دراسة اجتماعية–صوتية حول أثراختلافات اللهجات لدى الطلبة الكرد متعلمي الإنجليزية كلغة أجنبية في إنتاج أصوات العِلّة القصيرة في اللغة الإنجليزي

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كيفية اقتباس البحث

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A Socio-Phonetic Study of Kurdish EFL Students' Dialectal Variations in Producing English Short Vowels

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Keywords : socio-phonetics, Dialect variation, phonological transfer, Kurdish EFL learners, contrastive analysis.

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الملخص:

يُعَدّ اكتساب نطق قريب من النطق الأصلي أحد الأهداف البارزة في تعلم علم أصوات اللغة الإنجليزية. ومع ذلك، فإن تحقيق هذا الهدف محفوف بالصعوبات، إذ تُعَدّ اختلافات اللغة الأم للمتعلمين أحد هذه العوامل. ويرتبط تحقيق هذا الهدف عادةً بالانغماس في عملية تعلم اللغة ضمن السياقين الاجتماعي والثقافي. تسعى هذه الدراسة الاستكشافية إلى تحديد تأثيرات اختلاف اللهجات الكردية على نطق الحركات القصيرة في اللغة الإنجليزية لدى متعلمي اللغة الإنجليزية بوصفها لغة أجنبية. وتهدف إلى تسليط الضوء على أسباب مثل هذه الأخطاء في النطق. كما تتناول الدراسة ثلاث لهجات كردية رئيسة، وهي: الشمالية والوسطى والجنوبية، بغية تحديد التأثيرات المنهجية لاختلاف اللهجات الكردية في تعلم الفونولوجيا الإنجليزية. ولتحقيق أهداف الدراسة، تم اختيار (45) طالباً جامعياً من متعلمي الإنجليزية كلغة أجنبية عبر لهجات كردية

مختلفة من قسم اللغة الإنجليزية في كلية التربية الأساسية بجامعة صلاح الدين – أربيل، وذلك عن قصد للمشاركة في هذه الدراسة وأداء مهام إنتاج الكلام. وقد استُخدم برنامج Audacity لتحليل الخصائص الصوتية للأصوات، مثل الترددات والفورمانت (رنين الترددات) ومدد الحركات. وكشفت نتائج تحليل النطق والتحليل الصوتي أن اختلافات اللهجات الكردية، بوصفها عاملاً اجتماعية–صوتية ، تؤدي دوراً في كل من النقل الإيجابي والتداخل عند تشكيل نطق الحركات الإنجليزية لدى متعلمي الإنجليزية من الكرد.

Abstract:

Acquiring a native-like pronunciation is one of the prominent goals of learning English phonology. However, achieving this goal is laden with difficulties; native language variation of the learners is one of these factors. Achieving this goal is typically linked to immersion in social and cultural language learning. This exploratory study seeks to determine the effects of Kurdish dialect variation on English short vowels' pronunciation among EFL learners. It aims to highlight the causes of such mispronunciations. It also investigates three major Kurdish dialects, namely, Northern, Central, and Southern, to determine the systematic effects of Kurdish dialect variations on English phonological learning. To achieve the aims of the study, 45 EFL university students across various Kurdish dialects from the English department in the College of Basic Education at Salahaddin University-Erbil were purposively selected to participate in the current study and perform speech production tasks. Audacity software program is used to analyze data's acoustic properties, such as frequencies, pitch formants, and vowel durations. The sound articulation and acoustic analysis revealed that Kurdish dialect variations, as a sociophonetic factor, have a positive transfer and interference in shaping English vowel production among Kurdish EFL learners.

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1.Introduction

One of the key features of language depth and authenticity lies in having diverse dialects, and using different accents. However, at the same time the presences of many dialects and accents within one language may lead to adverse result such as communication difficulties among the speakers of different dialects of the same language due to incorrect sound production and pronouncing, and this become more challenging when sound variation involves the speakers of different languages. In certain circumstances, such variations can

also lead to difficulties in mutual intelligibility. This arises the question: where do these phonetic and phonological differences may stem from? Several scholarly investigations have addressed this topic such as (Yavas, 2006; Al-Tamimi,2007; Al-Abdely and Thai ,2016a), most of these studies have associated these differences with sociophonetic factors, namely linguistic environment, gender, social background, and contact with other languages. Those authors believed that learning new sounds is perhaps the most challenging problem the speakers of different dialects face in mastering a target or standard language, since many keep a native accent while learning and aquiringthe target language pronunciation.

Many researchers, such as, Kenworthy,1987; Celce-Murcia, Brinton, and Goodwin2010; Ladefoged& Johnson, 2015; Swan;2016) have claimed that vowels are more difficult to produce than consonants because they are phonetically interrelated in articulation. In other words, vowels are more difficult because they gradually blend together, lack the distinct production points that consonants have, and are harder to distinguish from one another Al-Tamimi, (2007) defined vowels as sounds in which air sent through the vocal tract by lungs, but with relatively little obstruction of air. Thus, a good identification of vowels can be presented by defining their acoustic characteristics. (Yavas, 2006; AL-Abdaly, 2021).

The Kurdish language, like all the other languages, faces these phonetic problems across its dialects. Hamid and Salih (2022) considered the production and pronunciation of vowels, in Kurdish, to be particularly susceptible to variation, more than consonants, due to the diversity of these segments in different Kurdish dialects.

To identify Kurdish EFL students' vowel patterns and the socio-phonetic factors that affect vowels' pronunciation, the current study examines vowel pronunciation variations across Kurdish dialects and their effects on pronouncing and recognizing similar vowels in pronunciation and phonetics and phonology classes. This phonological analysis study compares and contrasts vowels' phonological features in the Kurdish dialects methodologically to show similarities and differences of vowels in the Kurdish dialects. Moreover, it studies their effects on recognizing English vowels in the English pronunciation classes. The study, also, highlights the socio-phonetic factors that lead to the phonological transfer and dialect variation in the Kurdish language. According to Cook (1999) contrastive analysis is well-grounded and most effective method to acquire an accurate result in the field of phonological studies. Thus, the study sheds light on the Kurdish sound

system and attempts identify the differences and similarities between vowel sounds' production across the aforementioned different Kurdish dialects. To achieve these aims the following research questions have been addressed:

- What effects do Kurdish dialect differences have on Kurdish EFL students' production of English vowels?
- Which acoustic features of Kurdish vowels cause the greatest English vowel mispronunciation among Kurdish EFL students?
- Which Kurdish vowel pronunciation most interferes with English vowel production?"
- Which sociophonetic factor has the greatest impact on Kurdish EFL students' English vowel pronunciation accuracy?

2.Literature Review

This section defines the term socio-phonetic and consider its factors and effects. It also review the Kurdish dialect variation, and the articulatory and acoustic properties of Kurdish vowels

2.1 Socio-Phonetic Factors

The term sociophonetics is often mentioned in discussions of language learning and acquisition, as sociophonetic factors play a crucial role in shaping learners' pronunciation and understanding of sounds. Baranowski (2013, p. 403) defined sociophonetics as "the interface of sociolinguistics and phonetics", noting that these sociophonetic factors have considerable influence on speech sound production and their variations. The focus of sociophonetic studies was initially on the acoustic analysis of vowel variation. Later, it rapidly expanded to include different instrumental sound analyses, yet its main focus remains the acoustic analysis. Baranowski (2013) claims that the foundation of sociophonetic research was established by three scholars: Labov, Yeager, and Steiner in 1972, when they conducted a study on American English vowels associating changes in vowel production with social factors. However, the term was introduced in 1974 by Dell Hymes, who established a connection between language variation and the cognitive structure of language (Erik, 2011).

The areas and purview of sociophonetics comprise several interconnected ones, including, among others, the relationship between sound variation and social stratification. It also studies whether social factors have any impact on the perception of speech, the relationship between features of pronunciation and social classes, and the mapping of speech sounds and regional variations (Labov, 2001). In other words, sociophoneticians analyze variations and changes in speech sound productions and

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perceptions because of factors varying from the age of the speaker, gender, regional influence, and identity to cultural background. Subsequently, this provides great assistance in research areas such as forensic linguistics and language teaching. Many studies have been conducted to measure the effects of these factors on the phonetic characteristics of speech (Foulkes & Docherty, 2006; Hay, Warren, & Drager, 2006; Erik, 2011; Baranowski, 2013; Hay, 2018; Zain, Abbasy, & Husain, 2025). The above-mentioned studies tried to provide evidence that sociophonetic factors are essential in interpreting speech production and perception in languages with differing dialects and accents. Here, sociophonetic factors equally contribute to causing generate variations in the sounds' acoustic characteristics.in the sounds' acoustic characteristics.The researchers implemented various sociophonetic methods to understand how speakers' pronunciation in multilingual communities affects the perception of certain target language speech sounds

2.2 Kurdish Accent and Dialect Variations

In examining how dialects emerge within languages in general, various factors are often mentioned, some of which are highly influential, such as geographical, economic, political, and religious boundaries. These factors bring languages and peoples into contact, resulting in the influence of one language over another. These kinds of interactions can result in the evolution of dialects and accents within the same language or the born of a new language, frequently through the emergence of a lingua franca (Crystal, 2003). Dialect formation is also influenced by individual-related factors other than the above-stated factors. these individual-level factors play a vital role in comprehending a different dialect. The speaker's idiolect and language background, regional and cultural variations including traditions, customs, and literary heritage leave a fingerprint in dialect evolution (Labov,1972). Kurdish language, like any other language, has particularly, been subject to the influence of all these factors, which have left their distinct remarks and caused it to break up into three major dialects that sometimes seem more like totally different languages. More importantly though, they lead to the development of different accents within one dialect. Sharaf Khan Bedlisi (1543-1603) was the first person on record to categorize Kurdish dialects as four main ones: Kurmanji, Goran, with other different versions of classifications. This paper uses the term Northern Kurmanji to refer to Bahdini spoken in Duhok city, Central Kurmanji refers to Sorani

spoken in Erbil,Kirkuk, and Sulaimani cities, Southern Kurmanji is used for a variant spoken around Khanaqin and its surrounding Kurdish region within Iraq. The most widely spoken dialect in the Kurdish language is called Kurmanji (Northern Kurdish), used mainly in the governorates of Dihoke and a part of Musil plus some parts of Erbil (hawler) specifically Barzan and Sherwan Mazin Mergasur, and Bile regions. The third dialect is Sorani (Central Kurdish), Dominant in Erbil, Suleimani and a part of Kirkuk governorates.

Political and historical factors have made it so difficult to decide which Kurdish dialect should be considered as a standard one. Throughout history, a distinct Kurdish dialect designated as the standard and an official language and took prominence over the others depending on the Kurdish emirates' hegemony, as well as the religious and regional influence. Additionally, their linguistic map was further drawn by raids carried out based on the dominance of neighboring states and entities that had geographical frontiers with Kurdish territories, such as Arabs, Turks, and Persians. (Blau, 1996)

Currently, the Central Kurdish dialect (Sorani), used in some areas of Southern Kurdistan has taken precedence officially because there is a semiautonomous Kurdish region with its management for more than two decades. Şorani is the main language in schooling and other government houses. However, the dialects were also affected by these factors. The most significant effects caused by the mentioned factors over the dialects appeared in the mode of articulation of sounds of words in two principal ways: first, they change their phonetic nature; and second, what has come to be known as sound substitution, i.e., switching a sound with another in the speech production. From a phonological perspective, the vowel sounds have been most affected, particularly due to the lack the absence of complete closure in their production, often involving semi-closure during pronunciation (McCarus, 1958). Here it has been concluded that dialect variation in all languages is not a random phenomenon but rather a matter of a complex interplay between personal, social, and cultural linguistic factors.

Understanding these changes offers deeper insight into how Kurdish accents evolve and are affected by the aforementioned factors. Thus, from this perspective, the current study attempts to shed light on vowel variations within the three well-known dialects, namely, Northern, Central and Southern.

2.3 Articulatory Features of Kurdish Vowels

The Kurdish language includes a total of eight pure monophthongs, six short pure vowels/ i̇ /, /u/, / ɐ /, /ɑ/, /o/, and the central, unstressed vowel / ɚ /, often referred to as the "hidden vowel" bizroka', in addition to, two long vowels, / î / and / û /, which are pronounced for a longer duration than their short counterparts (Zahedi et al., 2012; and Gündoğdu, 2015; Farah, 2000). The Kurdish language also includes two diphthongs. These diphthongs are typically represented in Kurdish orthography as, "ێي" and "وێ", and pronounced approximately as /yi/ and /wi/ (Fattah,2000).

These vowel sounds mostly share the common articulatory and acoustic features of vowels found in other spoken languages. However, they are pronounced with a slight change due to the place of articulation, the duration of the vowel production, the pitch and voice quality, and the frequency. It is worth mentioning, the Kurdish speakers who are familiar with all the Kurdish dialects perceive the changes clearly in vowels pronunciation of other speakers across different Kurdish dialects, northern, central, and southern (Haig & Öpengin, 2014). It's also worth noting that not all Kurdish vowels yield to change in the same way. Some vowels survive these changes, while others are severely affected by pronunciation changes across regions (Haig & Matras, 2002).

Before examining how these differences occur and why, it's helpful to describe each vowel more closely by looking at its place of articulation, what the tongue and lips are doing, and how open the space between the tongue and the palate is. The first Kurdish short vowel / i̇/ is a close central unrounded vowel between cardinal vowel number one /i/ and English close front vowel /ɪ/. The vowel produced with vocal cords vibrating [+voiced], and a flat tongue surface [− sibilant] respectively. It is articulated with air going continuously out from the mouth [+continuant]. Another phonological feature of this Kurdish vowel is [+ sonorant], which is produced with regular vocal cord vibrations. ((Zahedi et al., 2012)

The second Kurdish vowel is a close mid unrounded central vowel / ɐ /, it is similar to the cardinal vowel 15 /ɣ/, based on its backness, and English vowel /ɛ/, but more open (see figurr1). This vowel is capable to attract stress in the word consequences[+syllabic]. This vowel in Central dialects is [− sibilant], as it is produced with a flat tongue surface Pullum & Ladusaw,1996; Kreidler, 2004). Furthermore, it has [+voice and + sonorant] features and attracts the primary stress in mono and disyllable words [+syllabic].

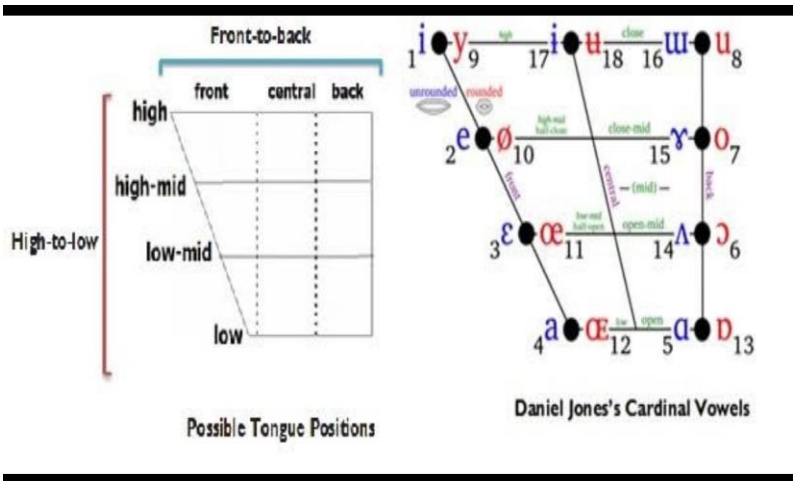

Figure (1) IPA vowel chart

The Central Kurdish vowel /ɑ/ is, standardly, similar to cardinal vowel number five. it is pronounced by involving the back part of the mouth [+ back], the lips shaped open and the lips are unrounded [- rounded]. It is produced with more tension in the facial muscles [+tense]. It is capable of carrying stress and pitch which leads to acquire [+ syllabic] feature, and articulated with air going continuously out from the mouth [+ continuant, + sonorant]. This vowel, in the central Kurdish dialect usually made with regular patterns of vibration [+ voice]. Also, it is produced by raising the back part of the tongue [+sibilant]. It is distinct from the English vowel/æ/ which is almost an open vowel and produced with a flat tongue surface.

The Kurdish hidden vowel "bizroka"/ə˞ /is mid [+ central], unrounded [- rounded]. it is pronounced with rhoticity, i.e., occurs with different strengths and weaker sonorant [- tense]. It never attracts stress due to its weakness[-syllabic]. It is similar to some extent to the English weak vowel/ə/.

Another Kurdish vowel is/o/. this vowel is featured as a close-mid central intermediate between cardinal vowel number 6 [o] and cardinal vowel number 10 [ɵ]. It is Pronounced with a high degree of muscular tension [+ tense] and capable to carry stress in the word[+syllabic]. In addition, it has [+ voiced and+ continuant] features due to the fact that this vowel is produced with articulated with a continuous air going in the vocal tract and vocal cord vibration. The lips are clicked and rounded [+ rounded]. (Kreidler, 2004)

The last short Kurdish vowel /u/is a close back vowel between cardinal vowel nine/ □/ and short English vowel /ʊ/. This sound is produced by rounding the lips [+ rounded] The other feature of this vowel in Kurdish are [+tense, + voiced, + continuant, + voiced, and

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+syllabic]. The Vocal cords are tightly stretched], producing a clearer and more resonant sound with a strong stress attractor [+ syllabic],

The phonological features of the long Kurdish vowel /ĭ/ are close, central and unrounded between cardinal vowel-1 /i/ and English long vowel / i: /. It is Produced with a high degree of muscular tension in the vocal tract [+ tense] in which the central part of the tongue while pronouncing this vowel, is higher than English long vowel /i:/, [+ high], and more retracted in the oral cavity. It has the continuous and voiced features [+continuant, +voiced], Moreover, the vowel is pronounced with a high pitch [+sonorant]. The second long vowel /ŭ/ in the Kurdish sound system, as identified by (Zahedi et al. (2012), is a close central rounded vowel.it shares the features of Cardinal vowel-eight / u/, nine /□/ and long English vowel /u:/. It is [+ sonorant] as it is produced with muscular tension[+tense] and without impeding the air flow [+ consonantal].

2.4 Acoustic Features of Kurdish Vowels

The acoustic features of Kurdish vowels include formant "The resonant frequencies of the vocal tract" (Encyclopedia Britannica, n.d.), such as F0 (related to vowel height) and F1/F2(related to vowel frontness and rounding), sound frequency, pitch characteristics, and sound duration. The analyses of acoustic features are typically extracted from sound wave and spectrograph using soft were programs like PRAAT and Audacity.

A number of studies (Zahedi, et al ,2012; Bijankhan, & Saleh, (2017); Garib,2018; Hamawand & Al-Jaf,2023) have been conducted to measure the acoustic features of Kurdish speech sounds. The aforementioned studies shed light on both Central and Northern Kurdish Dialects; however, the Southern Kurdish dialect has not yet received any specialized study concerning the acoustic analysis features of its vowels. Here. in this section the focus will be on the caustic features of Central Kurdish Dialect vowel sounds.

To understand the sound quality of any phoneme, both articulatory and acoustic features need to be measured accurately. Additionally, such analyses assist the phonetician and academic scholars in understanding the nature of sounds in any language easily, as well as assist them exploring the effect of acoustic variations and their influence on the pronunciation of other sounds across different languages.

The acoustic features of the short vowel sound in the central Kurdish dialect have been identified by the above-mentioned researchers (Zahedi, et al ,2012; Bijankhan, & Saleh, 2017; and; Garib,2018).

They attempt to examine the core acoustic parameters, namely: frequency and pitch formant measures, intensity, and sound duration. They, also attempt to investigate the acoustic characteristics of different Kurdish segments, including the analysis the vowels of Northern and Central Kurdish dialects. To gain a clear understanding on the nature of vowel phonemes, a comprehensive acoustic analysis of the vowel sounds, a comparison of both the articulatory positions and the acoustic features of the vowels across the Kurdish dialects (Northern, Central, and Southern) is required. This approach, will assist scholars, phoneticians and Kurdish learners in exploring the impact of these acoustic variations on vowel pronunciation when learning other languages as a foreign and second language.

It is worth noting that the previous chapter addressed the articulatory description of Kurdish vowel sounds, while the present section focuses on highlighting their acoustic characteristics.

The acoustic feature of the Kurdish tense vowel / i̊ /, as illustrated in table (1) tends to record proximately a high fundamental frequency (F0= 180Hz).it is a high-central vowel with formants (F1-F2: 300-2300Hz). The duration for producing this vowel in between(180-210ms). The second vowel is a tens vowel/ æ /. The formant descriptions of this vowel are averaging between (F1-F2: 450-2000Hz) which is approximately higher than the previous vowel. In addition, the fundamental and pitch variation were scored (F0 =170-180). This indicates that pitch variation does not contrast the vowels because the Kurdish language is a non-tonal language. This vowel needs 170-200ms to be produced clearly. Zahedi (2012 and Garib (2018) acoustic analysis of Kurdish vowel, identified that the Kurdish vowel/ ɑ/ has different vowel features articulatory and acoustically. In Central Kurdish it is a lax amid back vowel with a formant varying between (F1-F2: 750-1200Hz). The pitch averages (F0 =140-160Hz) and it takes between 210- 240 Ms. The same vowel in other Kurdish varieties and dialects is pronounced with different features. It is pronounced similar, to some extent, to the Kurdish vowel /o/ in the northern dialect. In a word like 'bab' which means 'father', the formant description vowel /ɑ/ is an open-mid and back rounded. It is pronounced similarlyto the cardinal vowel 14/ʌ/ Bijankhan, & Saleh, (2017). the acoustic feature of this vowel in southern dialect is (F1-F2:700-1000Hz), the fundamental frequency is (120-140Hz). It is considered a low and lax vowel and produced with a relatively shorter period (190-200ms). See table (1).

Table (1) Kurdish acoustic vowel features (Zahidi etal,2012)

Kurdish vowels	F1(HZ)	F2(HZ)	Formant Description	Pitch	Duration
/i/	~ 300	~ 2300	High-central	180Hz	180-210ms
/æ/	~ 450	~ 2000	Mid-central	160-180 Hz	170-200ms
/ɑ/	~750	~1200	Low- back	140-160 Hz	210-240ms
/u/	~350	~800	High-back	130-150 Hz	190-220ms
/0/	~500	~ 1000	Mid back	160 Hz	180-210ms
/ə/	~150	~499	Mid- front	100-120 Hz	140-170ms
/ĭ/	~600	~4000	High-mid	210 Hz	200-220ms
/ŭ/	~700	~1600	High back	170 Hz	220-240ms

The fourth Kurdish vowel /u/ is mid, back and rounded vowel. This tense vowel in Kurdish is produced with an average (F0= 130-150Hz). This vowel is slightly higher than the vowel /i/, its formants is varying between (F1-F2:350-800Hz). The sound production lasts between(190-200ms)., Figure 1 shows the formants description, and pitch variations of some Kurdish vowels in in contrast to their counterparts in English. Figure (2) illustrates the Central Kurdish vowels' formants.

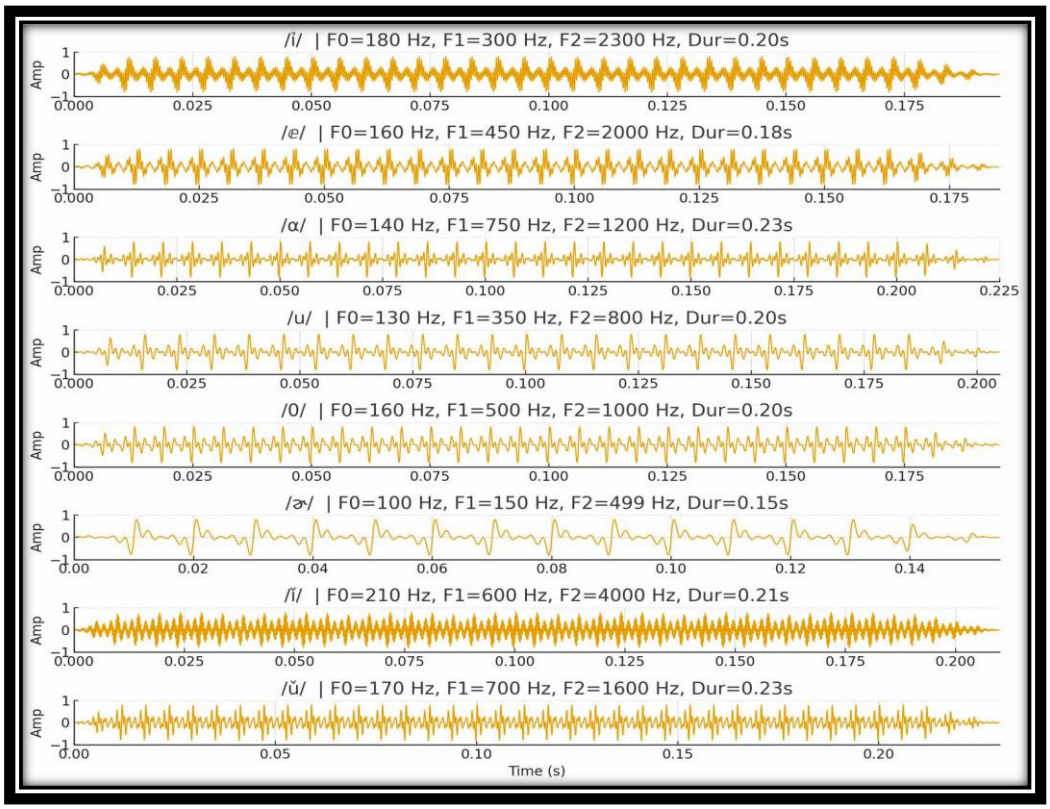


Figure (2) the formants description of some Kurdish vowels

Another Kurdish short vowel is /o/, the formant description of this vowel is mid-back and rounded. The formants, based on Zahidi (2012) score around (F1-F2:500- 1000) with a fundamental frequency (F0 =.160Hz). the sound average duration is between (180-210ms). The last short vowel in Kurdish is/ ə/ which is called 'bizroka' or reduced vowel, as it is mentioned previously. The average of formants and fundamental frequency of the vowel are:(F1-F2:150-499Hz), and (F0 =100-120Hz) which are slightly weak. The duration of this reduced vowel is shorter than the other vowels due to the fact that this vowel is unstressed one(140-170ms). Moreover, the acoustic features of the Kurdish long vowels, based on Zahidi al (2012, and Garib (2018) vary systematically depending on vowel quality, articulatory setting and speakers' dialect and variety. The first Kurdish long vowel / ĭ/ is a high-mid unrounded vowel. Its formants score (F1-F2:600-4000Hz), which is a high formant, the fundamental pitch of the sound is (F0 =210) the production pf the sound takes between (200-220ms). The second long vowel/ŭ/ in Kurdish have different acoustic and articulation features. In the Central Kurdish dialect this high-back sound is produced with a formant arranged between (F1-F2:700-1600Hz0 and the pitch quality is (F0 = 170Hz) and the duration of the vowel production is between (200-240). The same vowel, as in the word 'boçŭn', which means (perspective), has different sound features in southern and northern dialects. It is mid- back, nasalized vowel with a longer duration, its pronunciation is close to the French vowel /œ/ as in the word 'un' (one). The formants of this vowel are averaging between(F1-F2:600-1500Hz). The fundamental frequency is (F0=nasal pole around 250, Hz). The native speaker takes around (80-110ms) seconds to produce this vowel in the mentioned dialect. The following figures illustrate the formants features of Kurdish vowels. Figure (3) shows formants, pitches, and variations of Kurdish vowels in different Dialects.

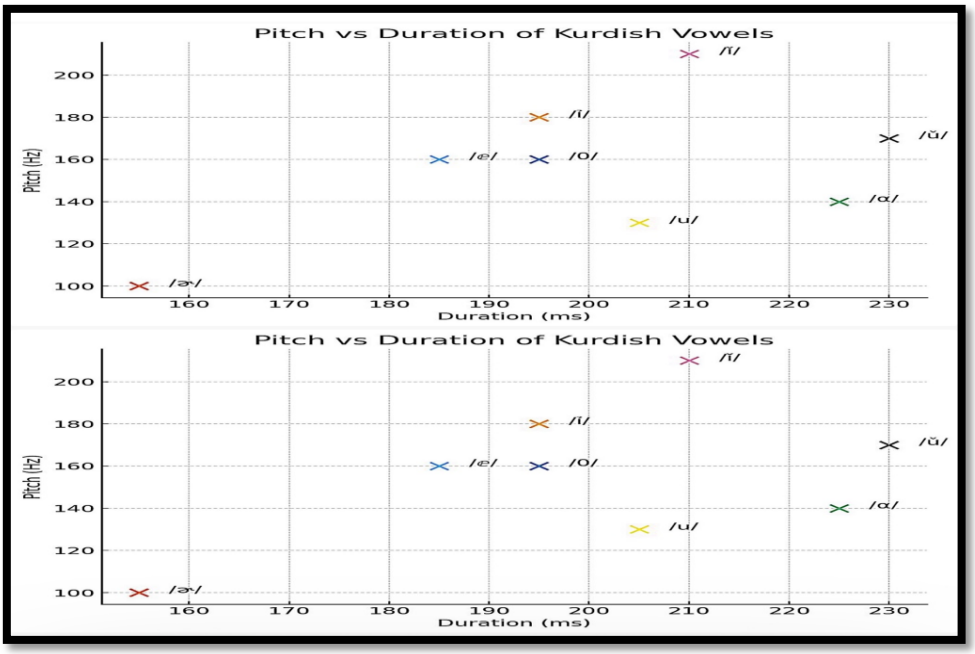


Figure (3) Formants, pitch and Durations of the Kurdish vowe

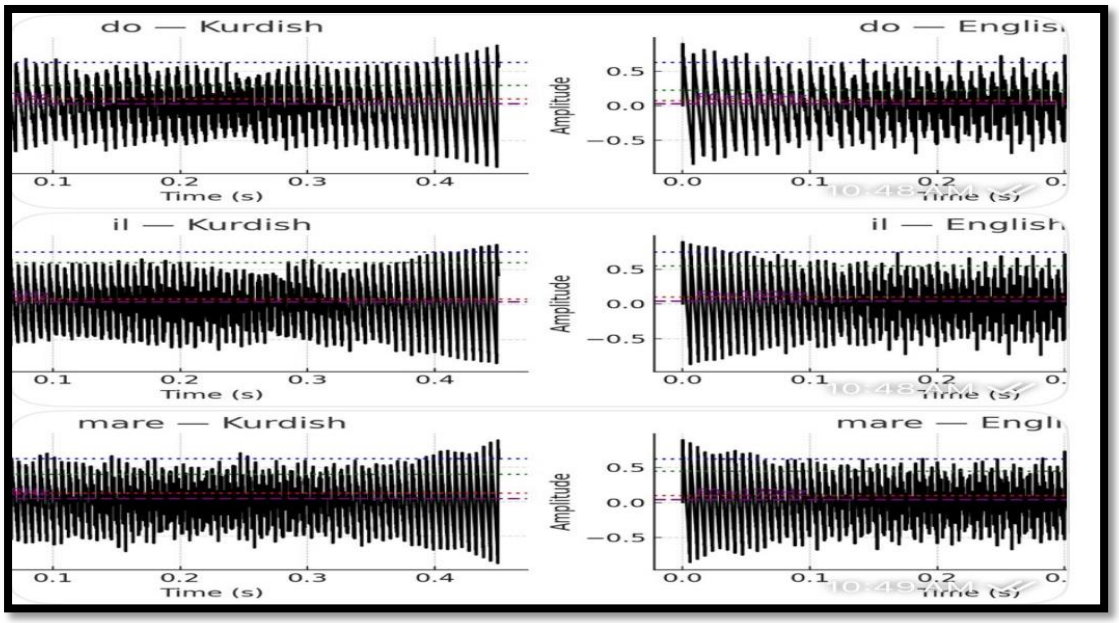
3. Methodology

The current section examines the research design employed in the study, the procedures, and the data collection tools. In addition, it sheds light on the participant selection process as well as the development of the written informed consent for the ethical purposes.

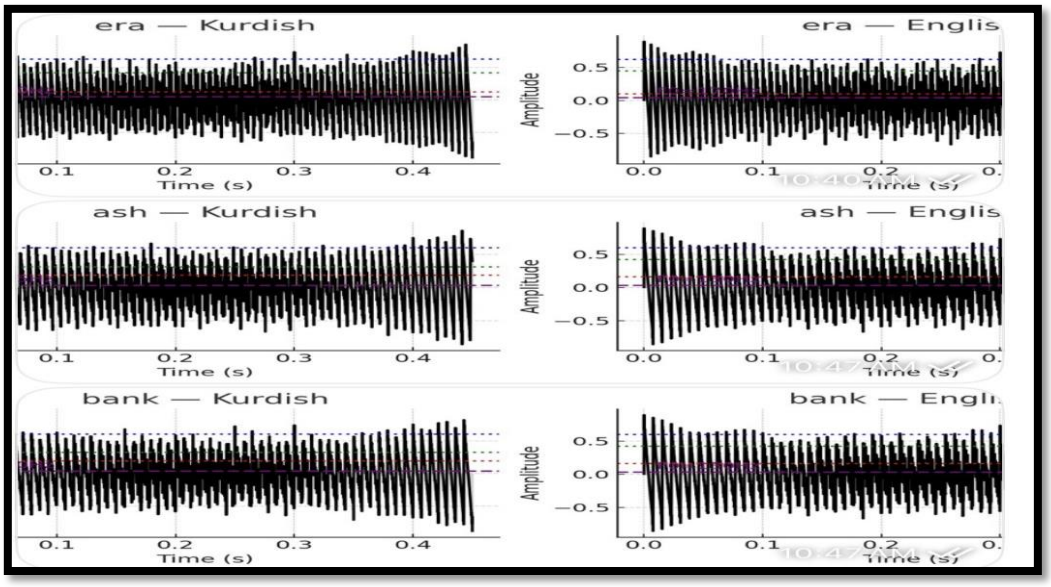
3.1 Research Design and Procedures

An exploratory approach was adopted in the current study, along with the use of a mixed-method for data analysis. To achieve the aims of the study, data were collected by recording Kurdish EFL students' tokens as they pronounced a series of Kurdish and English one-syllable words including the target vowel sounds in different positions: initial, medial, and final. An XYH-5 X/Y Mic Capsule Recorder was utilized to record participants' voices. The audio recorded data were analyzed via Audacity software to acquire their acoustic characteristics. A list of Kurdish and English words selected from three major Kurdish dialects, along with a number of commonly known English words familiar to the students, was used. The words have been selected due to the similarity in their pronunciation; for instance, the English words 'ash', 'bin', and 'poor' have corresponding words in Kurdish with the same pronunciation but different meanings, for example: ئاش 'mill', پوور 'aunt', and بن 'under'. The words were carefully selected based on the position of the vowel

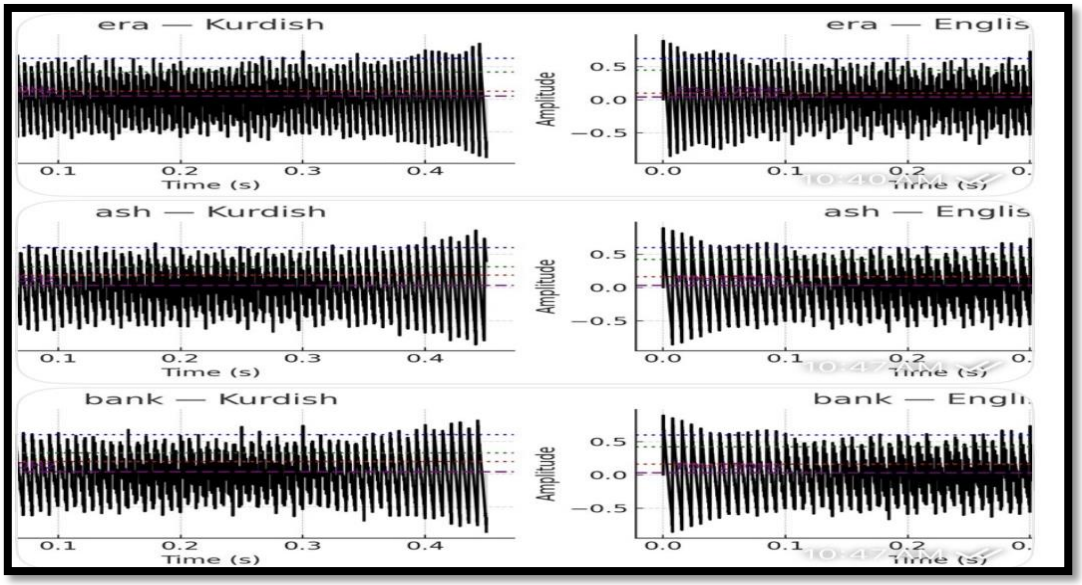
sound within the word (initial, medial, or final) in order to accurately trace phonetic variations. Through this list, the researchers aimed to investigate the influence of Kurdish vowel production on their counterparts in the English language. In other words, the goal was to examine the impact of socio-phonological factors, such as speakers' identity, regional variation, and native language interference on the pronunciation of vowel sounds across speakers of the three dialects. The results of the acoustic analysis of the Kurdish speakers were compared to the English vowels' acoustic features analyzed and presented by Philippe Martin (2021) in 'Speech Acoustic Analysis' and Dieter Maurer's acoustic features analysis of English vowels in his book titled "Acoustics of Vowel Indices," which was published in 2024, as a model to build the comparison on. Seen in the following figures (4A, B, C, and D).



Figure(4A) Southern and Northern Kurdish Vowel spectrographs in comparison to English vowels

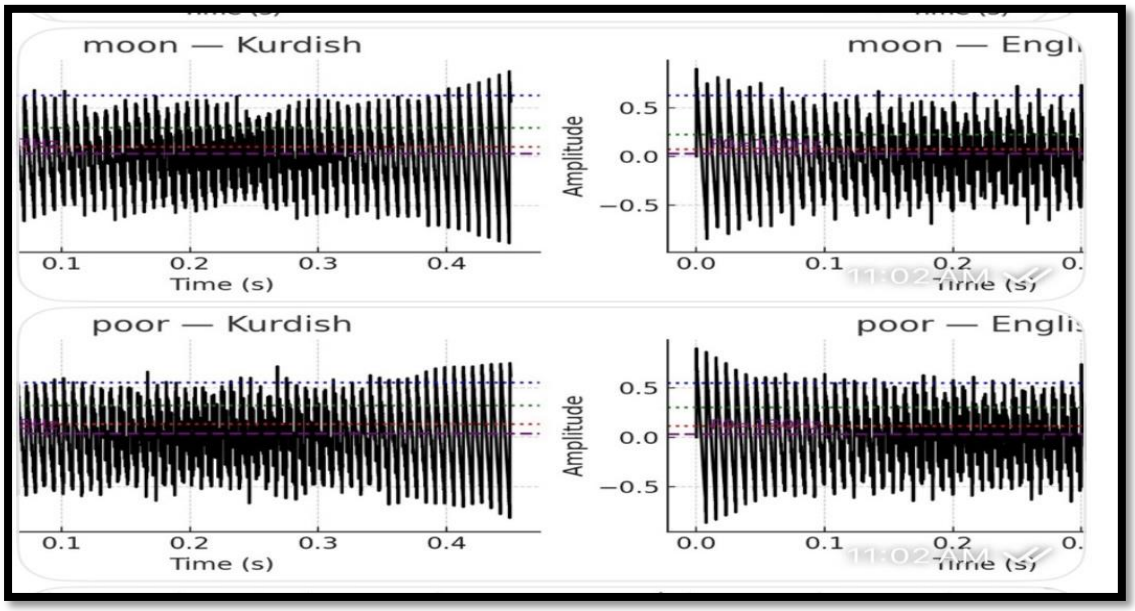


Figure(4B) Southern and Northern Kurdish Vowel spectrographs in comparison to English vowels



Figure(4C) Southern and Northern Kurdish Vowel spectrographs in comparison to English vowels

Additionally, to ensure clear audio recordings, the recordings were conducted in a noise-free room with a three-second pause between every two words. The participants were asked to repeat each word in the list twice to facilitate easier analysis of the recorded tokens using Audacity audio analysis software.



Figure(4D) Central Kurdish Vowels Spectrograph In comparison to English vowels

3.2 Participants

This study involved a total of 45 Kurdish EFL students, both male and female, aged between 19 and 21years old. The samples were selected using a convenience sampling method. The goal was to include students across the three Kurdish dialects, namely, Central, Northern, and Southern, with 15 participants from each group. All the participants studied in the English Department at the College of Basic Education, Salahaddin University-Erbil, and came from different stages throughout the 2024–2025 academic year.

The participants were selected conveniently based on the actual number of students met the dialectal criteria and were accessible to the researchers. Rather than selecting them randomly. Students who spoke the Central Kurdish dialect were from Erbil, Sulaymaniyah, and Kirkuk governorate. Those who spoke the Northern dialect came from Duhok, Barzan and Shirwan Mazin regions. Meanwhile, those who were Southern dialect speakers came from Kalar and Kifry, or had family roots in Khanaqin. The forty-five participants were composed of 21 males and 24 females; this distribution reflects the actual mix of students who were both available and willing to participate in the research.

3.3 Ethical Consideration

To ensure participants' privacy and obtain their approval, informed consent forms were prepared by the researchers and distributed to all

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participants in this study. The consent form fully informed the participants about the study's goals. They were assured that their identities would be kept confidential and their audio recordings would be used exclusively for research purposes. Additionally, the participants were informed that specific codes would be assigned to protect their anonymity throughout the data analysis and discussion phase.

4.0 Data Analysis

4.1 Results and Findings

The results of the acoustic analysis of English short vowels recorded from Kurdish speakers participating in the survey across different Kurdish dialects (Central, Southern and Northern) demonstrate that phonemic differences exist in formants, pitch and duration compared to native English speaker pronunciation. Comparative analysis between articulatory and acoustic features of short vowels in English reveals contrastive differences. The acoustic features of the short vowel/ɪ/ produced by Kurdish EFL students from the three dialects demonstrate nearly identical formants, pitch, and duration across different Kurdish dialects. Frequency variation (F0) measured approximately 164Hz, showing slight pitch and duration differences in Central, and Southern dialects (F1= 320, 327Hz; F2: 240,239 Hz) with nearly similar sound durations (225; 230ms). Conversely, EFL students in the Northern dialect produced this vowel with considerable formant differences in pitch and duration compared to other Kurdish dialects (F1=225; F2=232, duration=218ms). These findings indicate that EFL students in the Northern Kurdish dialect produce the short vowel /ɪ/ with reduced duration, and weaker pitch compared to students from other Kurdish dialects. Comparison of this vowel's phonemic features (articulator and acoustic) with actual native English speakers' pronunciation shows clear formants, pitch and duration differences, where native speakers produce this vowel with F0= 160. F1=390, F2=240HZ and significantly longer duration (240ms) than Kurdish students in the English phonetics and pronunciation classes. This positions Central and Southern Kurdish students' pronunciations of /ɪ/ closer to English than Northern Kurdish pronunciation.

The production and acoustic characteristics of the English vowel **/ɛ/** show remarkable similarity among Kurdish EFL students across the three Kurdish dialects. Acoustic features display similar pitch and frequencies with minor vowel length variations (F0 approximately 180Hz, F1±480Hz, F2=165Hz) and the sound durations (± 225ms) in

Central and Northern dialects. While Southern dialect EFL students demonstrate sound lengthening tendencies. Kurdish EFL students' pronunciation of this vowel exceeds the duration this vowel in English because they replaced by the duration of the Kurdish vowel /ɐ/. While this vowel has exhibits similar frequency feature when produced by English native speakers (F0= 188hz), its pitch quality measures lower (F1= 155, F2= 220). Additionally, English vowel /ɛ/ lasts less than its Kurdish counterpart phoneme (220ms).

The production of the short pure English vowel /æ/, by Kurdish EFL students, demonstrated pronunciation features dissimilarity compared to native speakers' pronunciations 'of the same phoneme, particularly among Kurdish EFL students in the Southern dialect. Articulatory features of the vowel /æ/ and acoustic features were distinct from its features when it is pronounced by English speakers. Northern Kurdish speakers articulated this vowel as a semi-round, open-mid back vowel /ɒ/. While speakers in the Central and Southern dialect often substitute the English vowel /æ / for the short Kurdish vowel / ɑ/. There was a positional shift from front the vowel to the central-back vowel. Resulting acoustic features measured F1 frequencies approximately at (760 Hz) in Central and Southern dialects, F2(240-245Hz), and duration lengths of 230ms. The acoustic data of this vowel in Northern dialect students' speech recordings measured (620Hz) for frequency, Pitch ranges F1- F2 showed (102-240Hz) variation. Duration measurement indicated a somewhat extended duration of 210ms when Kurdish speakers produced vowel/æ/ compared to English native speakers, which created acoustical and perceptual differences from the English phoneme, (see Table 2).

Articulatory and acoustic analysis of Kurdish speakers 'production of English vowel /ɒ/ across three Kurdish dialects shows nearly identical features. The vowels' articulation features among all Kurdish EFL students in the three dialects are positioned closer to the middle and central mouth cavity position than to the back with mid-open tongue height. Northern dialect speakers showed increased lip rounding compared to Central and Southern Kurdish speakers. Acoustic features, based on the recorded sound analysis of three Kurdish dialects compared with the RP English vowel model, revealed a notable similarity between the target vowel in both languages, with minor pitch formants variation, and blackness positioning. The vowel frequencies in the three Kurdish dialects measured (F0= ±165Hz) approaching the target English vowel (F0=160 Hz). Pitch qualities in Kurdish dialects measured (F1=760,768,755Hz, and F2=

around1000.1009, and 998Hz) respectively. Meanwhile, vowel formants recorded (F1=670, and F2=1000Hz). Vowel duration in both languages displayed approximately equivalent duration (±240ms).

Kurdish vowel /u/ pronunciation creates substantial interference with English vowel /ʊ/pronunciation, particularly among Southern dialect Kurdish speakers. Acoustic sound analyses showed that they pronounced this vowel with different frequencies, pitch and durations. Central and Northern dialects Kurdish EFL students pronounced this phoneme with similar frequency, pitch and required nearly identical production (F0= 120, F1= ± 525, and F2= ± 730Hz). Sound duration measured (± 220ms).While Southern Kurdish EFL students produced the target sound with different acoustic features (F0= 110, F2= 600, and F2= 650), requiring longer production time (260ms) in producing the sound English speakers' productions of this vowel demonstrate notable frequency, pitch and duration differences compared to the pronunciations of the Kurdish speakers, particularly the Kurdish students from southern dialects, (F0=12m, F1=735, F2= 800Hz). English speakers typically need (240ms) for producing this vowel.

The production of the English short vowel shwa/ə/ demonstrates considerable similarity to the Kurdish hidden vowel/ə/, commonly referred to as 'bizroka'. in the Kurdish phonological system. These two vowels exhibit shared articulatory and some acoustic features. The sound analysis results revealed that this vowel was pronounced with extended duration (120, 122, 118 ms) by Kurdish EFL students compared to English native speakers who need (110 ms) for producing this phoneme. Frequency analysis of recorded sounds from three Kurdish dialects demonstrated greater vibrations and higher pitch formants (F0= 100, 105 and 98Hz). Pitch variations, in Kurdish students' pronunciations F1 measured approximately (130Hz), and F2 measured (± 120Hz). Conversely, acoustic analysis of English vowel formants revealed (F0 = 80. F1= 120, F2= 87Hz). The data further demonstrate that the Northern Kurdish speakers' realizations of this vowel approximated native English pronunciation compared to EFL students from other Kurdish dialects backgrounds.

The only English short vowel that has no counterpart in Kurdish is the vowel /ʌ/. Consequently, Kurdish EFL student frequently encounter pronunciation difficulties in pronouncing this phoneme correctly in their early pronunciation classes. They typically substitute it with the Kurdish vowel /ɑ/. Articulatory acoustic analysis of Kurdish students across different dialects demonstrate that this sound is produced using the posterior area of their mouth cavity. Acoustic features analyses of

EFL students from various Kurdish dialects yielded the following results: the English vowel /ʌ/ was produced with weaker vibration and reduced pitch compared English native speakers' pronunciations. Frequency formants of participants producing the target vowel measured (F0 = 677, 690, and 645) respectively, with pitch qualities of (F1= ±135, and F2= ±250Hz). Duration measurement for this vowel was (232. 235, and 230ms) across the three dialects. In contrast, Acoustic analysis of the English vowel /ʌ/ shows stronger features, (F0= 680, F1= 140, and F2 =280Hz). Their productions to this vowel take nearly identical time duration compared to its Kurdish counterpart (230ms). From the gained results we conclude that Kurdish dialect variations influence English vowel pronunciation accuracy among EFL students. See Table (2).

Table (2) vowel formants, Pitch and duration by English and Kurdish speakers

IPA short vowels	Language	F0(Hz)	F1(Hz)	F2(Hz)	Duration(ms)
/ɪ/	Kurdish /central	164	320	240	225
	Kurdish/ southern	163	325	239	230
	Kurdish/ northern	164	227	232	218
	English	160	390	240	240
/ɛ/	Kurdish /central	180	480	165	225
	Kurdish/ southern	183	485	169	230
	Kurdish/ northern	181	482	165	224
	English	188	385	155	220
/æ/	Kurdish /central	760	133	245	230
	Kurdish/ southern	750	132	265	230
	Kurdish/ northern	620	102	240	220
	English	660	170	270	210
/ʌ/	Kurdish /central	677	132	245	232
	Kurdish/ southern	690	137	266	235

	Kurdish/ northern	645	130	242	230
	English	680	140	280	230
/ɔ/	Kurdish /central	160	760	1000	230
	Kurdish/ southern	169	780	1009	244
	Kurdish/ northern	163	754	997	223
	English	160	670	1000	240
/ʊ/	Kurdish /central	120	600	530	220
	Kurdish/ southern	110	650	550	222
	Kurdish/ northern	120	600	535	220
	English	120	500	800	240
/ə/	Kurdish /central	100	130	120	111
	Kurdish/ southern	105	133	122	113
	Kurdish/ northern	98	131	118	110
	English	80	120	110	87

The following tables(3A, B, C, and D) present measurements of the descrptive statiseics for English vowel features as pronounced by EFL Kurdish students from different dialect packgrounds. These measurements assess the extent of diffcults EFL students across the three dialects encounter when learning accurate pronunciation of English short vowels. The initial statestical measurement in (Table3 A) revealed remarkable inconsistency in cross-dialects frequency deviation among EFL students in the Southren Kurdish dialect,with a mean value (231.7) and a coefficient of variation (cv) that scored the lowest relative variability(79.5). The results also indicatat that participants from the Northern dialect showed the smallest overall acoustic distance from standard English vowel pronunciation .Additionally, the production of the English vowel /æ/ demonstrated the greatest deviation among all English vowels examined.

Table 3 statistical measurements of EFL Kurdish students' pronunction of English short vowels

Table 3(A)

	F0 Statistics					
Languages	Mean	Std Dev	CV %	Min	Max	Range
Central Kurdish	236.0	200.1	84.8	100	765	660
Southern Kurdish	231.6	184.2	79.5	106	690	585
Northern Kurdish	233.7	193.3	82.7	87	755	653
Languages	229.5	184.1	80.1	80	680	600

The second section (Table 3B) demonstrates the measuerment of the first pitch formants (F1) in correlation to the tongue height and lower jaw movement. The vowels/æ / in the pronunciation of the Northen dialect demonstrate dramatically reduced F1 values (102 Hz) compared to the accurate pitch variation of the same vowel when produced by English speakers. Conversely, the vowel/ɒ/ scored the highest F0 frequency (780 Hz) in the pronunciation of Nothern Kurdish EFL students compared to the pitch of the same vowel in English(670Hz).

Table (3B) Pitch formant(F1) statistics

F1 Statistics						
Languages	Mean	Std Dev	CV %	Min	Max	Range
Central Kurdish	433.1	246.5	56.9	125	975	840
Southern Kurdish	442.2	253.9	57.4	102	965	863
Northern Kurdish	425.7	248.2	58.3	130	955	825
English	415.4	221.3	53.3	120	955	835

Table 3C presents the statistical measurements of second formants of the vowels' pitches, as well as tongue positioning. The results reveal that the pronunciation of the short English vowel /ʊ/ exhibited the highest variation in F2 (550 Hz) compared to the second range when the same sound uttered by a native speaker (535HZ). The results show that the students from the Southern dialect group made a shift in the

tongue position from the front to the central -back position. Furthermore, the results indicate that a moderate cross linguistic difference in the production of sound /ʊ/ with a mean value (431.4) and a coefficient variation (cv= 73.9) between English and Kurdish speakers in the Southern dialect.

Table (3C) Table (3B) Pitch formant(F2) statistics

F2 Statistics						
Languages	Mean	Std Dev	CV %	Min	Max	Range
Central Kurdish	435.2	328.2	75.4	114	1003	888
Southern Kurdish	443.4	326.7	73.8	122	1010	886
Northern Kurdish	431.4	322.6	74.8	118	998	880
English	457.5	335.5	73.5	110	1012	902

Table 4 includes the temporal measurements, which indicate a stable consistency among the speakers of the three Kurdish dialects in their production of English short vowels (means= 220.9, 223,4,218.7) with a considerable exception of the vowel shwa. As noted previously, the vowel shwa is characteristically produced with a short duration by English speakers. Yet, EFL Kurdish students produce it with a longer duration (110-113ms) during its pronunciation which exceeded the native English sound duration (87ms). Based on these results, it can be concluded that: the students from the Northern dialect speakers exhibit the greatest acoustic distance suggesting a high potential interreference (mean value=218.7, cv= 14.3); Southern dialect speakers demonstrate an intermediate acoustic distance from the real English pronunciations indicating a moderate transfer (mean=223.3, cv= 14.9); And Central Kurdish speakers encounter minimal acoustic distance from the target English pronunciation.

Table 4 Duration statistics and temporal measurement

Duration						
Languages	Mean	Std Dev	CV %	Min	Max	Range
Central Kurdish	220.5	31.5	14.3	110	245	134

Southern Kurdish	223.6	33.4	14.9	113	255	142
Northern Kurdish	218.7	31.2	14.3	111	240	130
English	227.4	47.0	20.7	87	318	230

The answer to the second research question which states "Which acoustic characteristic of Kurdish vowels leads to English vowel mispronunciation among Kurdish EFL learners?' can be deduced from the results of mean values and coefficient variation measurements across the dialects of the Kurdish language and English language as the in table (5):

- Kurdish Central: Mean=433.1 Hz, SD=246.5, CV=56.9%
- Kurdish Southern: Mean=442.2 Hz, SD=253.9, CV=57.4%
- Kurdish Northern: Mean=425.7 Hz, SD=248.2, CV=58.3%
- English: Mean=415.4 Hz, SD=221.3, CV=53.3%
- The statistical analyses demonstrate that pitch variations, particularly the F1 formants most problematic issue due to the fact that the systematic tongue position errors which completely change English vowels' identities, and cause lexical confusions in words like;
- 'pat' and 'pot',
- 'spot', and 'spout',
- 'mood' and mode
- 'bud' and'bad'.,etc.

Table (5)Acoustic vowel parameters cross Kurdish dialects and English vowel syste

	F0(Hz)			F1(Hz)			F2(Hz)			Duration(ms)		
Languages	Mean	Std Dev	CV%	Mean	Std Dev	CV%	Mean	Std Dev	CV%	Mean	Std Dev	CV%
Central Kurdish	236.0	200.1	84.8	433.1	246.5	56.9	435.2	328.2	75.4	220.5	31.5	14.3
Southern Kurdis	231.6	184.2	79.5	442.2	253.9	57.4	443.4	326.7	73.8	223.6	33.4	14.9

h												
Northern Kurdish	233.7	193.3	82.7	425.7	248.2	58.3	431.4	322.6	74.8	218.7	31.2	14.3
English	229.5	184.1	80.1	415.4	221.3	53.3	457.5	335.5	73.5	227.4	47.0	20.7

To answer the third research question which states "Which Kurdish vowel pronunciation most interferes with accurate English vowel production?' acoustic distance measurements have been calculated to reveal the impact of participants' native language vowels on the pronunciation of English vowels. Table 6A and 6B demonstrated that the vowels that are mostly affected by participants' native language pronunciation of English vowels are the English vowel / ʊ,æ,ɛ, ɪ, ɒ, and the vowel *shwa* ə/ due to the change in the frequency, pitch and sound durations with different ratings. The tables reveal that the vowel /ʊ/ showed the greatest distance between the English language and the Kurdish language, particularly within the Southern Kurdish dialect (283.9). The vowel/ æ/ showed acoustic distance, particularly within the Northern Kurdish and Southern Kurdish dialects speakers (69.4 and 104.1). Another vowel that showed acoustic distance is the English vowel/ɒ/within the southern Kurdish speakers (110.8), the vowel /ɪ/ in the Northern dialect speakers' pronunciation. Finally the vowel /ɛ/ in the pronunciation of the Southern Kurdish speakers with a distance (101.5).

Figure (6A) Acoustic distance from English vowels

Vowels	Central Kurdish	Southern Kurdish	Northern Kurdish	Smallest distance
/ɪ/	72.9	71.7	164.5	**Southern (71.7)**
/ɛ/	96.0	101.5	97.5	**Central (96.0)**
/æ/	113.3	104.1	69.4	**Northern (96.4**
/ʌ/	36.0	52.6	18.2	**Northern (18.2)**
/ɒ/	90.5	110.8	85.8	**Northern (85.8)**

/ʊ/	288.6	292	283.9	**Southern (28.3)**
/ə/	34.3	40.2	32.2	**Northern (32.2)**

In addition to acoustic distance differences, the cross-language variance measurement reveals that the English vowel /ʊ/ showed the highest variance (113.5) among the English short vowels when pronounced by Southern Kurdish EFL students. See Table 6B and Figure (5).

The answer to the last research question, which states "Which sociophonetic factor has the biggest impact on Kurdish EFL students' English vowel pronunciation accuracy?' can be deduced from the acoustic results that identified the source of Kurdish EFL problems in mispronouncing English vowels. The results in Tables 3, 4, 5, and 6 identified that the source of the mispronunciation refers to pitch variation, particularly F1 formants, which demonstrate a deviation from the pitch formant F1 of the English language with an acoustic distance of 283.9 (see Table 5A) compared to frequency and sound duration, which have moderate effects on acoustic distances across the dialects of Kurdish language and English language. Furthermore, the pronunciation of the Kurdish participants in the Southern dialect group exhibits the highest cross-language variance at 18.2 (see Table 5B). As is clear, the pitch variation F1 relates to tongue positioning and tongue height. These two factors are closely articulated according to mother tongue and regional influence, as well as cultural background. From this logic, we understand that the difference in Kurdish EFL students' mispronunciation of English vowels is due to the three factors mentioned previously.

Table (6B) Cross- language variance by vowels

Vowels	F0 Variance	F1 Variance	F2 Variance	Duration Variance	Highest variance
/ɪ/	1.10	58.1	0.8	11.0	F1(58.1)
/ɛ/	3.9	42.2	5.5	3.8	F1(42.2)
/æ/	47.6	24.4	12.8	8.2	F0(47.6
/ʌ/	16.9	4.0	15.5	2.0	F0(16.9)
/ɒ/	3.9	42.4	4.5	8.3	F1 (42.1)
/ʊ/	4.4	54.5	113.5	8.4	F2 (113.5
/ə/	9.1	5.0	4.6	10.6	Duration (10.6)

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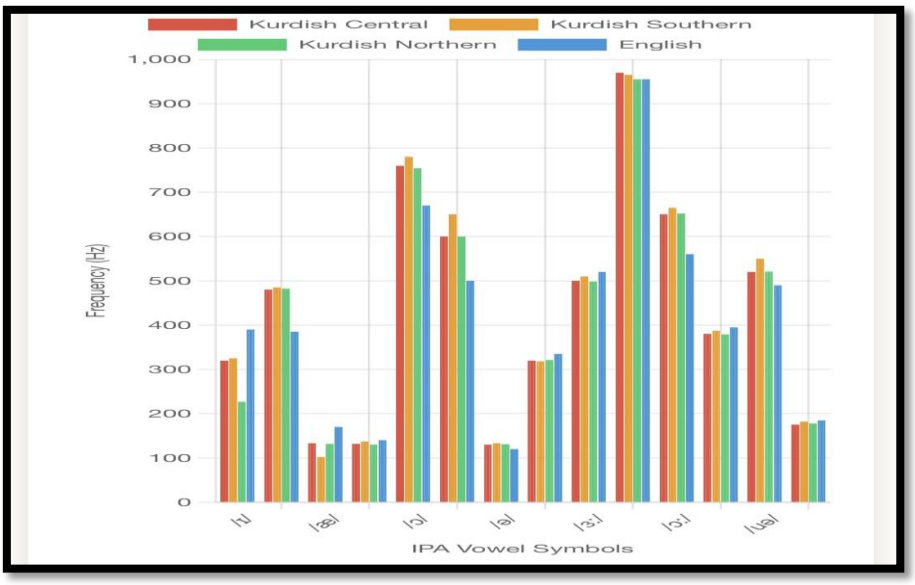
Figure (5) Cross- language variance by vowels



4.2 Discussion

This socio-phonetic study investigates the effects of dialectal variations among Kurdish EFL students on their production of English short vowels. The results were obtained via observing participants' sound articulation and acoustic analyses of their sound productions using Audacity sound analysis software. The findings clearly revealed that language variation in participants' mother tongue and regional influences significantly affect their production of English short vowels. In other words, the impact of sociophonetic factors was evident in their English pronunciation patterns.

From the data analysis it is concluded that the Participants across the three Kurdish dialects confronted difficulties in recognizing and producing certain vowels correctly, particularly the vowels /ʊ, æ, ɪ, ɒ, and ə/, although the difficulties varied from severe to moderate. These difficulties are rooted in positioning the tongue incorrectly and achieving inappropriate tongue height. The vowel /ʊ/ proved most problematic compared to other vowels, followed by /æ/ and then /ɪ/ and /ɒ/. This pattern can be attributed to the fact that Kurdish speakers generally utilize the central part of their tongue more than the front and back regions.

Furthermore, for vowels such as /ɒ/, /ɪ/, and /ɛ/, although these sounds were phonetically similar to the Kurdish vowels /o/, /ì/, and /æ/, Kurdish students prolonged these vowels beyond native English speaker norms. This arises from difficulties caused by students' mother tongue interference, as their production of English vowels

within words is automatically substituted by Kurdish counterparts within the English phonological system.

The findings also demonstrated that Kurdish EFL students speaking the Northern dialect exhibited the greatest acoustic distance compared to other dialects. In other words, their vowel productions deviated most significantly from standard English vowel pronunciation, with their accent being more heavily influenced and constrained by regional variations. English vowel pronunciation among Central Kurdish speakers was more consistent and acoustically closer to native English speakers' productions, while English vowel recognition and production by Southern Kurdish students fell between the other two groups.

The results further revealed that variations among the aforementioned Kurdish dialects are systematic and can be traced to the phonological inventory of each dialect speaker's native accent. Finally, while all sociophonetic factors demonstrated effects on Kurdish EFL students' English vowel pronunciation, regional variation and native dialect background showed the most substantial influence on English vowel production accuracy.

5. Conclusions

The present study investigated the effects of Kurdish dialect variation on English short vowel production and the role such variation plays in shaping target vowel learning among Kurdish EFL learners. Results from acoustic analyses of Kurdish students' speech productions revealed that:

1.native language background and regional variables constitute the most influential sociophonetic factors contributing to participants' barriers in English vowel production, and significantly affecting their pronunciation accuracy.

2. pronunciation errors observed in Kurdish EFL students were attributable not to the inherent complexity of the English vowel system, but rather to structural divergences between learners' dialectal backgrounds and the target language.

3.The acoustic and articulatory analyses demonstrated that while all three Kurdish dialects influenced English vowel pronunciation among Kurdish EFL students, the Northern dialect exerted the most substantial impact.

4. participants' native language pronunciation patterns exhibited pronounced influence on the production of most English vowels, particularly /ɪ, ɛ, æ, ɒ, ə, and ʊ/. Notably, the English short vowel /ʊ/ demonstrated the greatest degree of mother tongue interference,

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especially among Kurdish EFL students who speak the Southern dialect.

5.Northern Kurdish dialect lacks adequate phonetic space for /ɪ/, resulting in massive acoustic distance, whereas, Southern Kurdish speakers demonstrate longest vowel durations and lowest tongue position.

6.The data conclusively identify vertical tongue positioning as the primary cause of mispronunciation, not timing or fundamental frequency. F1 variance consistently exceeds other acoustic parameters across all vowels examined.

7.The findings of the current study emphasize the importance of increasing a practical pronunciation session and developing suitable curriculum, particularly based on the pedagogical needs of Northern, Central, and Southern Kurdish students when teaching the English pronunciation to delaminate their problems in recognizing and producing these phonemes.

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