exist in English. Example of these phonemes include /y:/, /ʏ/, /œ/, and /ø:/

(O'Brien & Fagan, 2016, Hall, 2003). Front rounded vowels as with all other vowels are dispersed throughout a language, and they are not necessarily restricted to one particular grapheme. A prime example of this is the phoneme /y:/which is present in the words <Tür> 'door' and <Typ> 'type'. These variations on a phoneme's orthographical presentation can lead to further complications for learners trying to acquire German vowels in their differing forms (O'Brien & Fagan, 2016). In an effort to assist students in correctly pronouncing German vowels containing umlauts, [/øː/], [/œ/], [/y:/], and [/ʏ/] are the main focus of this study along with [/ɛː/] and [/ɛ/]. The latter two phonemes were included in this study so as to incorporate the full spectrum of German vowels containing umlauts.

See below two separate charts outlining German vowels. The first is taken from Mangold (2005), and it highlights the vowels contained within German. The second is borrowed from O'Brien and Fagan (2016). It outlines various vocalic phonemes found in German along with their allophones and examples.

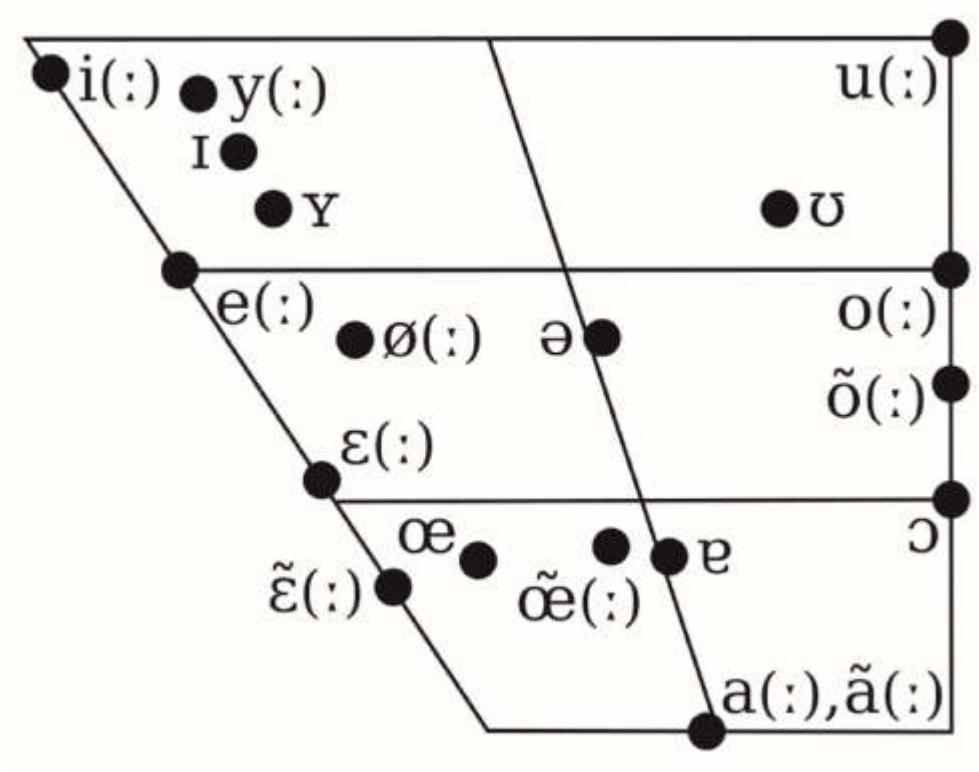

Figure 1 German Vowel Chart Mangold (2005)

Table 1 The Vowel Phonemes of German (O'Brien & Fagan, 2016).

Phoneme	Allophone	Example
/iː/	[iː]	/muːˈziːk/ [muˈziːk] <Musik> 'music'
	[i]	/muːziːˈkaːlɪʃ/ [muːziːˈkaːlɪʃ] <musikalisch> 'musical'
/ɪ/	[ɪ]	/ˈmɪtə/ [ˈmɪtə] <Mitte> 'middle'
/yː/	[yː]	/ˈfyːziːkəʁ/ [ˈfyːzikɐ] <Physiker> 'physicist'
	[y]	/fyːˈziːk/ [fyˈziːk] <Physik> 'physics'
/ʏ/	[ʏ]	/ˈmʏsən/ [ˈmʏsən] <müssen> 'to have to'
/uː/	[uː]	/ˈjuːbəl/ [ˈjuːbəl] <Jubel> 'jubilation'
	[u]	/juːbiːˈliːʁən/ [jubiˈliːʁən] <jubilieren> 'to jubilate'
/ʊ/	[ʊ]	/ˈmʊtəʁ/ [ˈmʊtɐ] <Mutter> 'mother'
/eː/	[eː]	/ˈleːbən/ [ˈleːbən] <leben> 'to live'
	[e]	/leːˈbɛndɪg/ [leˈbɛndɪç] <lebendig> 'lively'
/ɛ/	[ɛ]	/nɛt/ [nɛt] <nett> 'nice'
/øː/	[øː]	/ˈøːkoː/ [ˈʔøːko] <Öko> 'Green'
	[ø]	/øːkoːloːˈgiː/ [ʔ0kolo'giː] <Ökologie> 'ecology'
/œ/	[œ]	/ˈkœnən/ [ˈkœnən] <können> 'to be able to'
/ə/	[ə]	/ˈbɪtə/ [ˈbɪtə] <bitte> 'please'
/oː/	[oː]	/ˈpʁoːbə/ [ˈpʁoːbə] <Probe> 'test'
	[o]	/pʁoːˈbiːʁən/ [pʁoˈbiːʁən] <probieren> 'to try'
/ɔ/	[ɔ]	/ˈvɔlə/ [ˈvɔlə] <Wolle> 'wool'
/aː/	[aː]	/ʁeːˈaːl/ [ʁeˈaːl] <real> 'real'
	[a]	/ʁeːaːliːˈteːt/ [ʁealiˈteːt] <Realität> 'reality'
/a/	[a]	/ˈpanə/ [ˈpanə] <Panne> 'breakdown'
/aɪ̯/	[aɪ̯]	/daɪ̯n/ [daɪ̯n] <dein> 'your'
/aʊ̯/	[aʊ̯]	/baʊ̯m/ [baʊ̯m] <Baum> 'tree'
/ɔɪ̯/	[ɔɪ̯]	/nɔɪ̯/ [nɔɪ̯] <neu> 'new'

2.11 Research Questions and Hypotheses

The first question posed by this study was to gauge the degree of accuracy in learners' ability to auditorily perceive German vowels. Listening identification exercises and speaking assessments were employed to determine students' perception and oral production skills, as they related to selected German vowels. It was hypothesized that learners' perception of German vocalic phonemes would influence their production of these sounds. It was thought that students would replicate the perceived sounds as they heard them.

The second questions presented in this study investigated whether explicit instruction methods would enhance students' perception and production of German vowels. Students in the experiment group were offered a lesson and handout on the German phonemic system between the pre- and post-tests. The purpose of the pronunciation lesson was to make students aware of the many facets involved in vocalic phoneme articulation. It was hypothesized that through direct instruction, learners would gravitate toward a more native-like production of German vowels due to their greater awareness of each vowel's articulatory structure.

CHAPTER 3: METHODOLOGY

3.1 Introduction

The purpose of this chapter is to illustrate the research methods undertaken by this study, which seeks to ascertain beginner-level learners' auditory perception of targeted vocalic phonemes. Likewise, this study also claims that explicit pronunciation training within the Communicative-Based approach enhances language students' German vowel articulation. To support the validity of this study, a description of the research participants, the materials used, and the study procedures will be provided. A summary of participant recruitment methods will also be given, as well as an outline of data-analysis procedures.

3.2 Participants

The study was comprised of 47 participants. The students were divided into four groups. The project consisted of three experimental groups and one control group. Overall, the experimental groups contained 41 participants, while the control group comprised of six students.

The students' ages ranged between 18 and 26 years of age, with the mean average age being 19 years old. The students came from various language backgrounds. American English had the highest representation at 71% of overall participants, and other native-languages represented in this study included Spanish, Chinese, Vietnamese, Indonesian, Tamil, Hindi, and Malay. Fifty-five percent of the students who answered the biographical survey indicated that they had studied another language in addition to German. Most participants with a second language, other than German, learned the language in a traditional classroom setting. These students indicated that they had learned the L2 in either elementary school, middle school, high

school or university. Most of the students learned their second language in high school or college. According to the survey, many of the participants had enrolled in between 1-5 years of a language course. These languages included, English, French, Latin, Spanish, Korean, Japanese, Mandarin, Cantonese, Indonesian, and Hindi. Only one participant did not acquire the L2 through a traditional language course; rather, this student learned English through moving to the United States and receiving private tutoring. Several students described themselves as being heritage speakers of Indonesian, Japanese, Tamil and Hindi. However, they remarked in their responses that they did not consider themselves to be fully proficient in these languages.

According to the biographical survey administered to the study-participants, most of the students had not studied German before attending university. Sixty-nine percent of the study-participants responded that they had started learning German at college with all but one having learned German at the research-institute. This participant began learning German at another university before transferring to the current institute. Twenty percent of the surveyed students said that they started learning German in high school. Two of the respondents answered that they began learning German in middle school, whereas no one indicated that they had started acquiring German prior to the sixth grade. One student noted that he first learned German after completing his secondary education by attending a two-month long program in his home country. The remaining five percent of students did not comment as to whether they had learned German prior to the second-semester course, in which this study was conducted. One-hundred percent of the participants marked that they had never received phonetic training in their German courses.

Only one participant responded that he had ever resided in a German-speaking country for three months or more and had indicated that he had lived in Hanover for three months.

However, he did not specify any further details such as his age during his time of stay in Hanover, or if he had received any official instruction on the German language. When asked on the survey, 20 percent of the participants wrote that they had visited a German-speaking country, including Germany and Switzerland. The average length of stay was two weeks, with the shortest visit being only one day, and the longest trip consisting around a month. Most of these excursions were designated as summer or holiday vacations with friends and family members. One individual specified that she had participated in a one-month summer exchange to Germany in high school. None of the other participants mentioned study abroad in their responses. Eight of the students who responded that they had visited a German-speaking country conveyed having positive feelings toward the experience, while another eight students expressed feeling neutral about their time overseas. Only two students disclosed that they had a negative experience.

All the study participants consented to have their data results examined for this project. Participants were not required to allow their data to be used for data-analysis. Everyone who completed the study requirements were given full extra credit toward their German course. Students who failed to fulfil all study requirements only received partial credit for the assignments they completed.

3.3 Materials

3.3.1 Pre-test Design

On the outset of the project, participants in both the experimental and control groups were administered a 14-questioned biographical survey and a pre-test, which consisted of a multiple-choice listening identification exercise and a speaking assessment. The biographical survey was designed to investigate participants' previous exposure to German and phonetic training, to determine students' prior experiences with other languages, and lastly to ascertain

students' attitudes toward their visits in a German-speaking country. The survey also included standard background questions such as name, age, and native-language. The questions concerning experiences with German and other non-native languages were intentionally designed to be open ended so that students would feel invited to supply detailed relevant information (see Appendix A).

Once completing the biographical survey, participants were administered a multiple-choice listening identification exercise via the Qualtrics online survey platform. Students were required to listen to an audio recording of 24 nonce German words read aloud by a female native German speaker. The learners were then provided with four various spelling options for each designated nonce word. The multiple-choice answers varied slightly based on the stem vowel for each option. The participants were asked to select the answer they felt contained the correct vowel in accordance with the word they had heard. For example, the nonce German word for question 2 was schläsen. Participants were asked to mark whether the correct spelling was either schläsen, schlösen, schlüsen or schlusen. With every question, three out of the four selections contained an umlaut. The fourth option for each question did not include an umlaut. The stem vowel for the fourth multiple-choice answers for each question were randomized to avoid intentionally alerting students to the correct answer (see Appendix B). The nonce words were read aloud twice with an eight second pause in between each reading. Altogether students were permitted 20 seconds to answer each question. Nonce words were employed in the listening identification exercise to gauge students' perception of the target vowels. It was assumed that by presenting learners with nonce words, they would have to rely on their listening skills to determine the spelling of the sound played aloud. It was further hypothesized that the absence of

existing German words from the listening identification exercise would insure that students did not mark the correct answer based on previous knowledge of the word's spelling.

After finishing the listening identification exercise, participants were directed to the Speak Everywhere website. There they were given access to a PowerPoint containing 24 German sentences. Each phrase contained a similar premise, "ich sage _____ wieder". This phrase translated into English means I say again. Inserted in the middle of each sentence was a nonce German word. For example, the first phrase on the pre-test speaking assessment read as "ich sage brazen wieder". The phrase "ich sage wieder" served as distractor words to gauge students' actual production of the inserted nonce word (see Appendix C). Nonce words were used in the speaking assessments to ascertain the learner's natural and intuitive pronunciation of the targeted phonemes. It was hypothesized that by deliberately avoiding existing German words, students would rely on their instincts to pronounce the nonce word versus parroting words they had previously heard.

The participants were asked to record themselves reading each phrase aloud. Students were equipped with a headset and microphone. This was to ensure that students could record themselves with as little background noise as possible. They were also encouraged to listen to their recordings before proceeding to the next phrase. Participants could record themselves reading each sentence multiple times before uploading their recordings onto the Speak Everywhere website, but they were only allowed to submit each phrase once.

The listening identification and speaking exercises were specifically designed to test the vowels (ä), (ö), and (ü) in both their long and short forms. The regular vowels, (a), (o), and (u) were initially incorporated into the exercises as distractor words; however, they were later analyzed in conjunction with the vowels possessing umlauts. The decision to examine the vowels

not containing umlauts was taken due to the lack of variation in students' perception and production scores between the pre- and post-tests. The diphthong au was also inserted in the pre-test speaking assessment as part of a single ploy word. The distractor words were disbursed throughout the speaking assessment to ensure that students differed in their vowel articulation patterns. Combined, the biographical survey, listening identification exercise and the speaking assessment lasted the entire 50-minute session.

Below are two tables outlining the number and types of vowels tested in the pre-test exercises.

Table 2 Pre-Test Vowels Containing Umlauts

Vowel Description	IPA	Listening Identification Exercise	Speaking Assessment
Long ä	/ɛː/	2	2
Short ä	/ɛ/	3	3
Long ö	/øː/	2	2
Short ö	/œ/	3	3
Long ü	/yː/	3	2
Short ü	/ʏ/	2	3

Table 3 Pre-Test Vowels not Containing Umlauts

Vowel Description	IPA	Listening Identification Exercise	Speaking Assessment
Long a	/aː/	2	1
Short a	/a/	2	1
Long o	/oː/	2	3
Short o	/ɔ/	2	0
Long u	/uː/	2	2
Short u	/ʊ/	2	1
Diphthong au	aʊ	0	1

3.3.2 Pronunciation Lesson Design

In the second phase of the project, the three classes comprising the experimental groups were offered a lesson on German phonetics and pronunciation training practices by the researcher. This took place one week after the pre-test. The pronunciation lesson was given during the 50-minute weekly course lab period. As an introduction to pronunciation instruction, the experimental groups were presented a lesson along with a PowerPoint outlining the key parameters of vowel articulation and the International Phonetic Alphabet. The information used in the lesson was drawn from Hall (2003) and O'Brien and Fagan (2016). At the start of the class, students were taught about tongue position, lip rounding, tenseness and vowel length in the formulation of vocalic phonemes. Participants were also instructed on the three main vowel positions within the mouth: front, middle and back.

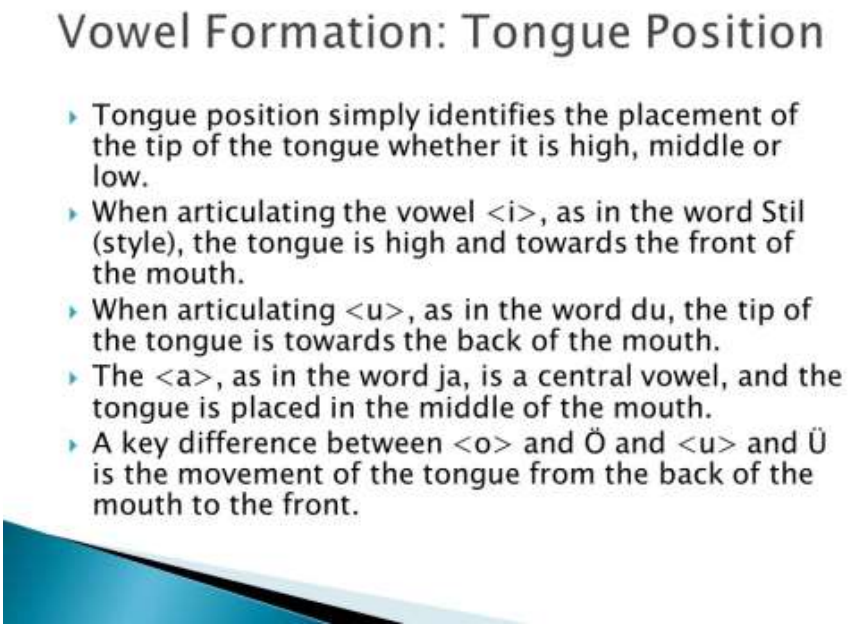

Figure 2 Vowel Formation

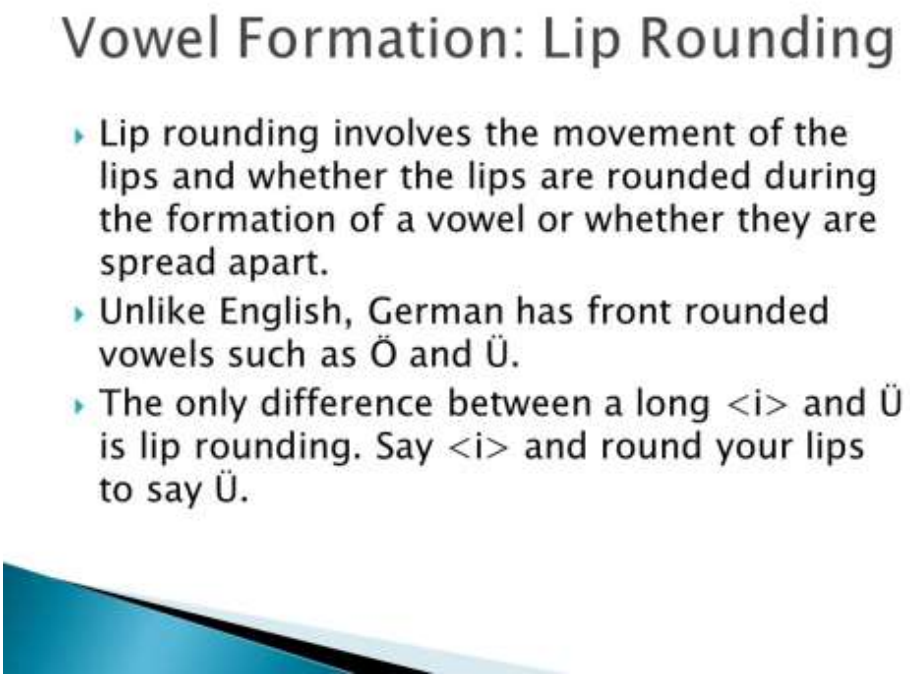

Figure 3 Vowel Formation: Tongue Position

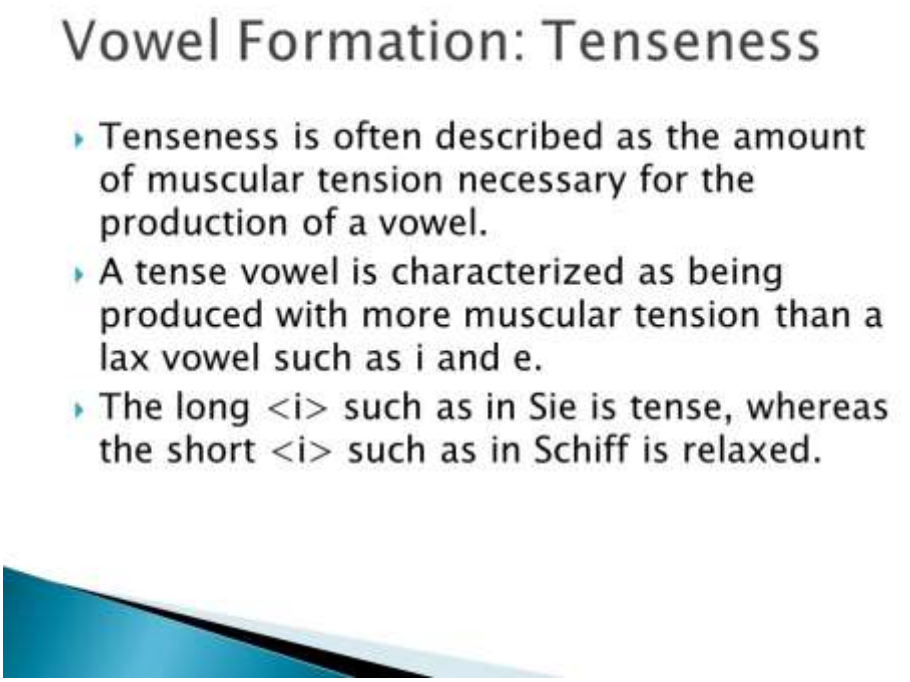

Figure 4 Vowel Formation: Lip Rounding

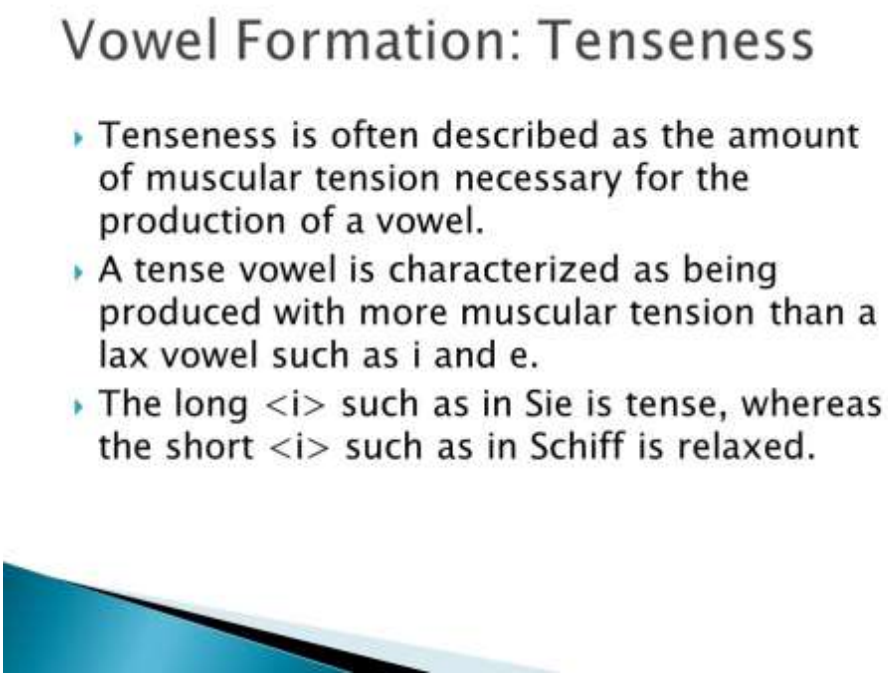

Figure 5 Vowel Formation: Tenseness

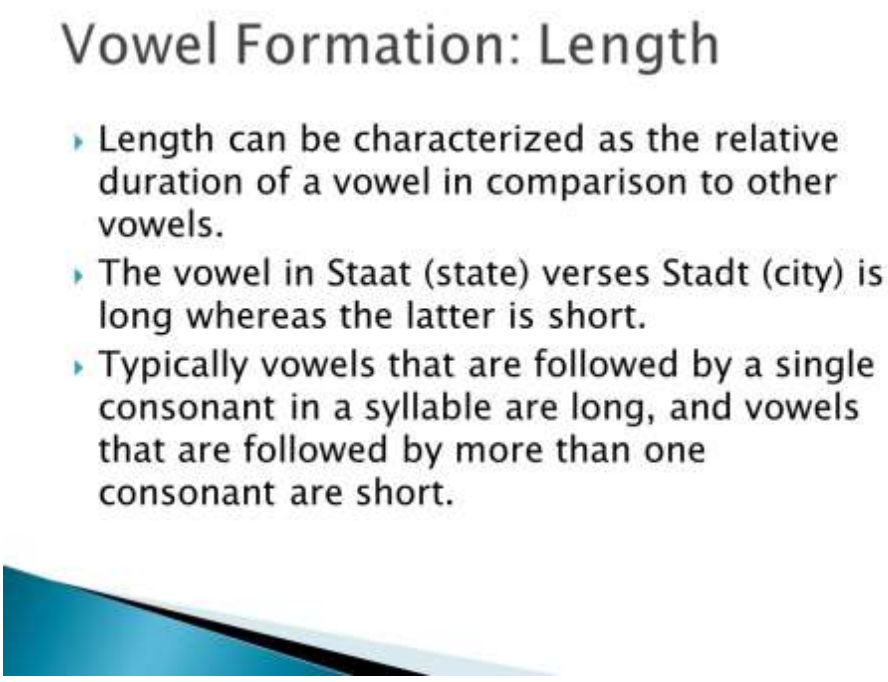

Figure 6 Vowel Formation: Length

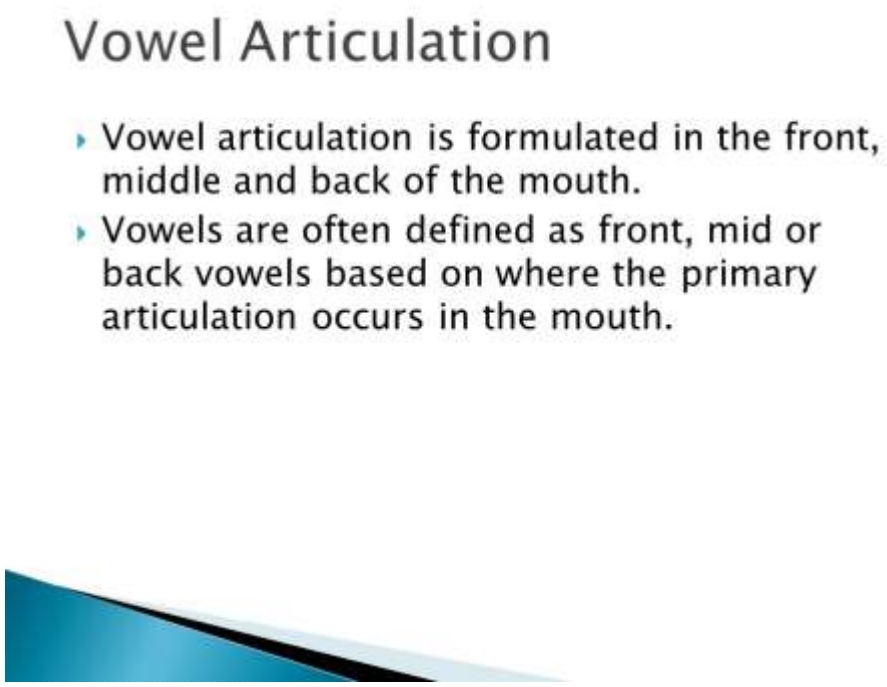

Figure 7 Vowel Articulation

To help learners, grasp these concepts, they were shown the University of Iowa's Sounds of Speech website pertaining to German. This website used visual and audio descriptions to demonstrate how vowels are formulated in the mouth. Learners were encouraged to click on the sounds listed on the webpage to hear the sound pronounced by a native German-speaker, as well as view a brief video of the speaker's mouth articulating the sounds.

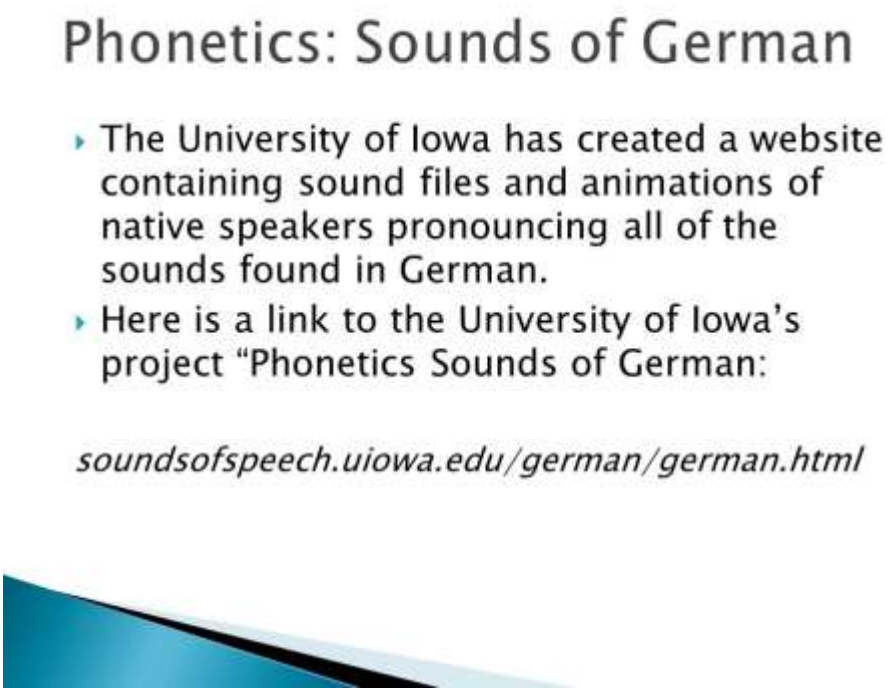

Figure 8 Phonetics: Sounds of German

The participants were then directed back to the PowerPoint which reviewed the International Phonetic Alphabet. Students were taught to recognize the IPA and to understand that the characters represent a sound in a language, and they do not often directly correspond to an orthographical letter. The learners were specifically trained to identify the IPA symbols as they related to German vowels. Participants were educated on all the German IPA vowels (i, e, ie, ei, etc.), not just those exclusively focused on by the study. Learners were provided with a German word along with each phoneme to create an association with that sound.

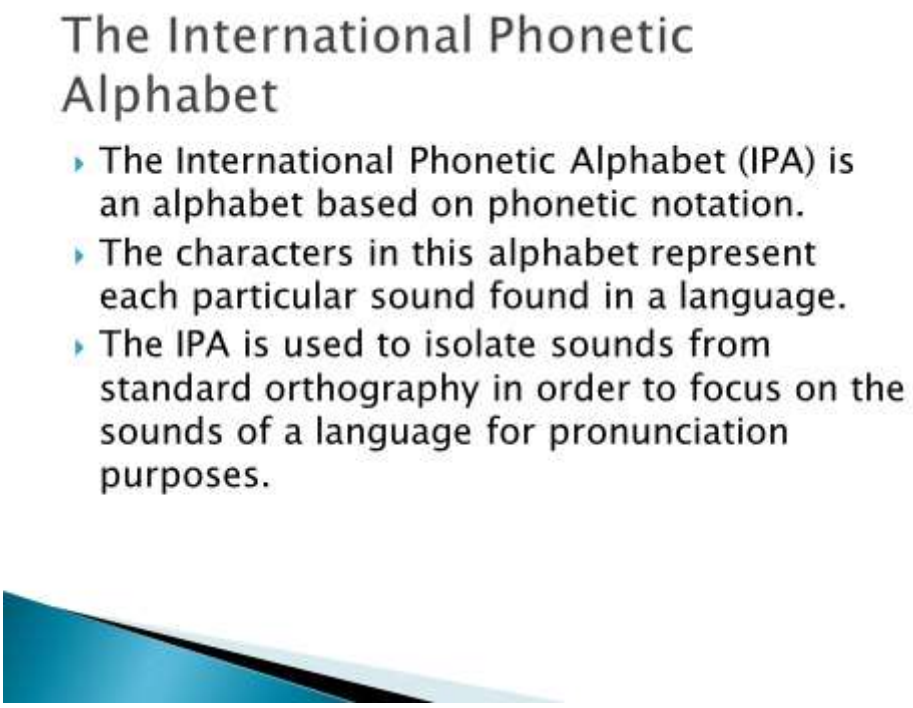

Figure 9 The International Phonetic Alphabet

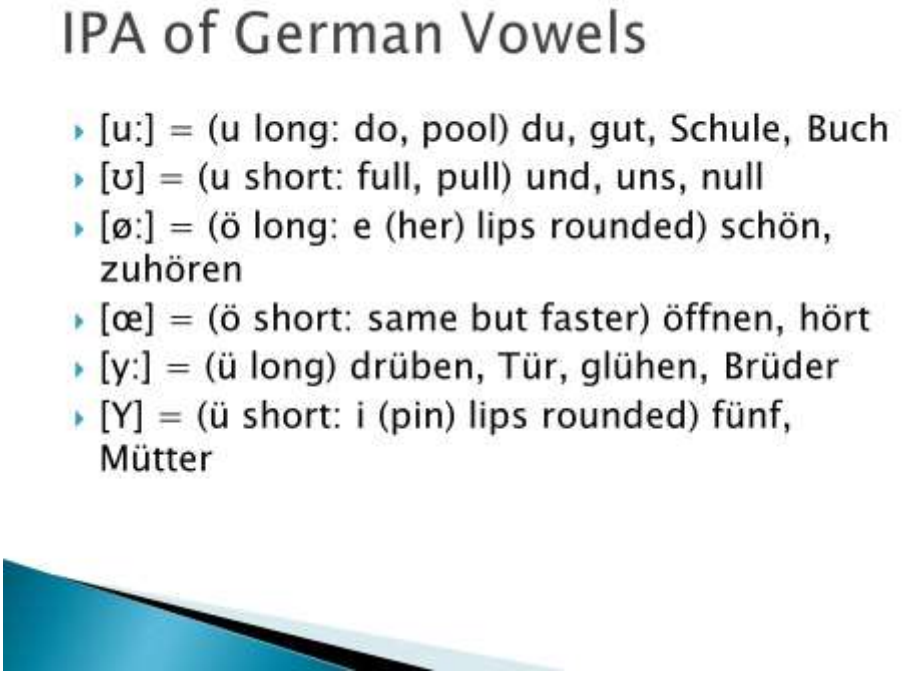

Figure 10 IPA of German

As a follow-up exercise, students were given a handout with individual and group activities to practice the IPA characters and sound formulation (refer to Appendix D). The handout and the corresponding instructor answer key were adapted from O'Brien and Fagan (2016). The first two exercises were assigned as individual activities. In the first exercise, students were required to pronounce the ten vowels listed and determine whether they were rounded. The second activity focused on tongue height. The exercise listed 9 pairs of German vowels. Individuals were asked to pronounce each vowel combination to ascertain whether the vowels in each match had the same height. They were then asked to describe the height of each vowel supplied. Following the first two individual assignments, there was a course discussion for each activity led by the researcher. Students were asked to provide oral feedback on how they determined the answer for each of the subsequent questions. They were also asked to consider how the movement of their mouths facilitated the various sounds.

As front rounded vowels do not exist in English, these first two activities were selected in particular to draw students' attention to their articulatory structure in German. The first activity emphasized roundedness, whereas the second activity highlighted height and frontedness. Front rounded vowels were a main component of each exercise. They were also given greater priority in the post-activity discussion.

The last two activities on the handout tested participants' knowledge of the International Phonetic Alphabet. Learners were permitted to work in groups of 3 or 4. The third exercise provided articulatory descriptions of 9 vowels. The group members were required to pronounce each sound according to its description. Once they determined which vowel was being depicted, they had to transcribe its equivalent IPA symbol. The last exercise on the handout correlated

with the previous exercise. Students were given a new list of 9 IPA vowels, and they were instructed to describe each character phonetically.

As with the previous exercises, there was a brief course discussion on the students' thought processes while completing the assignment. Participants were asked by the researcher to describe their observations, as they formulated the vocalic phonemes listed on the handout. The students were also invited to provide their initial reactions to the IPA and its value in acquiring German phonemes. The length of the second group discussion was shorter than the first due to the end of the course period.

The students delegated to the control group did not participate in the pronunciation lesson offered by the researcher. Instead, they were given a lesson on German grammar and vocabulary by their regular instructor. The students prepared for their final exam in the course by reviewing German adjective endings, relative clauses, subordinating conjunctions, two-way prepositions, and the semester's vocabulary. They were given a PowerPoint presentation containing this information, as well as a handout to complete in groups.

3.3.3 Post-Test Design

During the final session of the project, participants were administered a post-test which was similar to the pre-test. It was comprised of both a listening identification exercise and a speaking assessment. Much like the first listening exercise, the second consisted of 24 nonce German words read aloud twice by a native-speaker. The words listed in this activity differed from that of the original. Though the stem vowels were used in the same order as the pre-tests, the nonce words' consonants were altered to inhibit the students' from remembering them in the first exercise. Likewise, each question contained four multiple-choice spelling options. Three out of the four answers possessed an umlaut, whereas one selection did not. The second question

on the assignment was the nonce word dräsen with dräsen, drösen, drusen and drasen as the spelling options (Appendix E). Students were permitted 20 seconds to answer each question on the Qualtrics survey platform.

For the speaking assessment, students were given 24 sentences to read aloud. They were also supplied with a headset and microphone to record and listen to themselves. Additionally, they were advised to record themselves multiple times before submitting the final version of each response to Speak Everywhere. Only one submission was permitted per sentence. The phrase "ich sage _____ wieder" was once again used. Imbedded within each sentence was a nonce word. As in the first speaking assessment, the words comprising the phrase served as distractor words to capture the participants' natural pronunciation of the nonce German words. Phrase 1 of the exercise read as "Ich sage gläzen wieder". The nonce words in the post-test speaking assessment maintained the stem vowels in the same order as the pre-test speaking assignment. However, the surrounding consonants were changed to prevent the students from recognizing the exercise from the pre-test (See Appendix F).

See below two tables which outline the number and types of vowels presented in the post-test exercises.

Table 4 Post-Test Vowels Containing Umlauts

Vowel Description	IPA	Listening Identification Exercise	Speaking Assessment
Long ä	/ɛː/	2	2
Short ä	/ɛ/	3	3
Long ö	/øː/	2	2
Short ö	/œ/	3	3
Long ü	/yː/	3	2
Short ü	/ʏ/	2	3

Table 5 Post-Test Vowels Not Containing Umlauts

Vowel Description	IPA	Listening Identification Exercise	Speaking Assessment
Long a	/a:/	2	1
Short a	/a/	2	1
Long o	/o:/	2	3
Short o	/ɔ/	2	0
Long u	/u:/	2	2
Short u	/ʊ/	2	1
Dipthong au	aʊ	0	1

3.4 Study Procedures

3.4.1 Study Design Outset

The design of this study was primarily composed of four main segments, which consisted of a biographical survey, a pre-test, an in-class lecture on vowel articulation within the German phonetic system, and lastly a post-test. The structure of this design was drawn from several research articles. In particular, Gonzalez-Bueno and Quintana-Lara (2011) played an integral role in the development of this study's pre- and post-tests, as they utilized listening identification exercises and speaking assessments in their project. Likewise, this study also utilized biographical surveys to ascertain students' linguistic backgrounds and attitudes toward phonetic instruction. These means of evaluation were likewise employed for the purpose of this study. Other articles were referenced in the construction of the study-procedures including (Eliot, 1997, Lappin-Fortin and Rye, 2014, Lord, 2005, and Lord, 2010). Each of these studies tested phonological progression among learners through the use of pre- and post-tests. Also taken from Gonzalez-Bueno and Quintana-Lara (2011) was the use of an experiment and control group. This was done to insure that students receiving treatment in the experiment group improved over their counterparts in the control group, who did not receive directed phonetic training.

3.4.2 Study Population

In order for the participant's data to be analyzed, each student was required to complete all sections of the experiment. On the outset of the research project, an initial total of 114 students participated in the study. Sixty-seven participants were eventually removed from the project as they did not complete all the study requirements. This, in turn, left a remainder of 47 participants. All study-participants were enrolled in one of the four second-semester German courses offered at a large Midwest university. The German course structure was centered around the Communicative-Based approach and met 4 days a week for 50-minute sessions. The research was conducted during the course lab sessions one day a week over a three-week period.

The second-level course was selected to participate in the study, as the learners enrolled in these classes were still in the initial phase of acquiring German, but they already possessed some familiarity with the language. This course-level was also selected for the project, as it is a core introductory unit in the university language sequence. The course focused on reading, writing, listening and speaking skills centered on a variety of literary and cultural topics. The class also instructed students on initial grammar and vocabulary acquisition. Furthermore, the second-semester course was primarily chosen to address the main research questions of this research. Firstly, this study sought to analyze beginner-level students' perception and consequent production of German vowels. Secondly, this study sought to investigate whether explicit lessons on German phonetics would solicit greater accuracy in participants' comprehension and articulation of German vowels. In this research, greater attention was given to vowels possessing umlauts, as they are frequently deemed the most difficult for non-native learners to acquire (O'Brien & Fagan, 2016). The study design and data collection methods were adapted from Gonzalez-Bueno and Quintana-Lara's 2011 article, in which they tested high school students' perception and production of Spanish rhotic phonemes.

The current project consisted of 3 experimental groups and one control group. Each group was comprised of one of the four German level II classes. The process to select whether a course would be in the experimental or control group was randomized. Each course consisted of around 22 students.

3.4.3 Data Analysis

In order for the data to be analyzed, all of the components had to be submitted by the participants. Incomplete data were removed from the project. Upon the completion of the study, links to the biographical survey and the pre- and post-tests' exercises were deactivated. To begin, the results of the biographical survey and the listening identification exercises were organized into separate Excel spread sheets. The students' audio recordings were downloaded from the Speak Everywhere website and saved to a computer hard drive and USB drive.

The results from the listening identification exercises were analyzed using a chi-squared test in SPSS. Afterward, the audio recordings from the speaking assessments were run through the Praat Software to determine the vowel height, vowel placement, and vowel duration of each targeted utterance. This was achieved by measuring F1 and F2 values. In order to calculate these values, the onset and offset of each transition formant was marked. Praat then automatically determined the F1 and F2 values based on the midpoint. There were 205 tokens for vowels containing umlauts and 123 tokens for vowels not possessing an umlaut.

The participants' vowels were normalized using the Nearey1 method. Several considerations were undertaken when determining the best method for normalizing vowels for this project. According to Adank, Smits, and Van Hout (2004), the Neary1 method performed well in their study at reducing physiological variations in normalized Dutch vowels. The authors also noted that the Neary1 method did well at preserving sociolinguistic variations. Disner

(1980) found that Neary1 reduced scatter the best out of all of the method she tested. It was also found during the course of this study that Nearey1 produced clear graphs of normalized values. It is for the reasons listed above that Nearey1 was selected for this study to normalize and compare participants' values.

Initially participant's names were required on the biographical survey, the listening identification exercises and speaking assessments, to guarantee that students received full credit for their participation in the study. All identifying information was eventually removed and replaced with a code. Students were sorted and marked by several categories, and names were substituted with a number. The numbers ranged from 1 through 47 as that was the number of participants involved with the study. Males were indicated by the number 1 and females by the number 2. Participants were also arranged by their courses. This was indicated by the number of their course section. Students enrolled in German 102-007 had the number 7 as part of their participant profile.

3.5 Conclusion

As outlined in this chapter, extensive measures were undertaken in this study to solicit accurate data. Detailed accounts of the participants' language history and German exposure were provided to validate the study results. A full description of the materials created and implemented throughout the project were stated. A comprehensive description of the study design and procedures were given along with the research questions to verify the authenticity of the project. Lastly, the data-analysis process was recounted to support the methods and outcomes of this study.

In the following chapter, the results from the study will be discussed in detail. A brief synopsis of the study methods will once again be recounted. The following chapter will first

review participants' overall trends in their vowel perception exercises. The results taken from the experiment and control groups will be compared with one another. The chapter will then analyze each vowel tested in the listening identification exercise individually by each group. Visual graphs of these outcomes will be provided. The results chapter will then examine the data collected from the speaking assessments. Tables outlining the students' F1 and F2 values will be Supplied. Vowel plot charts with the participants' values will also be given along with a vowel plot chart of native-speaker values for comparison purposes. Descriptions for each of the study outcomes will be presented along with their corresponding visual demonstration. An in-depth discussion along with an interpretation of the study's results will be offered in the discussion chapter.

CHAPTER 4: RESULTS

4.1 Overview

The purpose of this chapter is to outline the results gather during data-analysis. This chapter will briefly review the methods undertaken to solicit participants' results in the perception and production exercises. Detailed descriptions of data-outcomes will also be given, along with visual graphs to illustrate students' progression throughout the study.

4.2 Perception Data

During the perception exercises in the pre- and post-tests, participants were required to listen to 24 nonce German words read aloud by a native German-speaker. As noted in the methodology chapter, students were then asked to select from four options the spelling choice that best correlated with the word they had heard. The purpose for this exercise was to determine whether students could discriminate between and correctly identify different vowels.

The results from the listening identification exercises were downloaded from the Qualtrics survey website and analyzed through SPSS using chi-squared tests. Separate chi-squared tests were performed for each targeted vowel to ascertain the participants' perception score for all of the tested phonemes. . The results from the listening identification exercises indicate that students did not experience any significant measureable changes between the pre-test and post-test. This was the same for both the experimental and control groups across the spectrum of the tested vowels.

4.2.1 Perception Data: Overall Trends

At the beginning of the perceptual data-analysis, a chi-squared test was run to gauge overall trends within the experimental and control groups. The alpha level was P = .05. The data

from the three classes comprising the experimental group were represented together as one body. The results from the experimental group were first analyzed to see whether the introductory pronunciation lesson led to greater perception of vowels sounds. The p-value for this chi-squared test was .746. The results taken from the experimental group showed that there was not a statistically significant difference between the way students performed in the pre-test verses and the post-test. For there to have ben statistical significance in the data, the p-value should have been less than .05. Upon further investigation, it was determined that the experimental group had 377 incorrect values in the pre-test and 384 incorrect values in the post-test. Likewise, in the pre-test, participants in the experimental group had 607 correct values, compared with the 600 correct values from the post-test.

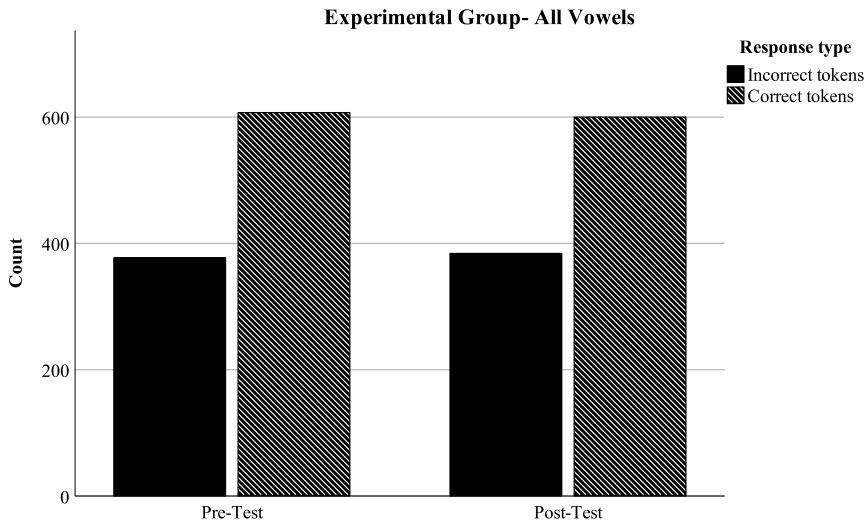

Figure 11 Experimental group – all vowels

The data from the control group was then evaluated to compare with the experiment group. Much like the experiment group, the control group also did not acquire any statistical significance in their results between the pre-test and post-test. However, upon scrutinizing the

data further, there appears to be an extraordinary phenomenon with the results collected from the control group. Their p-value approaches significance at P=.097. The control group also appears to change slightly between the pre-test and post-test. In the pre-test they had 51 incorrect values and 93 correct values in the post-test. Similarly, in the post-test, the control group had 38 incorrect values and 106 correct values. It is not apparent as to what would cause the control group's results to differ between the pre- and post-tests without receiving treatment.

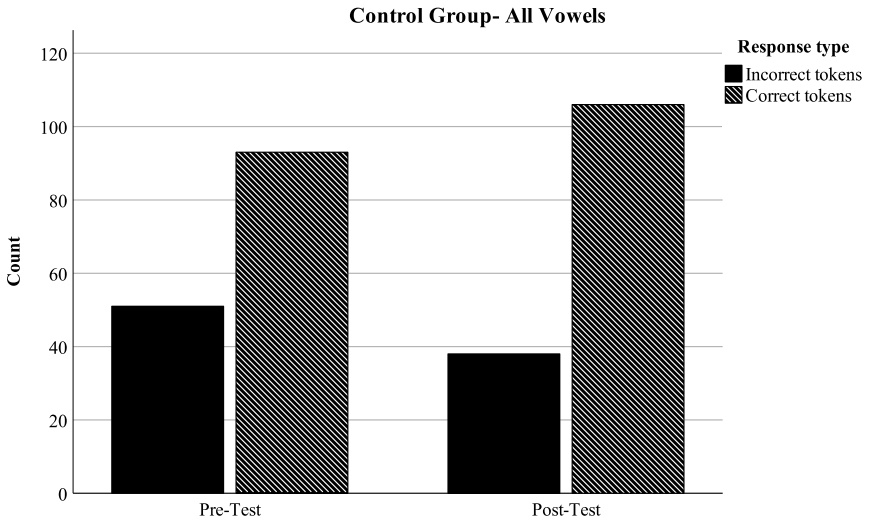

Figure 12 Control Group – all vowels

4.2.2 Perception Data: Experimental Versus Control Group

To provide a more in-depth look into the participant's results, bar graphs were constructed for each of the individual targeted phonemes tested in the listening identification exercises. Listed below are the graphs developed from the experimental and control group's data along with a brief description of their results. The graphs from the experimental and control groups for each vowel will be presented alongside each other for ease of comparison.

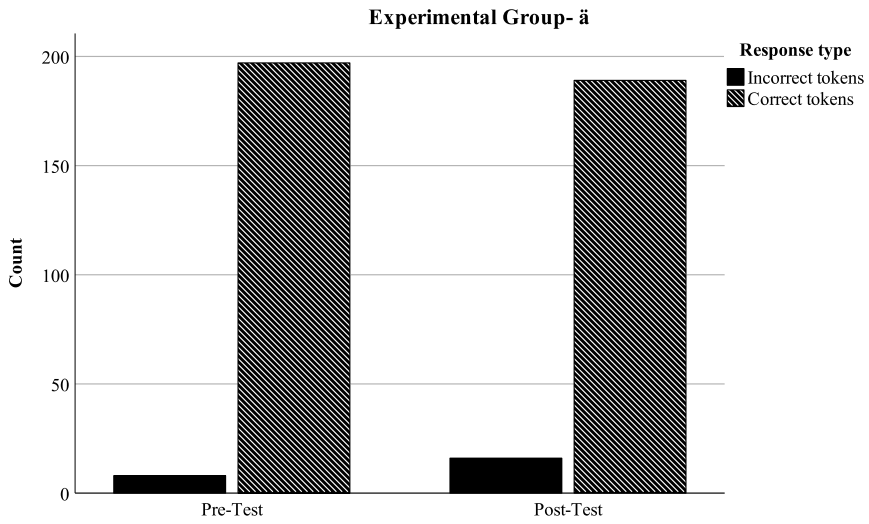

Figure 13 Experimental /ɛ:/ and /ɛ/

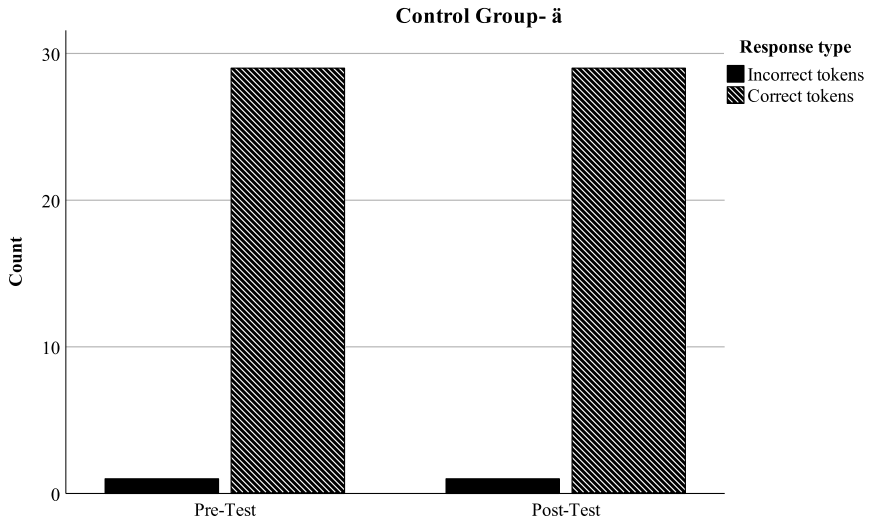

Figure 14 Control /ɛ:/ and /ɛ/

Looking only at /ɛ:/ and /ɛ/ in the experimental group's perception data, the t-test approached significance with (p= .092). When looking at these results on a bar chart it appears that participants experienced some deviation in both the pre-test and the post-test. Out of 205 tokens, the experimental group got 197 of them correct on the pre-test and 189 of them correct

on the post test. The results of the control group are similar. The t-test did not yield any significant results with (p=1). Out of 30 tokens, 29 of them were marked correctly on both the pre-test and the post-test.

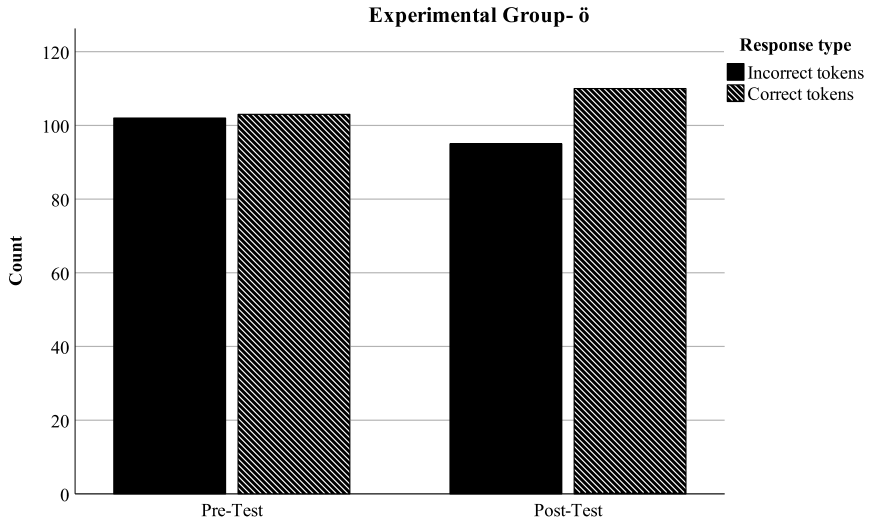

Figure 15 Experimental /øː/ and /œ/

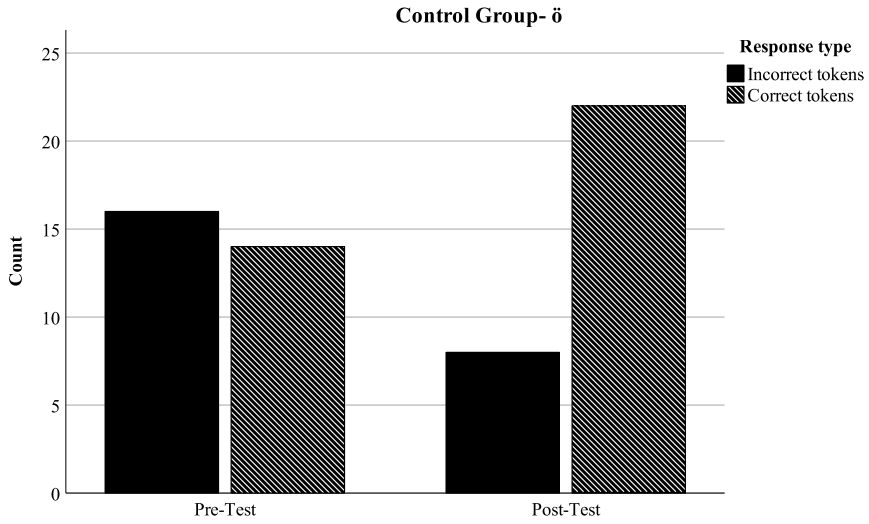

Figure 16 Control /øː/ and /œ/

Focusing only on /øː/ and /œ/ in the experimental group, a t-test did not yield any significant results with (p=.489). In the pre-test students got 102 tokens incorrect and 103 correct. In the post-test 95 tokens were incorrect and 110 were correct. However, the control group's pre-test and post-test results approach significance with (p=.035). In the pre-test, 14 tokens were correct and 16 were incorrect, whereas in the post-test, 8 were incorrect and 22 were marked as correct. In this instance, it appears that the control group's results deviated slightly between the pre- and post-test in their perception of (ö).

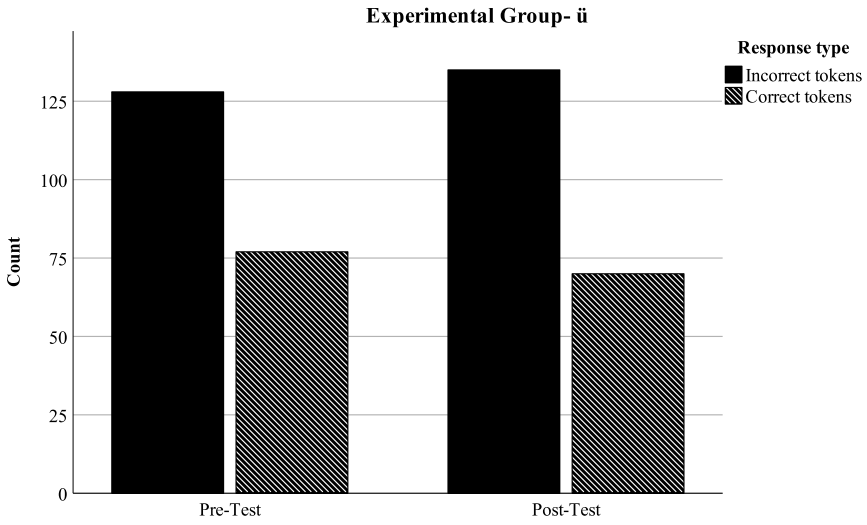

Figure 17 Experimental /y:/ and /ʏ/

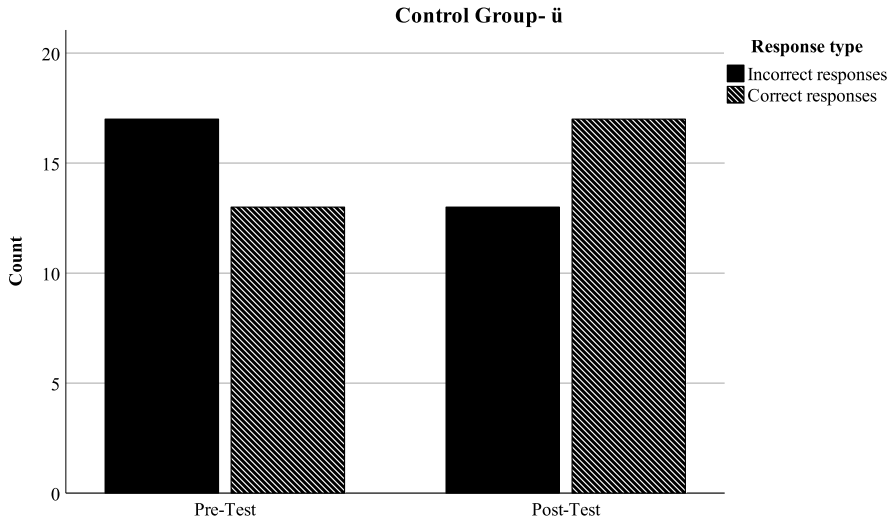

Figure 18 Control /y:/ and /ʏ/

The investigation into the experiment groups' /y:/ and /ʏ/ perception results reveal that the t-test did not yield any significant results with (p=.471). In the pre-test, students got 77 tokens correct and 128 tokens incorrect. In the post test, students got 70 tokens correct and 135 tokens incorrect. Similarly, the control group's t-test did not yield any significant results with (p=.302). The control group correctly identified 13 tokens in the pre-test, and they incorrectly marked 17 tokens on the same exercise. The participants in the control group also got 17 tokens correct and 13 incorrect in the post-test.

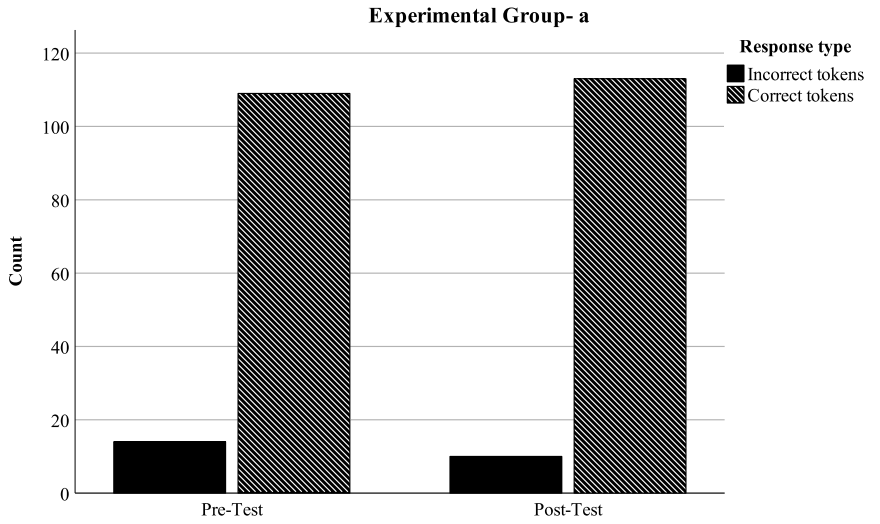

Figure 19 Experimental /a:/ and /a/

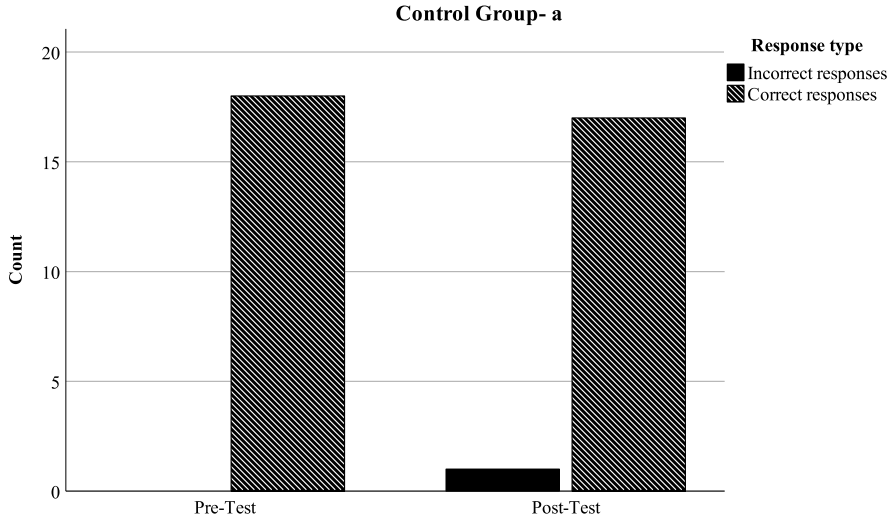

Figure 20 Control /a:/ and /a/

Looking only at /a:/ and /a/ in the experimental group, a t-test did not yield any significant results with (p=.390). In the pre-test students got 109 tokens correct and 14 incorrect. In the post-test 113 tokens were correct and 110 were incorrect. Correspondingly, a t-test on the control group did not yield any significant results with (p=.310). In the pre-test, the participants

got 18 correct and 0 incorrect. Furthermore, in the post-test, the control group got 17 correct and 1 incorrect.

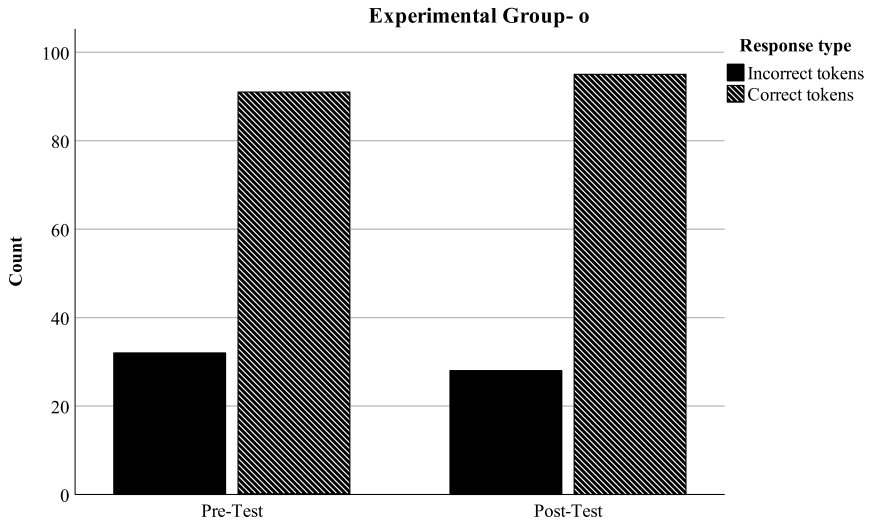

Figure 21 Experimental /oː/ and /ɔ/

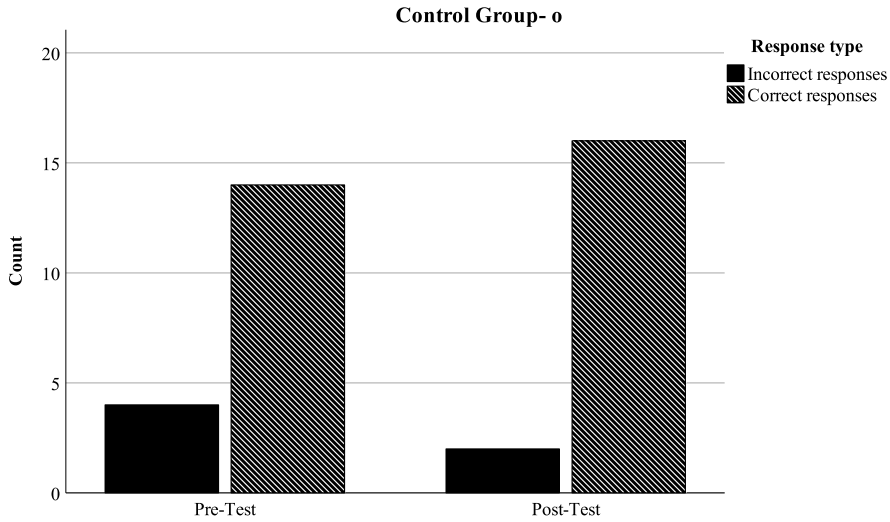

Figure 22 Control /oː/ and /ɔ

Focusing purely on /oː/ and /ɔ/ in the experimental group, a t-test did not yield any significant results with (p=.553). In the pre-test there were 91 correct tokens and 32 incorrect

tokens. In the post-test there were 93 correct tokens and 28 incorrect tokens. The control group performs similarly. The t-test did not yield any significant results with (p=.371). They had 14 correct and 4 incorrect tokens in the pre-test and 16 correct and 2 incorrect tokens in the post-test.

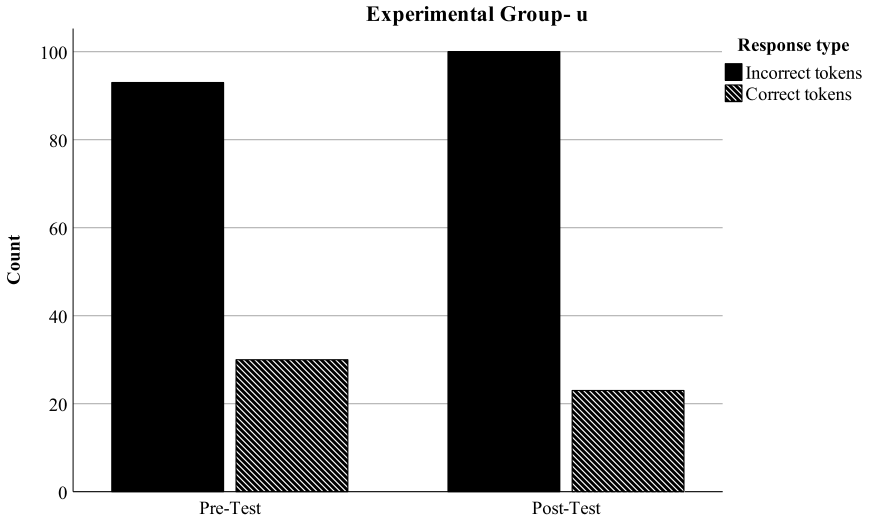

Figure 23 Experimental /u:/ and /ʊ/

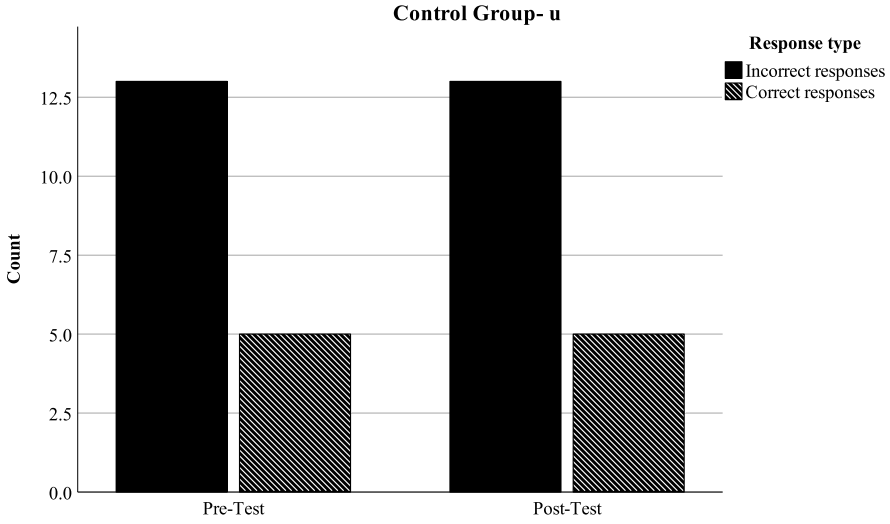

Figure 24 Control /u:/ and /ʊ/

Concentrating solely on the experiment group's perception data on /u:/ and /ʊ/, a t-test did not yield any significant results with (p=.278), with 30 correct and 93 incorrect tokens in the pre-test and 23 correct and 100 incorrect tokens in the post-test. Control groups results are similar. A t-test did not yield any significant results with (p=1). They had 13 incorrect and 5 correct in both the pre- and post-tests. The outcomes here are peculiar, in that almost all the same tokens are marked incorrectly across groups.

4.3 Production Data-Analysis Processes

As previously stated in the methodology chapter, the pre- and post-tests' speaking assessments contained 24 sentences, which the participants were directed to read aloud on to the Speak Everywhere website. The students' recordings were then run through Praat. Afterward, the vowels contained within the nonce words were isolated and then normalized. The Nearey1 method was employed to accomplish this task. Then, the data collected from the vowel normalization process was entered in to SPSS to generate linear mixed-effect models. The data was analyzed through three-way tests which looked at pre-test and post-test, vowel types, and participant groups. Vowel height and frontedness were measured by evaluating F1 and F2. A native German-speaker was recruited to read the 2 24-word lists into Praat, so as to provide a baseline for students' results to be compared and examined. Below are listed the tables with the participants' results from the speaking assessments. As with the perception data, the participants appear to have reached the ceiling effect with overall vowel production, though there are small yet notable changes within some of the test vowels' F1 and F2. Details will be supplied below. Potential explanations to the lack of score variation will be provided in the discussion chapter.

In the table presented below, two vowels experienced statistical significance (/ɛ/ and /œ/). Listed are the statistical measurements for one of the vowel treatment tests as it

pertains to /ɛ/ ($F(6, 2321)=4.061$, $p < 0.001$). A post-hoc test with Bonferroni adjustment showed a significant difference ($p < 0.01$) between treatment groups for /ɛ/ with a higher mean normalized F1 for the control group (M=1.184) than the test group (M=1.413). The opposite occurred for /œ/ ($p <0.05$) with a higher mean for the test group (M=1.004) than the control group (M=0.957).

Table 6 Type III Tests of Fixed Effects (Dependent Variable: Normalized F)

Source	Numerator df	Denominator df	F	Sig
Intercept	1	2321	44028.416	.000
Vowel	6	2321	326.737	.000
Treatment Group (Experimental v. Control)	1	2321	1.394	.238
Test Group (PreTest v. PostTest)	1	2321.000	.119	.730

Table 5 continued

Treatment Group by Test Group	1	2321.000	.212	.645
Vowel by Treatment Group	6	2321	4.061	.000
Vowel by Test Group	6	2321	1.152	.329
Vowel by Treatment Group by Test Group	6	2321	1.448	.193

In the table below, there appears to be a significant interaction between Vowel and Test ($F(6, 2321)=2.892$, $p < 0.01$). Bonferroni-adjusted post-hocs show a significant difference for /a/ between tests ($p < 0.01$) with a higher mean normalized F2 for the pre-test (M=1.019) than the post-test (M=0.920).

Table 7 Type III Tests of Fixed Effects (Dependent Variable: Normalized F2)

Source	Numerator df	Denominator df	F	Sig
Intercept	1	2321	31467.818	.000
Vowel	6	2321	231.844	.000
Treatment Group (Experimental v. Control)	1	2321	.022	.881
Test Group (PreTest v. PostTest)	1	2321	1.910	.167
Treatment Group by Test Group	1	2321.000	.027	.870
Vowel by Treatment Group	6	2321	1.720	.112
Vowel by Test Group	6	2321	2.892	.008
Vowel by Treatment Group by Test Group	6	2321.000	1.218	.294

4.3.1 Means and Standards of Deviations for Normalized F1 and F2 Values

Below are two tables, which outline the means and standards of deviation for the tested F-values collected from the control and experiment groups. The first table presents information gathered from the control group, and the second outlines the normalized F1 and F2 values rom the treatment group. The following tables displays the data for each individual vowel tested in the study.

Table 8 Means and standard deviations for normalized F1 and F2 by vowel and test for control group productions

Vowel	Test	Normalized F1		Normalized F2	
		Mean	SD	Mean	SD
/ɛ/	Pretest	1.22325926	0.25466131	1.33562963	0.23877093
/ɛ/	Posttest	1.23387037	0.3196664	1.33135185	0.27055548
/ɛ:/	Pretest	1.13225	0.33989724	1.25902778	0.26071194
/ɛ:/	Posttest	1.10080556	0.31481086	1.35152778	0.26548893
/œ/	Pretest	0.98437037	0.11169286	0.94983333	0.24504052
/œ/	Posttest	0.98975472	0.24992352	0.99850943	0.24660141
/ø:/	Pretest	0.92505556	0.15730025	0.98325	0.21873342
/ø:/	Posttest	0.90141667	0.154184	1.04508333	0.25831945
/ʏ/	Pretest	0.81536111	0.1089034	1.25538889	0.27517748
/ʏ/	Posttest	0.75744444	0.15729217	1.20225	0.3256877
/y:/	Pretest	0.79840741	0.1206782	1.08464815	0.24778849
/y:/	Posttest	0.8067963	0.11239542	1.10631481	0.28036754
/ʊ/	Pretest	0.87694444	0.1746632	0.90588889	0.15391819
/ʊ/	Posttest	0.95122222	0.3019253	0.78505556	0.15430736

Table 8 continued					
/u:/	Pretest	0.80891667	0.11893176	1.04627778	0.22394624
/u:/	Posttest	0.83486111	0.16157089	0.96697222	0.27414443
/o:/	Pretest	1.13737037	0.16953347	0.73994444	0.14015375
/o:/	Posttest	1.06233333	0.15983907	0.69309259	0.15813456
/a/	Pretest	1.44344444	0.28405679	1.02227778	0.31388005
/a/	Posttest	1.46544444	0.26535619	0.93266667	0.13987936
/a:/	Pretest	1.60016667	0.27227975	0.99516667	0.19308433
/a:/	Posttest	1.53755556	0.30723458	0.92016667	0.19250401
/aʊ/	Pretest	1.37977778	0.20568152	0.81461111	0.10747593
/aʊ/	Posttest	1.45544444	0.1942434	0.83577778	0.12031603

Table 9 Means and standard deviations for normalized F1 and F2 by vowel and test for treatment group productions

Vowel	Test	Normalized F1		Normalized F2	
		Mean	SD	Mean	SD
/ɛ/	Pretest	1.22325926	0.25466131	1.33562963	0.23877093
/ɛ/	Posttest	1.23387037	0.3196664	1.33135185	0.27055548
/ɛ:/	Pretest	1.13225	0.33989724	1.25902778	0.26071194
/ɛ:/	Posttest	1.10080556	0.31481086	1.35152778	0.26548893
/œ/	Pretest	0.98437037	0.11169286	0.94983333	0.24504052
/œ/	Posttest	0.98975472	0.24992352	0.99850943	0.24660141
/ø:/	Pretest	0.92505556	0.15730025	0.98325	0.21873342
/ø:/	Posttest	0.90141667	0.154184	1.04508333	0.25831945
/ʏ/	Pretest	0.81536111	0.1089034	1.25538889	0.27517748
/ʏ/	Posttest	0.75744444	0.15729217	1.20225	0.3256877
/y:/	Pretest	0.79840741	0.1206782	1.08464815	0.24778849
/y:/	Posttest	0.8067963	0.11239542	1.10631481	0.28036754
/ʊ/	Pretest	0.87694444	0.1746632	0.90588889	0.15391819
/ʊ/	Posttest	0.95122222	0.3019253	0.78505556	0.15430736
/u:/	Pretest	0.80891667	0.11893176	1.04627778	0.22394624
/u:/	Posttest	0.83486111	0.16157089	0.96697222	0.27414443
/o:/	Pretest	1.13737037	0.16953347	0.73994444	0.14015375
/o:/	Posttest	1.06233333	0.15983907	0.69309259	0.15813456
/a/	Pretest	1.44344444	0.28405679	1.02227778	0.31388005
/a/	Posttest	1.46544444	0.26535619	0.93266667	0.13987936
/a:/	Pretest	1.60016667	0.27227975	0.99516667	0.19308433
/a:/	Posttest	1.53755556	0.30723458	0.92016667	0.19250401
/aʊ/	Pretest	1.37977778	0.20568152	0.81461111	0.10747593
/aʊ/	Posttest	1.45544444	0.1942434	0.83577778	0.12031603

4.3.2 Vowel Plot Charts

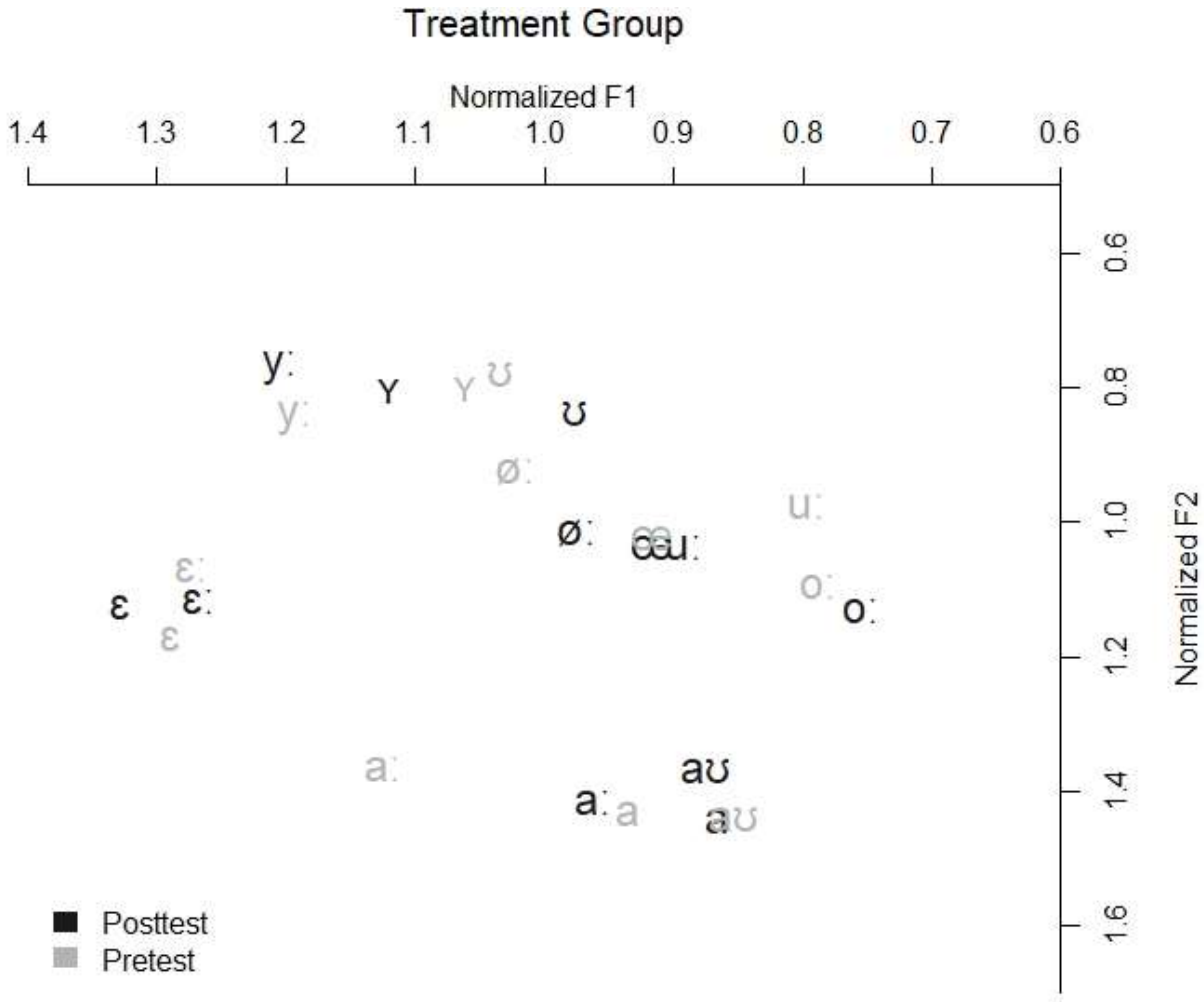

Figure 25 F1 and F2 Plot of German Vowels Produced by the Test Group in the Pre- and Post-tests

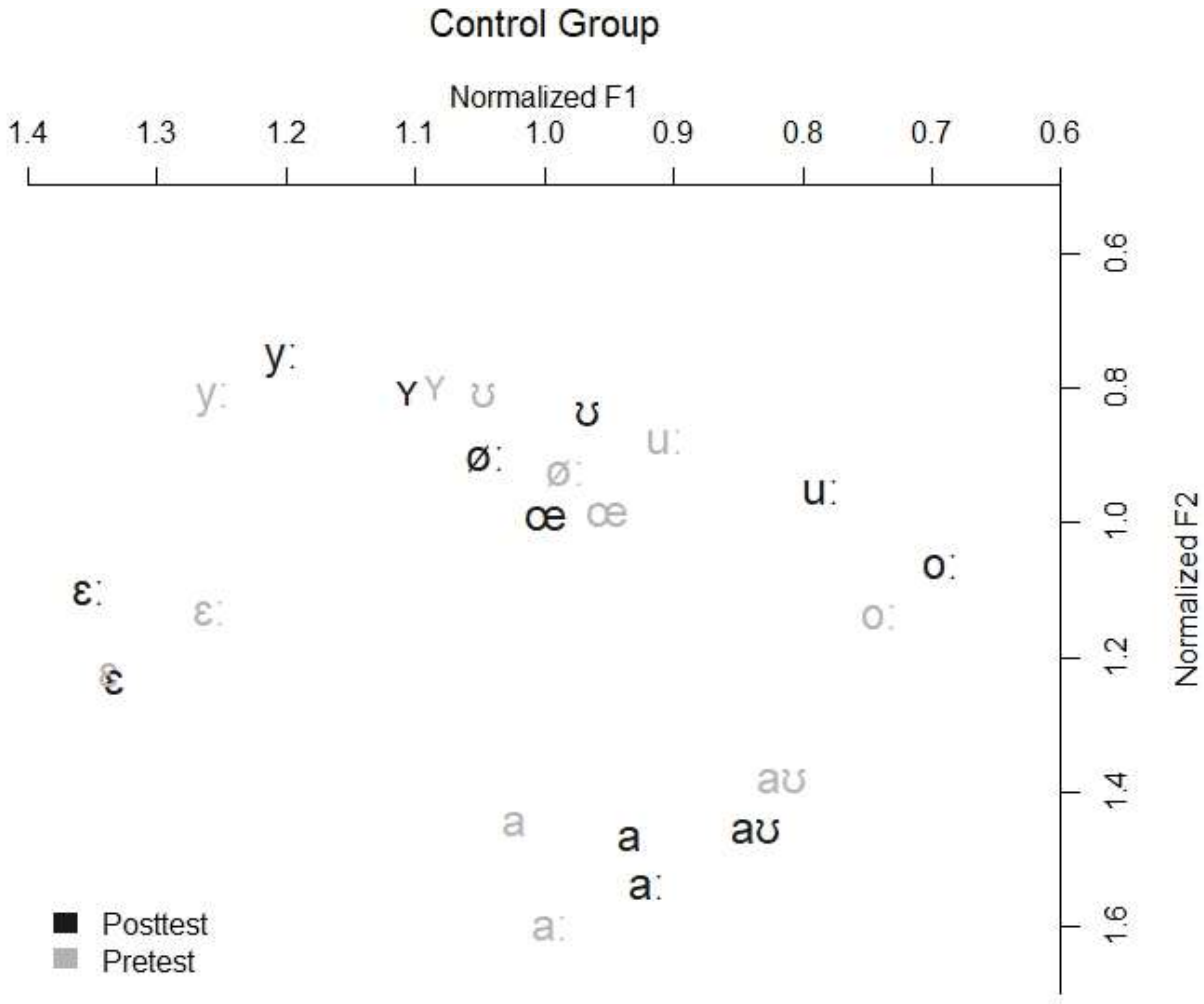

Figure 26 F1 and F2 Plot of German Vowels Produced by the Control Group in the Pre- and Post-tests

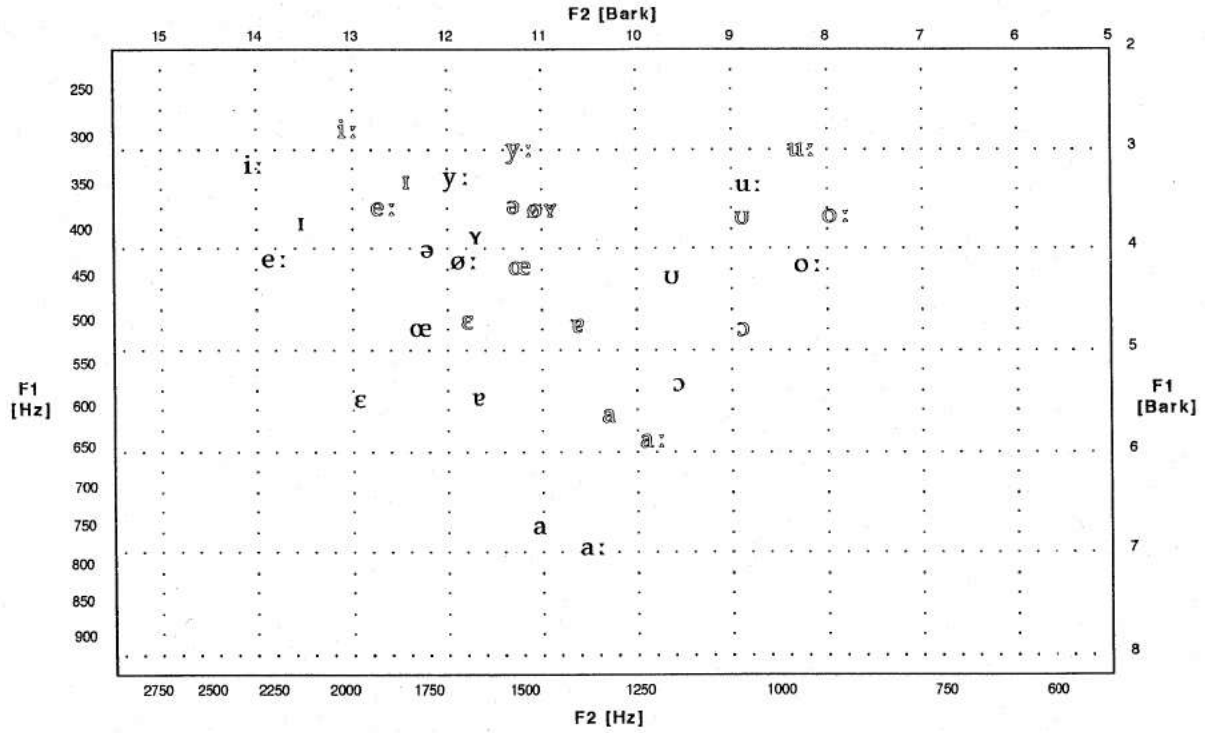

Figure 27 Formant Plot of Female (solid) and Male (outline) Median Values.

The vowel plot chart above was taken from Pätzold and Simpson (1997). This chart does not include /ɛ:/. They say, "the half-open vowel /ɛ:/ is also omitted, for although it was catered for in the canonical transcription of words such as Käse, most speakers produced such items with the closer vowel /e:/which was labeled as such. /ɛ:/is also attributed dubious status in standard German, often being treated as a product of the orthography (Kohler 1995: 172)." Though the vowel plot chart taken from Pätzold and Simpson (1997) does not contain /ɛ:/, it is important to note that this phoneme is represented in the current study's vowel plot charts presented above. It is also important to acknowledge that the stimuli in both Pätzold and Simpson (1997) and the current study differ from one another. In Pätzold and Simpson (1997), the data which they analyzed were collected as part of the Phon- Dat90 database. The data consisted of two sets of 100 short sentences read twice by 12 native German-speakers. Though the stimuli varies from that of the current project, the vowel plot chart taken from Pätzold and Simpson (1997) is useful

to compare the participants' results with those of native-speaker values. Their chart was also used as a guide in the development of the test group's and control group's vowel plot charts displayed above.

When comparing between Pätzold and Simpson's (1997) vowel plot chart and those taken from this study, there are some notable differences between the native-speaker values and those of study participants'. The phoneme /u:/ is lower in the project's control and treatment groups than in Pätzold and Simpson's data. The study's vowel plot charts also indicate that there was some u-fronting with /u:/ in the control group's pre-test and the experiment group's post-test. This is visable in the plot charts, as /u:/ has shifted forward of /o:/, and it aligns roughly with /a:/ in backness. The phonemes /y:/ and /ʏ/ also appear to be higher and more fronted in the study's vowel plot charts than those recorded in Pätzold and Simpson (1997). In the current project's data, the phonemes /øː/ and /œ/ also appear to be much further back. These phonemes are more roughly aligned with /a/ in backness. In the native-speaker vowel plot chart, /øː/ and /œ/ are presented further forward.

Though the native-speaker vowel plot chart taken from Pätzold and Simpson (1997) offer some interesting insights into the study participants' results, it is also important to note that any comparisons between the two datasets may be complicated due to differences in study procedures. The data in this study and in Pätzold and Simpson's (1997) were normalized using two different systems. As a result, any minor differences in vowels between the plot charts could be attributed to how they were normalized. It is also strongly likely that the consonant contexts differed between the two datasets. Therefore, any supposed divergences between the datasets could be attributed to variations in consonant-vowel coarticulation, rather than in differences between vowels.

4.4 Conclusion

In this chapter, results from the perception and production exercises were presented. As outlined throughout the chapter, participants' results did not vary greatly from the pre-test and post-test. This was proven to be largely true for most of the tested vowels. The control group did experience a small improvement in perceiving (/œ/) as confirmed by the perception tests' results. According to the production data, the experiment group did achieve a slight improvement in vowel height for /ɛ/ and /œ/, while both groups appeared to have improved in fronting /a/. An in-depth analyses of probable causes to the students' results will be examined in the next chapter.

CHAPTER 5: DISCUSSION AND CONCLUSION

5.1 Overview

Applying the data presented in chapter four, this chapter will reexamine the research questions considering the data collected. Each question will be addressed individually along with the relevant findings. The study design and methods employed by this project will also be evaluated, as well as their effectiveness in soliciting the hypothesized results. Additionally, possible explanations for the participants' results will be explored in this chapter. In conclusion, the implications taken from this study as they relate to pronunciation pedagogy will be discussed along with suggestions for future projects.

5.2 Question 1: What is the Degree of Accuracy in Beginner-Level Students' Auditory Perception of German Vowels???

The first question proposed by this study was to determine how well students' perceived and identify German vowels. Based on the results gathered from the listening identification exercises and speaking assessments, it is impossible to draw any conclusions. The study's results are insufficient to offer any insights on students' mental processes when admitting new phonemes from the target language. In general, the participants' scores from the listening identification and speaking assessments did not demonstrate any significant changes throughout the course of the project.

A potential explanation for this occurrence may stem from the study design. The participants were required to undergo the listening identification and speaking assessment exercises in a regular classroom setting. It is reasonable to consider that distractions such as the presence of fellow classmates and concerns about time limitation may have prevented learners from providing their undivided attention to the tasks. Likewise, students may have also

struggled with comprehending the sounds in the listening exercises, as the recordings were played aloud over a speaker in the classroom versus over headphones on the students' computers. Despite these potential explanations, it is also necessary to assert that the study conditions mirrored a typical classroom environment. In this regard, this project offers an indication of what could occur should these exercises be carried out in a regular language classroom. Another potential explanation of these results may be drawn from the students' common backgrounds. According to the biographical survey, sixty-nine percent of the students did not begin learning German until attending the research institute. These learners would have begun acquiring German in one of the 101 course sections before advancing to the second-semester class in which this study was conducted. These participants would have undergone similar teaching and assessment practices in their 101 and 102 courses, as these courses across sections are specifically designed to be like one another. These shared experiences may have influenced the ways in which most of the learners interpreted and produced the targeted vowels. As noted in the biographical survey, one hundred percent of the students had indicated never receiving pronunciation training in prior German courses. This lack of pronunciation training may be a culprit to the lack of variation in the test scores.

5.3 Question 2: Does Explicit Pronunciation Instruction Enhance Learners' Perception and Production of German Vowels?

The second goal of this study was to ascertain whether explicit phonetic training would solicit greater accuracy in participants' perception and production of the tested German vowels. This study initially sought to examine vowels containing umlauts, though vowels that did not possess umlauts were analyzed as well. The decision to analyze vowels not possessing an umlaut was due to the lack of variation in students' perception and production scores with vowels containing an umlaut.

It was determined through the scores gathered from the listening identification exercises and the Praat spectrograms produced from the speaking assessments that the students in the experiment group did not significantly improve on overall vowel perception and production. Rather, it appears that their skills in these abilities were stagnant, as there was no statistical indication of improvement. It is hypothesized that the lack of variation in students' scores may be attributed to the short length of the experiment. Students in the test group only received one lesson on German phonetics. This one 50-minute session may not have been enough time for the students in the experiment group to fully benefit from the lesson.

There is some evidence that participants in the experiment group experienced a slight decrease in their perception dexterity. As mentioned in chapter 4, students in the experiment group had 377 incorrect values on the pre-test compared to 384 incorrect values on the post-test. Likewise, the number of correct values between the pre- and post-tests decreased with 607 correct values regressing to 600 correct in the post-test. Though the difference in values are small between the pre- and post-tests, its occurrence is notable.

In relation to the experiment group, the control group likewise did not experience any statistically significant variations in their perception results between the pre-test and post-test. Although their scores on the listening identification exercises were slightly greater than those taken from the experiment group. They had 51 incorrect values in the pre-test and 38 incorrect values in the post-test. Similarly, the number of their correct values increased between the pre- and post-tests with 93 in the pre-test and 106 correct values in the post-test. Additionally, their p-value was closer to P.05 at P.097 compared to the experiment group with P=.746. These results were unexpected as these students did not receive any treatment in the form of a pronunciation lesson.

The data taken from the production exercises confirm that participants did not obtain greater significance in vowel articulation between the pre-test and post-test. This was the same for both the experiment and control groups. The speaking assessments sought to record students' vowel height and frontedness, through formants F1 and F2 value measurements. Tables outlining these results are listed in chapter four. Though it was anticipated that students in the control group would not improve in vowel production without any treatment, it was, however, unexpected that the experiment group would equally not improve in vowel production. The participants' scores for their F1 and F2 values did not differ greatly between the pre- and post-tests. However, the data taken from the speaking assessments did indicate that students in the experimental and control groups experienced minor improvement in pronouncing the phonemes /ɛ/ and /a/ according to the F1 value. Only the participants in the control group obtained slight significance in pronouncing /œ/ as concurred by their F2 values.

5.4 Study Design and Methods

The design of this study was drawn from Gonzalez-Bueno and Quintana-Lara (2011) in which they sought to measure learners' abilities to perceive and produce the various rhotic Spanish phonemes. In their study, the authors incorporated pre- and post-tests, which were comprised of a listening exercise and speaking assessment. Students delegated into the experiment treatment group were offered a lesson on interpreting and replicating the targeted phonemes in between the pre-test and post-test. The researchers noted that their students participating in the experiment group experienced mild improvement after treatment.

Though the methods employed in the current study were valid, the results indicate that adjustments may be required for future research. The use of a pre-test and post-test were invaluable to the study as they provided tangible means of measuring students' progression

throughout the project. However, the way in which the listening identification exercises were administered may have inadvertently influenced students' abilities to accurately identify vowel stems.

Firstly, due to complications related to the Blackboard Learn website, the listening identification audio files could not be uploaded to the website. During the pre- and post-test sessions, the audio files with the 24 nonce words were played aloud over a speaker for the students to hear. The volume of the recordings and sound-interference from the classroom may have prevented the participants from fully hearing each word before having to select a spelling option on the exercise. Ideally, students should have been able to listen to the sound files on the computer over headphones. This would have allowed the students to more closely hear the nonce words without interference, which potentially may have resulted in greater perception scores.

Secondly, it is also hypothesized that the listening identification exercise may have inadvertently tested orthography rather than perception. It is logical to consider that students may have correctly heard and understood the sounds being read aloud, but they did not know to which letter each sound corresponded. According to this hypothesis, the students would then not be able to select the correct spelling option for each tested phoneme.

In order to avoid this issue in future research, it is proposed that the perception exercise be composed of a AxB task. In this situation, the students would hear an audio recording of a nonce word read aloud. They would then be presented with two choices. One option would be the correct answer, and the second would possess a different stem vowel. Ideally, the students could listen to each option read aloud and view them written on the test before selecting an

answer. The participants would be asked to select the choice that sounds closest to the word they heard.

In regard to the speaking assessment, the application of Speak Everywhere in the project was beneficial to the study. Many of the learners had prior experience with the website due to completing earlier speaking assessments in their first-semester German courses. Although students were equipped with headphones and microphones to create optimum recording sessions, they were, nevertheless, obliged to complete the speaking assessment in the classroom with their fellow classmates. This may have unintentionally led to possible anxiety on the part of the students to have their colleagues in close proximity.

The study may also have been limited due to its short duration. In its entirety, the study lasted only three weeks. The students in the experiment group also only received one 50-minute pronunciation lesson. This may have limited the effectiveness of the treatment. At most the lesson may have made the learners more aware of the various nuances involved with vowel articulation. However, it would have not imparted a lasting influence on students' perception and production skills.

5.5 Anomalies in Data Outcomes

As noted above, students in the control group fared slightly better on the listening identification exercises between the pre-test and post-test. Several possible contributing factors may have resulted in this circumstance. As mentioned previously, the control group had a higher number of international students in proportion to the overall number of students in the control group than those sorted into the experiment group. The experiment group had more native-English speakers, for whom German was their second language. The control participants' prior exposure to other languages and language acquisition tactics may have afforded them greater

insight in isolating and discriminating between sounds in non-native languages. A second possibility may simply lie in the number of students delegated into the control group versus the experimental. The control group only consisted of one course section, whereas the experiment group contained three classes. This resulted in a substantially larger number of students in the experiment group, which could have led to more variability within the group's scores.

A minor underlying possibility for the control group's results may be because their course section met early in the morning, whereas the experiment group's classes met in the late afternoon. It is reasonable then to expect that students in the control group may have been more driven to perform the project tasks than their counterparts in the later course sections.

In regard to the study's overall stagnant results, a factor to consider is accent fossilization (Miller, 2012, Saalfeld, 2011). Several underlying causes may be at the root of the participants' potential fossilized accents. As noted above, 100% of the students marked that they had never received pronunciation training in their German courses. This lack of phonetic training may in part be responsible for the absence of increased accurate vowel production among participants. Another potential culprit to the possible onset of accent fossilization is the common teaching practice of recasting. As stated by Lyster and Ranta (1997) recasting was employed by 55% of observed language educators. However, it only generated 31% of student self-correction of word articulation. A third factor may also lie in the insufficient allotment of time dedicated to pronunciation instruction in language courses. As Olson (2014) asserts, when pronunciation instruction was offered in the language classroom, the grand total of time dedicated to pronunciation consisted of approximately eight minutes a week. It is reasonable then to consider that students enrolled in the German language courses at the research institute were likely exposed to the same teaching practices and amount of time for pronunciation instruction. Given

the factors provided, it is conceivable to argue that the participants in the experiment and control groups were displaying symptoms of accent fossilization.

This problem may also be compounded in that vowels are difficult for most L2 learners to acquire as the tongue does not touch the roof of the mouth (O'Brien & Fagan, 2016). The sensation of the tongue contacting parts of the mouth can serve as an indicator whether students are formulating the sounds correctly. However, this does not exist when articulating vocalic phonemes, which may have enhanced the participants' difficulties in formulating the vowels targeted in the speaking assessments.

Though by and large the results did not vary between the pre- and post-tests, small notable changes did occur in some of the learners' phoneme articulation. For example, the experiment group's pronunciation of /ɛ/ did slightly improve between the pre-test and post-test regarding the F1 value. Though it is not entirely understood why the students were able to formulate this sound more accurately, a strong probable cause for this incident is that this sound also exists in English. Seventy-one percent of the participants were native speakers of American English. As such, a greater portion of the learners were already accustomed to sounds in German that also occur in English. The phoneme /ɛ/ can be found in such English words as bed. Students would have more readily gravitated toward this sound than some of the other vowels presented in the pronunciation lesson, due to the phoneme's duel role in both languages.

The phoneme /a/ also experienced mild significance in the speaking assessments for both the control and experiment groups. It is suspected that this sound /ɛ/ may have been easier for most students to articulate as it to exists in English. This phoneme can be found in English words like always.

The instance of theF2 value receiving slight significance with the control group's production of /œ/ requires more consideration. This sound does not exist in English, as such the participants would not have been as familiar with the phoneme's articulation. For the learners to grasp this phoneme, they would need to first become aware of its existence, and then be taught to understand their observation (Lappin-Fortin & Rye, 2014). This, in essence, was the purpose of the pronunciation lesson. However, the students in the control group did not undergo any treatment in the study. In most anticipated circumstances, the experiment group should have demonstrated significance in their production scores with this phoneme, as they were instructed on its articulation. The control group's F2 scores with /œ/ provides more questions than answers.

It is worth mentioning that without multiple native-German raters it is impossible to fully capture the extent of the participants' progression in the study. The production scores indicate that changes did occur with students' F1 and F2 values. However, the scores do not necessarily offer an in-depth look into the students' speech patterns. For possible future research on this topic, several native German-speakers will be required to rate the participants' audio recordings and provide more accurate feedback on learners' advancement in German vowel production.

5.6 Summary: Study Implications for Pronunciation Pedagogy

Explicit pronunciation instruction in second language acquisition has largely been ignored. Subjects such as grammar and vocabulary have in general been given greater focus as they can be easily accessed through exams and coursework. It is only recently that attention has been given by researchers on promoting the advantages that phonetic training holds for language learners. The results taken from this study underscore the need for the inclusion of direct pronunciation instruction in lower-level language classrooms. The students' lack of variation in

their pre- and post-test perception and production exercise scores demonstrate that they are not receiving the adequate instruction required to enhance their oral proficiency in German.

For pronunciation instruction to be effective, a greater amount of time will need to be dedicated to the subject. As evidenced by the experiment groups' results, one session on pronunciation will not solicit greater accuracy in word articulation. Pronunciation instruction will need to be an on-going process within the language classroom throughout the duration of the course semester.

The need for early intervention in pronunciation instruction is likewise paramount to prevent accent fossilization among learners. As explained previously, in addition to limitations with the study design, it is suspected that the students' perception and production scores may have been influenced by the onset of accent fossilization. The participants were nearing the end of their second-semester of German at the time of the study. This is roughly the mid-point of the four German course sequence at the research institute required for students outside of the language degree programs. Based on the data collected from this project, it is advisable that pronunciation training starts early in the first semester, to counteract and prevent the effects of accent fossilization.

5.6.1 Summary of Teaching Strategies

Language educators can incorporate pronunciation instruction into the classroom through individual and group activities on the IPA such as those employed in the pronunciation lesson. Likewise, instructors can use the Communicative-Based Approach to their advantage in teaching pronunciation much like Elliot (1997). In his study, the author used reading, mimicking and identification exercises to assist students in their production of allophones. Educators can also incorporate technology into the classroom as a supplement to pronunciation. The use of ASR by

McCrocklin (2016) and Mroz (2018) highlight the benefits that this technology can have in making pronunciation instruction more accessible for learners and educators.

5.6.2 Summary: Future Research

Though the current project did not meet the result hypotheses, its endeavor to understand the ways in which students process sound and insert them into their phonemic system is valid. For the purposes of future research, it is proposed that the research questions posed by the project should be examined in separate studies. The question concerning whether learners' perception of German vowels relates to their production of said sounds was not fully addressed in this study. Potential results on this matter can offer significant insights into the way students' learn languages, which can assist educators in developing lessons and materials catered to the individuals in their class.

The second question asked by this study on whether explicit pronunciation instruction aids students in acquiring German vowels warrants being revisited. In future attempts of this project, several adjustments will be required. Firstly, the duration of the study will need to be extended to encompass the entire course semester. Ideally, this will take place with the researcher's own language students. The use of a pre-test and post-test will once again be utilized, as they offered insight into the students' progression throughout the project. In this scenario, the pre-test will be offered at the start of the semester, while the post-test will be administered at the end of the term.

The use of a listening identification exercise with nonce German words will once again be incorporated in the pre- and post-tests. However, in this instance, students will be allowed to listen to the exercises over headphones, to prevent any interference from inhibiting the learners from completing the task to the best of their abilities. Likewise, the use of speaking assessments

to record nonce German words will be employed, but the means of measuring production accuracy will be altered. In the future project spectrograms will be replaced by several native German speakers, who can listen to and rate the audio recordings for native-like production. In addition, the future project will delegate an equal number of students into the control and experiment groups, to prevent distortion of participants' scores.

It is hoped by the researcher that in future academic research, the questions posed by this study will be examined in other languages to see how teaching methods and students' results compare across languages. It is desirable that through such research, materials and course lessons on explicit pronunciation instruction can be developed to meet the growing needs and concerns of students and educators across languages.

5.7 Conclusion

In this chapter, the questions inquired by this study were once again examined considering the data collected. Study limitations and outcomes were discussed along with possible explanations for the results. The implications of this study regarding pronunciation pedagogy were offered to advocate for greater promotion and implementations of pronunciation instruction in language classrooms. Lastly, this chapter outlined possible future directions for the topic of explicit pronunciation instruction for the perception and production of German vowels.

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APPENDIX A: LANGUAGE BACKGROUND QUESTIONNAIRE

Q1 In this research study, you will be asked to fill out information about your language learning background. This study looks at the relationship between students' pronunciation of certain German sounds and their perception of these sounds. The information from this brief survey will be kept confidential and will not be made public. It should take only 3-4 minutes to fill out. Thank you!

Adrial Bryan
PhD Student in German
School of Languages and Cultures
Purdue University

Q2 Last Name

_____

Q3 First Name

_____

Q4 Age

_____

Q5 Native language

_____

Q6 When and where have you previously studied German? Please list all courses that you can, including courses you are enrolled in this semester.

_____

_____

_____

_____

_____

Q7 Do you know any other languages?

Yes (1)
No (2)

Q8 If you marked "yes" on the previous question, please list and describe your experience with those languages in as much detail as possible (number and level of courses taken, study abroad, etc.). If you marked "no", please disregard this question and move on to the next one.

_____

_____

_____

_____

_____

Q9 Have you ever taken a German phonetics or pronunciation class?

Yes (1)
No (2)

Q10 If you checked "yes" on the previous question, please describe when/where you had such a class. If "no", please disregard.

_____

_____

_____

_____

_____

Q11 Have you ever lived in a German-speaking area?

Yes (1)
No (2)

Q12 If you checked "yes" on the previous question, please describe when/where you lived in a German-speaking area. If "no", please disregard.

_____

_____

_____

_____

Q13 Have you ever visited a German-speaking area?

Yes (1)
No (2)

Q14 If you checked "yes" on the previous question, please describe when/where you visited. If "no", please disregard.

_____

_____

_____

_____

_____

APPENDIX B: GERMAN PRONUNCIATION PRE-TEST IDENTIFICATION

Q1 German Pronunciation Exercise

For this exercise, you will be asked to identify a word that you'll hear played through the speakers in the lab. On the next screen, there will be four multiple choice options to choose for each word. Please check what word you think is the most appropriate choice that goes along with what you hear.

You will be asked for your name for research identification purposes only. The results of the survey will be kept completely anonymous.

Thank you!
Adrial Bryan
Department of German and Russian
School of Languages and Cultures
Purdue University

Q2 Your Last Name

_____

Q3 Your First Name

_____

Q1 Word Number One
Jäsen (1)
Jösen (2)
Jusen (3)
Jasen (4)

Q2 Word Number Two
Schläsen (1)
Schlösen (2)
Schlüsen (3)
Schlusen (4)

Q3 Word Number Three
Säpfen (1)
Söpfen (2)
Süpfen (3)
Sapfen (4)

Q4 Word Number Four
Jätzen (1)
Jötzen (2)
Jützen (3)
Jutzen (4)

Q5 Word Number Five
Wurzeln (1)
Worzeln (2)
Wärzeln (3)
Wörzeln (4)

Q6 Word Number Six
Kruzen (1)
Kräzen (2)
Krüzen (3)
Krözen (4)

Q7 Word Number Seven
Prätern (1)
Prötern (2)
Prütern (3)
Prutern (4)

Q8 Word Number Eight
Klästen (1)
Klasten (2)
Klusten (3)
Klosten (4)

Q9 Word Number Nine
Stüseln (1)
Stöseln (2)
Stuseln (3)
Stäseln (4)

Q10 Word Number Ten
Löben (1)
Luben (2)
Lüben (3)
Läben (4)

Q11 Word Number Eleven
Tächten (1)
Töchten (2)
Tüchten (3)
Tuchten (4)

Q12 Word Number Twelve
Blüchten (1)
Blochten (2)
Blöchten (3)
Bluchten (4)

Q13 Word Number Thirteen
Docheln (1)
Döcheln (2)
Dücheln (3)
Dächeln (4)

Q14 Word Number Fourteen
Jätzeln (1)
Jötzeln (2)
Jützeln (3)
Jutzeln (4)

Q15 Word Number Fifteen
Kuben (1)
Koben (2)
Küben (3)
Köben (4)

Q16 Word Number Sixteen
Blästern (1)
Blöstern (2)
Blüstern (3)
Blustern (4)

Q17 Word Number Seventeen
Schucken (1)
Schöcken (2)
Schücken (3)
Schäcken (4)

Q18 Word Number Eighteen
Fursen (1)
Försen (2)
Fürsen (3)
Forsen (4)

Q19 Word Number Nineteen
Grütten (1)
Grutten (2)
Grötten (3)
Grätten (4)

Q20 Word Number Twenty
Blötern (1)
Blätern (2)
Blütern (3)
Blatern (4)

Q21 Word Number Twenty-One
Horgen (1)
Hörgen (2)
Hurgen (3)
Hürgen (4)

Q22 Word Number Twenty-Two
Röten (1)
Räten (2)
Rüten (3)
Raten (4)

Q23 Word Number Twenty-Three
Schofnen (1)
Schöfnen (2)
Schüfnen (3)
Schäfnen (4)

Q24 Word Number Twenty-Four
Öchten (1)
Üchten (2)
Ächten (3)
Ochten (4)

APPENDIX C: PRE-TEST READING EXERCISE

In this exercise, you will be asked to read the list of vocabulary provided below into the Speak Everywhere website. Please be sure to articulate clearly the phrases provided.
Thank you

Ich sage bräzen wieder.

Ich sage tösen wieder.

Ich sage dufen wieder.

Ich sage schlüsten wieder.

Ich sage straufen wieder.

Ich sage klögen wieder.

Ich sage nüchten wieder.

Ich sage dromen wieder.

Ich sage fästen wieder.

Ich sage sarken wieder.

Ich sage sörgen wieder.

Ich sage brüzen wieder.

Ich sage strosen wieder.

Ich sage brängen wieder.

Ich sage höchten wieder.

Ich sage schlunken wieder.

Ich sage dännen wieder.

Ich sage tügen wieder.

Ich sage dröpsen wieder.

Ich sage mazeln wieder.

Ich sage häseln wieder.

Ich sage Drühen wieder.

Ich sage goben wieder.

Ich sage kluzen wieder.

APPENDIX D: ARBEITSBLATT: DEUTSCHE AUSSPRACHE

A. Pronounce each of the following vowels and determine whether it is rounded or unrounded.

a. [aː] (<Vater>)

b. [uː] (<gut>)

c. [ɛ] (<Bett>)

d. [œ] (<können>)

e. [yː] (<müde>)

f. [eː] (<Schnee>)

g. [ʊ] (<muss>)

h. [ɔ] (<offen>)

i. [ɪ] (<Kiste>)

j. [ʏ] (<Küste>)

B. Pronounce each of the following pairs of vowels, determine whether they have the same or a different vowel height, and then identify the height of each vowel. Remember that there is a correlation between vowel height and the degree to which your mouth is open. Pay attention to the position of your lower jaw when you say these pairs of vowels.

a. [iː] : [aː] (<Kiel>, <kahl>)

b. [uː] : [yː] (<Stuhl>, <Stühle>)

c. [uː] : [oː] (<tun>, <Ton>)

d. [aː] : [eː] (<sah>, <See>)

e. [ʊ] : [ɔ] (<Schluss>, <Schloss>)

f. [ɔ] : [œ] (<konnte>, <könnte>)

g. [ɪ] : [ɛ] (<sitzen>, <setzen>)

h. [ɔ] : [a] (<Tonne>, <Tanne>)

i. [oː] : [eː] (<wo>, <Weh>)

C. Provide the phonetic symbol for the following vowels in German:

a. mid, back, lax, short, rounded vowel

b. high, front, tense, long, unrounded vowel

c. mid, front, lax, short, unrounded vowel

d. low, central, short, unrounded vowel

e. high, front, tense, long, rounded vowel

f. lower-mid, central, lax, short, unrounded vowel

g. mid, front, tense, long, unrounded vowel

h. high, front, lax, short, rounded vowel

i. high, back, tense, long, rounded vowel j. mid, front, lax, short, rounded vowel

D. Describe the following vowels phonetically (see the descriptions in exercise 1.15):

a. [yː]

b. [ɪ]

c. [ʊ]

d. [œ]

e. [ɛ]

f. [ə]

g. [aː]

h. [oː]

i. [eː]

Resource: O'Brien, M. G. and Fagan, S. M. B. (2016). *German Phonetics and Phonology Theory and Practice.* New Haven, CT and London, UK: Yale University Press.

APPENDIX E: GERMAN PRONUNCIATION POST-TEST IDENTIFICATION

Q1 Please read each word twice from the list provided below. Please allow 8 seconds between each reading so as to allow the students time to mark the correct spelling option. Please also be sure to read the number and then the word. Example: #1 Jasen, #2 schläsen #3 söpfen. This reading will be played aloud over the lab's speakers. The students will listen to the words aloud before selecting the correct spelling from 4 options provided in Qualtrics. Each word will have four spelling options from which the students are to choose. Thank you!

Thank you!
Adrial Bryan
Department of German and Russian
School of Languages and Cultures
Purdue University

Q2 Your Last Name

_____

Q3 Your First Name

_____

Q1 Word Number One

Täsen (1)
Tösen (2)
Tusen (3)
Tasen (4)

Q2 Word Number Two

Dräsen (1)
Drösen (2)
Drüsen (3)
Drusen (4)

Q3 Word Number Three

Gäpfen (1)
Göpfen (2)
Güpfen (3)
Gapfen (4)

Q4 Word Number Four

Schlätzen (1)
Schlutzen (5)
Schlötzen (2)
Schlützen (3)

Q5 Word Number Five

Storzeln (1)
Sturzeln (2)
Stärzeln (3)
törzeln (4)

Q6 Word Number Six

Bluzen (1)
Bläzen (2)
Blüzen (3)
Blözen (4)

Q7 Word Number Seven

Frätern (1)
Frötern (2)
Frütern (3)
Frutern (4)

Q8 Word Number Eight

Prästen (1)
Prasten (2)
Prusten (3)
Prosten (4)

Q9 Word Number Nine

Rüseln (1)
Röseln (2)
Ruseln (3)
Räseln (4)

Q10 Word Number Ten

Stöben (1)
Stuben (2)
Stüben (3)
Stäben (4)

Q11 Word Number Eleven

Grächten (1)
Gröchten (2)
Grüchten (3)
Gruchten (4)

Q12 Word Number Twelve

Klüchten (1)
Klochten (2)
Klöchten (3)
Kluchten (4)

Q13 Word Number Thirteen

Tocheln (1)
Töcheln (2)
Tücheln (3)
Tächeln (4)

Q14 Word Number Fourteen

Wätzeln (1)
Wötzeln (2)
Wützeln (3)
Wutzeln (4)

Q15 Word Number Fifteen

Nuben (1)
Noben (2)
Nüben (3)
Nöben (4)

Q16 Word Number Sixteen

Glästen (1)
Glösten (2)
Glüsten (3)
Glusten (4)

Q17 Word Number Seventeen

Blucken (1)
Blöcken (2)
Blücken (3)
Bläcken (4)

Q18 Word Number Eighteen

Norsen (1)
Nörsen (2)
Nürsen (3)
Närsen (4)

Q19 Word Number Nineteen

Frütten (1)
Frutten (2)
Frötten (3)
Frätten (4)

Q20 Word Number Twenty

Trötern (1)
Trätern (2)
Trütern (3)
Tratern (4)

Q21 Word Number Twenty-One

Sorgen (1)
Sörgen (2)
Surgen (3)
Sürgen (4)

Q22 Word Number Twenty-Two

Löten (1)
Läten (2)
Lüten (3)
Laten (4)

Q23 Word Number Twenty-Three

Dofnen (1)
Döfnen (2)
Düfnen (3)
Däfnen (4)

Q24 Word Number Twenty-Four

Stöchten (1)
Stüchten (2)
Stächten (3)
Stochten (4)

APPENDIX F: POST-TEST READING EXERCISE

Ich sage Gläzen wieder.

Ich sage jösen wieder.

Ich sage blufen wieder.

Ich sage klüsten wieder.

Ich sage draufen wieder.

Ich sage schlögen wieder.

Ich sage düchten wieder.

Ich sage tromen wieder.

Ich sage hästen wieder.

Ich sage warken wieder.

Ich sage zörgen wieder.

Ich sage trüzen wieder.

Ich sage grosen wieder.

Ich sage frängen wieder.

Ich sage nöchten wieder.

Ich sage strunken wieder.

Ich sage bännen wieder.

Ich sage jügen wieder.

Ich sage ströpsen wieder.

Ich sage wazeln wieder.

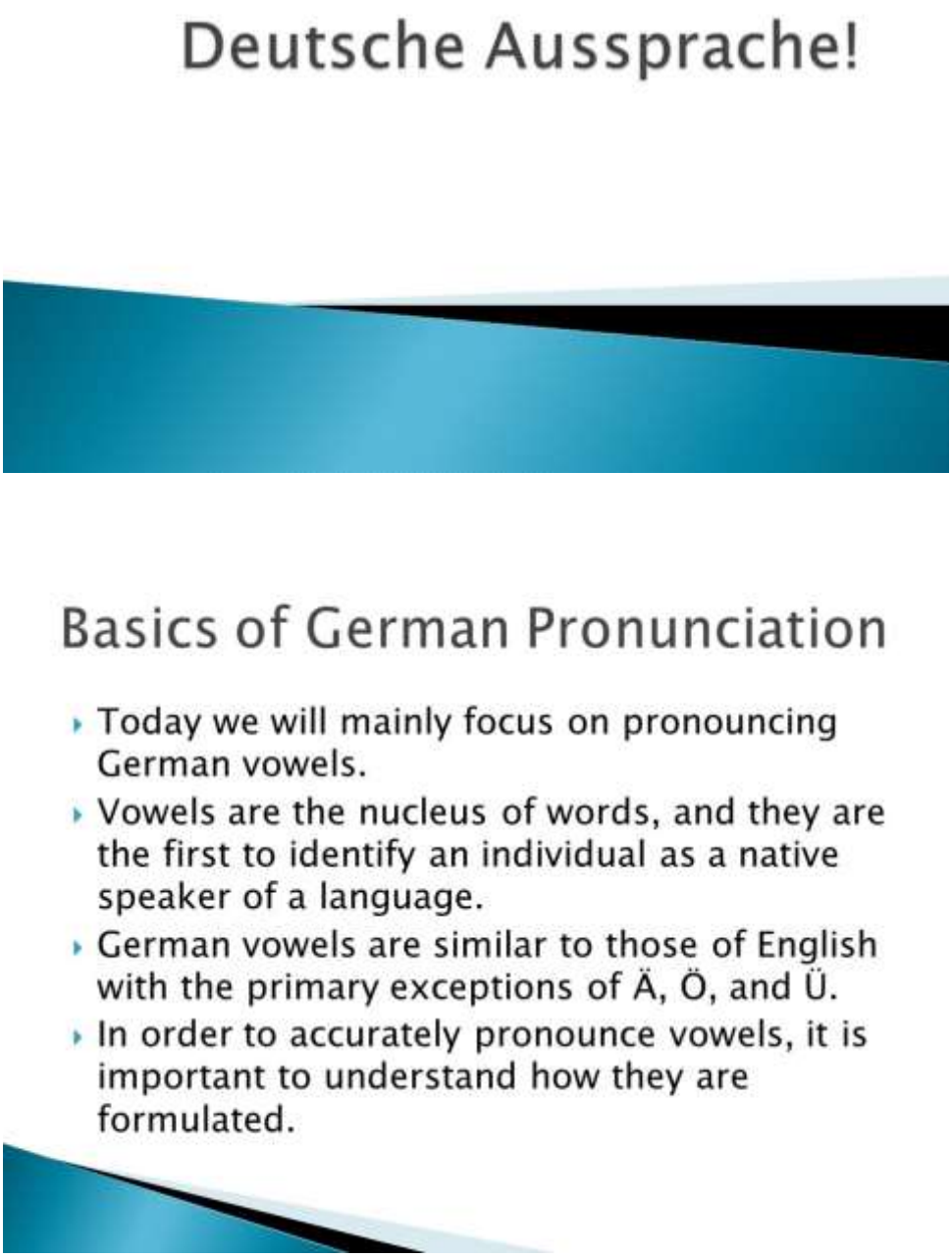
Ich sage schläseln wieder.

Ich sage rühen wieder.

Ich sage hoben wieder.

Ich sage gluzen wieder.

APPENDIX G: PRONUNCIATION POWERPOINT SLIDES



Vowel Formation

There are 4 parameters that are important to German vowel articulation:

1. Tongue position
2. Lip rounding
3. Tenseness
4. Vowel length

Vowel Formation: Tongue Position

- Tongue position simply identifies the placement of the tip of the tongue whether it is high, middle or low.
- When articulating the vowel <i>, as in the word Stil (style), the tongue is high and towards the front of the mouth.
- When articulating <u>, as in the word du, the tip of the tongue is towards the back of the mouth.
- The <a>, as in the word ja, is a central vowel, and the tongue is placed in the middle of the mouth.
- A key difference between <o> and Ö and <u> and Ü is the movement of the tongue from the back of the mouth to the front.

Vowel Formation: Lip Rounding

- Lip rounding involves the movement of the lips and whether the lips are rounded during the formation of a vowel or whether they are spread apart.
- Unlike English, German has front rounded vowels such as Ö and Ü.
- The only difference between a long <i> and Ü is lip rounding. Say <i> and round your lips to say Ü.

Vowel Formation: Tenseness

- Tenseness is often described as the amount of muscular tension necessary for the production of a vowel.
- A tense vowel is characterized as being produced with more muscular tension than a lax vowel such as i and e.
- The long <i> such as in Sie is tense, whereas the short <i> such as in Schiff is relaxed.

Vowel Formation: Length

- Length can be characterized as the relative duration of a vowel in comparison to other vowels.
- The vowel in Staat (state) verses Stadt (city) is long whereas the latter is short.
- Typically vowels that are followed by a single consonant in a syllable are long, and vowels that are followed by more than one consonant are short.

Vowel Articulation

- Vowel articulation is formulated in the front, middle and back of the mouth.
- Vowels are often defined as front, mid or back vowels based on where the primary articulation occurs in the mouth.

Phonetics: Sounds of German

- The University of Iowa has created a website containing sound files and animations of native speakers pronouncing all of the sounds found in German.
- Here is a link to the University of Iowa's project "Phonetics Sounds of German:

soundsofspeech.uiowa.edu/german/german.html

The International Phonetic Alphabet

- The International Phonetic Alphabet (IPA) is an alphabet based on phonetic notation.
- The characters in this alphabet represent each particular sound found in a language.
- The IPA is used to isolate sounds from standard orthography in order to focus on the sounds of a language for pronunciation purposes.

IPA for German Vowels

Here is a list of the IPA symbols for German vowels:

- [a:] = (long ah) Abend, Vater, Zahlen
- [a] = (short ah –faster) hast, das, kalt, alt
- [e:] = (e long–bay) gehen, den, zehn, gehts

IPA of German Vowels

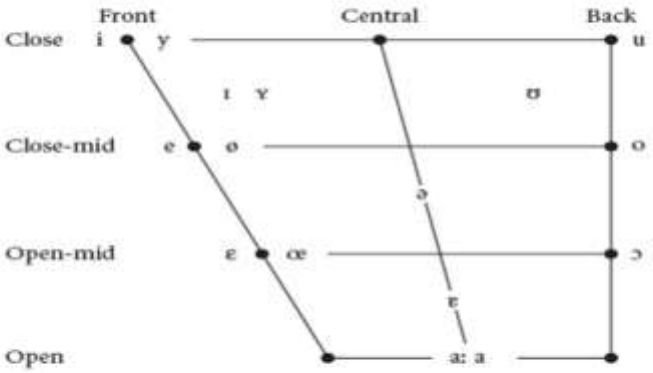
- [ɛ] = (e short: met, let) denn, Bett, es
- [ə] = (e short: upon, amaze) gute, Pute, Ameise
- [i:] = (i long: glee, machine) ihn, prima, ihm, ihr
- [ɪ] = (i short: pin, it) ich, mich, will, Liste
- [o:] = (o long: coal, hold) holen, jawohl, also
- [ɔ] = (o short: almost like caught but with rounded lips) Koch, noch, Lotto

IPA of German Vowels

- [u:] = (u long: do, pool) du, gut, Schule, Buch
- [ʊ] = (u short: full, pull) und, uns, null
- [ø:] = (ö long: e (her) lips rounded) schön, zuhören
- [œ] = (ö short: same but faster) öffnen, hört
- [y:] = (ü long) drüben, Tür, glühen, Brüder
- [Y] = (ü short: i (pin) lips rounded) fünf, Mütter

IPA of German Vowels

- [ɛ:] = (ä long: bay, say) spät, Mädchen, Väter
- [ɛ] = (ä short: met) älter, kälter, glänzen
- [aI] = (ai: eye) Mai, Haifisch
- [aʊ] = (au: wow, cow) Frau, Paul, auch
- [ɔY] = (äu: boy, coy) Fräulein, Mäuse



Works Cited

Hall, C. (2003). Modern german pronunciation: An introduction for speakers of English. Manchester, UK: Manchester University Press.

O'Brien, M. G. and Fagan, S. M. B. (2016). German Phonetics and Phonology Theory and Practice. New Haven, CT and London, UK: Yale University Press.

APPENDIX H: POST-HOC ANALYSIS

F1 Model

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	2321	44028.416	.000
Segmentlabel	6	2321	326.737	.000
Treatment1yes2no	1	2321	1.394	.238
PreTest1PostTest2	1	2321.000	.119	.730
Treatment1yes2no * PreTest1PostTest2	1	2321.000	.212	.645
Segmentlabel * Treatment1yes2no	6	2321	4.061	.000
Segmentlabel * PreTest1PostTest2	6	2321	1.152	.329
Segmentlabel * Treatment1yes2no * PreTest1PostTest2	6	2321	1.448	.193

a. Dependent Variable: Normalized F1.

One significant interaction Vowel by Treatment Group ($F(6, 2321)=4.061$, $p < 0.001$). Post-hoc tests with Bonferroni adjustment showed a significant difference ($p < 0.01$) between Treatment Groups for /ä/ with a higher mean normalized F1 (lower vowel) for the control group ($M=1.184$) than the test group ($M=1.125$). Same for /a/ ($p < 0.01$) with a higher mean for the control group ($M=1.512$) than the test group ($M=1.413$). Opposite for /ö/ ($p <0.05$) with a higher mean for the test group ($M=1.004$) than the control group ($M=0.957$).

F2 Model

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	2321	31467.818	.000
Segmentlabel	6	2321	231.844	.000
Treatment1yes2no	1	2321	.022	.881
PreTest1PostTest2	1	2321	1.910	.167
Treatment1yes2no * PreTest1PostTest2	1	2321.000	.027	.870
Segmentlabel * Treatment1yes2no	6	2321	1.720	.112
Segmentlabel * PreTest1PostTest2	6	2321	2.892	.008
Segmentlabel * Treatment1yes2no * PreTest1PostTest2	6	2321.000	1.218	.294

a. Dependent Variable: Normalized F2.

Significant interaction between Vowel and Test ($F(6, 2321)=2.892$, $p < 0.01$). Bonferroni-adjusted post-hocs show a significant difference for /a/ between tests ($p < 0.01$) with a higher mean normalized F2 for the pre-test ($M=1.019$) than the post-test ($M=0.920$).