Gender element in explicit pronunciation classroom: An acoustic study of English vowels /æ/ and /ə/

The Case of Second Year LMD Students of English at L’Arbi Ben Mhidi University

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Dedications

In the Name of Allah, the Most Gracious, Most Merciful, All the Praise is due to Him alone, the Sustainer of the entire World.

I dedicate this work to:

My parents: without you I could not reach that point, I could not reach that happiness; I could not reach that graduate. You were always my pillars for my entire career. THANK YOU

My sister: Assia, you were always my guide

My brothers: Salah and Shouaib, you were always support me financially and morally

My husband: Rodwan, no word can describe your patience and love

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All my friends in Libya: Mona, Imen and Ahlam, Asma, Hania, Hanan

My uncle: Chadli and his wife Sorya

My aunts: Noussa and Samia

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Abstract

This research attempts to provide an experimental evidence of whether Explicit Phonetic Instruction affects EFL Algerian learner’s accurate level of pronunciation and whether there is acoustic difference between both genders /æ/ and /ə/ Formant frequencies. Of particular concern, this research attempts to answer the following question: Does Explicit Phonetic Instruction, in the primary area of segmental features, affect EFL Algerian learner’s accuracy pronunciation? Is there any acoustic difference between male and female /æ/ and /ə/ Formant frequencies? Participants were twenty Algerian University learners of English at Larbi Ben M’hidi University. They are divided into two groups: experimental group consists of ten subjects divided equally into five females and five males and control group consists of ten participants divided into five females and five males as well. In the process of conducting this research, isolated words used as pre-post recording tests for both groups while Explicit Phonetic Instruction with further practice was the main core of the treatment session. Praat program used to measure acoustically the recordings. However, acoustic chart and statistical analysis used to examine the significance of the treatment on the predictor variable (gender). For the first question, the results indicated that there is a significant difference in the accurate pronunciation of both genders after Explicit Teaching. For the second question, the acoustical analysis showed that EFL Algerian female /æ/ and /ə/ Formant frequencies were higher than male Formant frequencies.

Key words: gender, Explicit phonetic instruction, vowels, acoustic analysis
List of abbreviations

EFL: English as a Foreign Language

TEFL: Teaching English as Foreign Language

FL: Foreign Language

[?] : Glottal stop

SEG: Segmental

SUPSEG: Suprasegmental

ESL: English as a Second Language

ET: Explicit Teaching

EPI: Explicit Phonetic Instruction

1L: First Language

2L: Second Language

TL: Target Language

F1: First Formant

F2: Second Formant

HZ: Hertz

RP: Received Pronunciation

IPA: International Phonetic Alphabet

CVC: Consonant Vowel Consonant

H0: Null hypothesis

H1: Alternative hypothesis

M: Mean

SD: Standard Deviation

P: P value
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Résumé

ملخص
General introduction
Introduction

1. Statement of the problem

Teaching pronunciation involves variety of challenges. To begin with, teachers are faced with crowded curriculum. Therefore, they are obliged to gain crowded pedagogy, which make them disregard the aspect of English instruction. When they do find time to teach pronunciation, they confuse to choose the appropriate instructions that suite teaching phonological aspects. Moreover, the way a language is taught has an influence on learning any language. In the Algerian context, where English is taught as a foreign language, pronunciation adeptness has little space in the syllabus design.

Most of EFL Algerian classes focus on other teaching aspects such as grammar, vocabulary, and morphology that focus on sentence structure. However, learning to gain correct pronunciation is not taken into consideration in these syllabuses and many of Algerian EFL teachers think that accurate pronunciation can be reached implicitly through those aspects. According to Hariri (2012), "pronunciation teaching is a prominent factor in foreign language teaching. Since sounds play an important role in communication. Foreign language teachers must attribute proper importance to teaching pronunciation in their classrooms" (p. 4861). In other words, giving more attention to the way words are articulated is the main role that should be taken into consideration while teaching.

Furthermore, no focus is given to gender, which is considered as an effective variable that may give different results in a given instruction. As an advanced EFL learner, I noticed that producing correct English vowels are one of the most challenging tasks for EFL Algerian learners at Larbi Ben Mhidi University. Such learners have
difficulties in achieving the accurate pronunciation of the English vowels like /æ/ and /ə/.

The point of departure of this work arrives in the previous works of Laib (2013) and Mokri (2013). The former tackles the issue of ‘gender and language learning strategies in foreign language learning’ while the latter tackles the issue of ‘the effects of connected speech training on the enhancement of listening comprehension’. Some missing points were displayed in the two studies. For Laib, the acoustic analysis of both genders’ voices were absent, while for Mokri the issues of segmental features, that should be taught explicitly, were not investigated. For that reason, this work is going to combine the previous two studies.

2. Aim of the study

The overall aim of this research is to investigate the effectiveness of explicit phonetic instruction (segmental features) on both genders’ accurate pronunciation of the English vowels /æ/ and /ə/. Moreover, this research aims to investigate acoustically the difference between EFL Algerian females’ Formant frequencies with males’ Formant frequencies.

3. Research questions and hypotheses

Central to this research is the need to answer the following questions:

1. Does explicit phonetic instruction affect EFL Algerian learner’s /æ/ and /ə/ accurate pronunciation?

2. Is there any acoustic different between EFL Algerian male Formant frequencies and female formant frequencies?

The hypotheses

After viewing this issue, we can hypothesize that:
If both genders participate effectively in the Explicit Phonetic Instruction, they will achieve an accurate level of pronunciation concerning /æ/ and /ə/ vowels. Moreover, the acoustic analysis of the English vowels Formant frequencies will be higher for female than males.

4. Population and sampling

In this research, my focus will be on first year LMD students in the department of English at L’Arbi Ben Mhidi University. A sample consists of two groups, an experimental group which is composed of 24 students, divided equally into male and female, aged between 19-22, while the control group is composed of 20 students also divided equally to male and female, aged between 19-22 as well. This sample will be selected according to gender elements, to receive an equal instruction.

5. Methodology

For collecting the required data, we are going to follow an experimental method to reach the objectives of the current study. The study will be focus on two groups that represent first year university EFL LMD students. The first group will be the experimental group of the Study. However, the second group will be the control group.

At the beginning, both groups will receive pre-recording test to analyze their voice acoustically in order to evaluate their accurate level of pronunciation. Furthermore, the experimental group will receive Explicit Instruction that focuses on segmental features via different activities, viz. vowel discrimination activities, role plays, and chain drills. However, the control group will receive no pronunciation instruction method. By the end, both groups will be tested by a post-recording test. These recordings will transfer to a computer to be analyzed by a Praat software program.
to make a comparison between both genders vowel articulation and vowel Formant frequencies.

6. Structure of the study

In this research, two chapters mainly will be tackled. The first chapter related to the theoretical part reviewing the literature of: gender outside the classroom, Explicit Instruction (teaching pronunciation), and the acoustic studies of English vowel sounds. The second chapter related to the practical part, which includes: explanation of the methods, data analysis, results and discussion, and conclusions of the research.
Chapter 1

Acoustic differences between both genders in the Explicit Instruction
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Section 1: gender outside the classroom

Introduction

In a broad term, Speakers variations are related to (1) linguistic factors such as dialects, and sociolectal differences (cultural aspects), and (2) non-linguistic factors such as ‘physical anatomy, age, gender, and emotional state of speaker’ (Ladefoged & Broadbent, 1957; Traumnular, 1988; as cited in Yang, 1996, p. 245). In particular, Sociolinguistic variation correlates to the way language varies among speakers in terms of ‘social factors’ like gender, ethnicity, age, and ‘linguistic structures’ such as sounds, grammatical forms, intonation features, words (Britain, 2002). In other words, it studies the relation between gender and sound symbolism.

Discussions on male and female speech/ language, whether considered as biological or cultural or both, related to the concept of gender and sex which is the ultimate goal of social and psychological sciences (Romaine, 1999). Different researchers give different definitions to gender and sex but they all share the same view.

This section focuses on defining the relationship between sound symbolism and gender. Furthermore, the main differences between gender and sex will be tackled. Finally, since the aim of the current study focuses on the anatomical (biological) characteristics that affect both genders speech (see section three), mentioning cross cultural language differences in relation to gender is very important in any advanced research

1. Gender and Sound Symbolism

According to Romaine (1999), Sound symbolism refers to the relationship between linguistic items of sound (at the phonemic level, feature level or acoustic traits), and extra-linguistic factors (gender or size). Romaine (ibid.) studies the relationship
between gender and some items of vowels and consonants. She found that manner and place of articulations have an impact on ‘the acoustic perception of the sound’. She also adds that vowels and back consonants ascribed to masculinity while labial consonants related to femininity (ibid.) For example, one of the relationships in sound symbolism is the association of high, front vowels and female gender (small size). This relation shows less frequency in the second formant in that type of vowels. Furthermore, the association of low and back-rounded vowels and large size or male gender based on the reduction of the second Formant frequency which is due to lip rounding and lowering the tongue (ibid.). Therefore, it is very important to consider gender in relation to acoustic studies

2. Differences between gender and sex

In the decades of 1970s, researchers do not make any distinction between the influence of biological and cultural issues on the speaker. However, at the same time they were unconvinced by linking "biological sex and social behaviors", because they think that all people born males or females, but their way of speaking determined by social and cultural influences (Coates, 2007).

Sex and gender are interrelated factors, which were used interchangeably through years, but linguists untangle them to be more understandable because most people have difficulties to distinguish between those factors. Eckert and Sally (2003) define sex as "biological categories based primarily on reproductive potential", and gender as "social elaboration of biological sex" (p, 10). Sex is congenital while gender is constructed by facts, beliefs, cultures, and attitudes. Esplen and Susie (2006) define gender as "fluid and based in culture" and sex as "fixed and based in nature" (p. 2). We can deduce that gender is the adaptation of social traits and behaviors while sex is the anatomical structure of the body. Therefore, it is very useful to distinguish both definitions to avoid misconceptions.
3. Cross culture language differences and gender

Looking at the linguistic behaviors of men and women across languages and cultures, lead us look at different outcomes. Even though they belong to the same speech community, they may use different linguistic items (Nemati & Bayer, 2007). Females’ speech tend to be evaluated as more ‘correct’ or more ‘prestigious’. Men are more likely than women to use ‘socially-stigmatized’ forms (like "ain't" or g-dropping in English) (ibid.). For example, in the Amazon Indians’ community, a child’s mother uses language differs from the language used by the child’s father as well as each tribe is distinguished by a different language (Nemati & Bayer, 2007). They also state that the sex of the speaker, in some Native American languages (see Table 1.1), affect the use of grammatical forms of verbs. Examples from the Muskogean language are given below:

Table 1.1

<table>
<thead>
<tr>
<th>Women's form</th>
<th>Men's form</th>
<th>English gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>lakaw</td>
<td>lakaws</td>
<td>he is lifting it</td>
</tr>
<tr>
<td>lakawwitak</td>
<td>lakawwitaks</td>
<td>let me lift it</td>
</tr>
<tr>
<td>mol</td>
<td>mols</td>
<td>he is peeling it</td>
</tr>
<tr>
<td>i:p</td>
<td>i:ps</td>
<td>he is eating it</td>
</tr>
<tr>
<td>tacilw</td>
<td>tacilws</td>
<td>you are singing</td>
</tr>
</tbody>
</table>


Furthermore, concerning the use of linguistic variables such as ing /ŋ / and the /ð/, or the negative duplication (I did not never go to the cinema), women use more standard forms than men do because women have ‘sensitivity’ to standard and non-standard speech
(Meyerhoff, 2006). For instance, in most western societies, men and women are differentiated by what are men ‘do’ and how are women ‘appear’ (Trudgill, 1972; as cited in *ibid*.). This is why women take more attention and raise their awareness while speaking. Additionally, in the New York City, Meyerhoff mentions Labov’s work that confirms the use of innovative (r), in the final position, by woman than men because using the /l/ full is considered as standard talk while /l/ less as non-standard.

Moving to British society (particular in New castle), speakers awareness of variants were noticed by many teenagers in the use of some phonological items. For example, girls use more glottal stops [?] instead of oral stops (in which they consider oral stops as alveolar stops): /beʔə/ instead of /beta/ (Meyerhoff, 2006). This replacement of oral stops by [?] does not have direct reason, attitude toward the use of that form of speech, because those teenagers are aware about the use of [?] in non-standard forms (*ibid*.). However, researchers in United Kingdom, like Paul Kerswill and Ann Williams, consider it as ‘change in progress’ in the British English by the overt awareness of British teenagers (*ibid*.).

Shifting attention to Arab societies by sociolinguistics has been noticed in 1980s. Classical Arabic (standard Arabic) has overt prestige unlike the local one. In the sense that, men Arab speakers use more ‘overtly prestigious variants’ related to classical Arabic in contrast to women who use these variants in colloquial Arabic (*ibid.*). A study done by Bakir (1986) in Iraq showed that arab women use more local variants unlike men who use classical arabic variants. Therefore, Arab societies contrast with westerns where women use more standard variants.

Trudgill (as cited in Liberman, 2011) describes three main reasons behind gender’s cultural differences in language. First, all linguistic varieties arise between both genders.
language related closely to social attitudes. Second, different behaviours are expected from both genders because men and women differ socially. Finally, the larger differences between gender’s social roles in particular community the larger differences tend to be (ibid.) Therefore, it is very important to look closely to the circumstances in which both gender’s speech occur to investigate how verbally they use the language.

We can deduce that, in a given social community, any speaker uses specific variants, not because he is male but because he is ‘constituting’ himself as a part of maleness and works as a token to ‘musculinity’ (Meyerhoff, 2006). the same thing happened to females, using certain variants make them belong to femininity. For instance, women who use variants which are used more by men, become more interest to us to see what makes them atypical.

**Conclusion**

In this section, I highlighte briefly what Sound Symbolism means in relation to gender. then I tackled the main differences between gender and sex. Finally, I examine cross culture language differences and gender. All these differences are seen from the outside angle of the classroom while investigating both genders inside the classroom setting (by using a given instruction), give us another perspectives about the type of analysis to be conduct as well as the target concept that will be measured (wether culturally or biologically). In the current research I will focus on the biological characteristics that may affect both genders’ speech.
Section 2: Gender and the effectiveness of Explicit Pronunciation teaching

Introduction

The restriction of time always affects negatively the process of teaching pronunciation in TEFL courses. For that, most of the teachers feel unsure of how to provide learners with adequate instruction in the classroom (Moore, 2001). It is very important for the teachers to clarify the role of pronunciation and how it should be pronounced (focus on practice) to raise their awareness about its importance. For that reason, Singer (2006) posits that the more learners understand the characteristics that affect their learning pronunciation the more they can reach the level of accuracy. Therefore, the reason why I have decided to focus only on the effectiveness of Explicit Teaching (ET), on both gender’s accurate pronunciation, not the implicit one derives from its name that ET explains clearly and directly the main features of pronunciation (segmental and suprasegmental aspects) via adequate methods and techniques which make achieving that level of accuracy more easier.

The literature presented in this section shows: information about teaching pronunciation, viz., Former studies in teaching pronunciation; it’s importance; improving learner’s phonetic awareness; and the role of pronunciation instruction. Next, highlighting the difference between Explicit vs. Implicit teaching with more focus on the explicit one will be explored. Then, searching for some constrains that may hinder pronunciation namely: psychology, difficulties, and problems. Finally, this chapter will examine gender as an element to accurate pronunciation.
1. **Teaching pronunciation**

Teaching pronunciation has big attribute on the learners ‘intelligibility’ (the degree to which sounds and words can be understood by others) as well as on the ‘comprehensibility’ (the ability to understand the speech by the listener) of the speaker (Foote, Amy K, & Tracey M, 2011; Fraser, 2001; Singer, 2006). Yet, little is known about pronunciation teaching especially in countries where English is a Foreign Language (FL), and all the learners share the same mother tongue with fewer opportunities to speak the target language or have an interact with native speakers (Buss, 2013). Therefore, it is very important to consider teaching pronunciation as fundamental method in teaching FL to both genders.

1.1 **Former studies in pronunciation**

Pronunciation is a significant aspect in communication. Yates (2002) defines it as producing sounds, which are used to convey meanings. However, When it comes to classroom setting, it correlates to segmental (SEG) (individual sound, sound segments) and suprasegmental (SUPSEG) phonological features (stress, rhythm, intonation) (Echelberger, 2013; Gordon, Darcy & Ewert, 2013; Singer, 2006; Sárosdy, Tamás Farczádi, Zoltán, & Marianna, 2006) that may be used differently across genders.

In the past, the role of pronunciation varied by different approaches from being with no priority in the Grammar-translation method to being the main factor/aspect in the Audiolingual method (Jones, 2006). By the mid of 1980s, growing attention was given to the pronunciation component, SEG and SUPSEG, in the ESL curriculum (Morley, 1991; as cited in Moore, 2001).
With the advent of communicative language teaching, fluency became the focus more than accuracy. Later on accurate pronunciation developed as a result to investigate how sounds are articulated or pronounced and become the prime aspect in teaching FL.

1.2 Why is pronunciation important?

Sending messages to other people via uttering sounds is the mechanism of speaking. Those messages should be pronounced correctly to achieve a high level of accuracy. The importance of pronunciation flit in the last decades, but it emerged again in 1980s with the emergence of communicative approach (Celce-Murcia et al., 2010; as cited in Echellberger, 2013). Furthermore, Yates (2002) states that in English as Foreign Language (EFL) classrooms, learners with good pronunciation in (whether males or females) are more understood by others even they fall in doing errors, whereas learners whose pronunciation is bad will not be understood by others even their grammar is accurate. In other words, all people are judged by their way of speaking. Learners with poor pronunciation considered as ‘uneducated’ or ‘incompetent’ (ibid.). This fact affects both genders negatively and makes them avoid participation in the classroom.

Hewings (2004) in his book pronunciation practice activities shares the same view about the importance of pronunciation. He posits that it can be ‘demotivating’ if the learners face an experience where they cannot make their conversation goes on because of problems with English pronunciation, which is considered as a fact especially with those who have good knowledge and grammar (ibid.). For that reason, most learners want their pronunciation become better and they work hard to do so. Morley and Fraser (as cited in Yates, 2002) observe that many learners consider accurate pronunciation the most difficult aspect in learning a foreign language. However, achieving that level of accuracy does not mean to have a native-like accent, but it is a ‘subcategory of intelligibility’ (Jahandar, Morteza, Gohar, & Reza Mousavi Dolat, 2012). Therefore, they
need ET to overcome all these obstacles (Alves & Magro, 2011; Beltchenko, 2009, 2010; Couper, 2003; Echelberger, 2013; Fraser, 1999; Gordon et al., 2013; Moore, 2001; Saito, 2011; Thomson, 2013) that may hinder their progress in learning FL.

1.3 Raising student phonetic awareness

For many students, studying English language for full-time courses, i.e., EFL and ESL learners, pronunciation is the only vehicle to achieve the level of native-like accent. According to Jahandar et al., (2012), “it’s very strange that this very important language skill is usually set aside as secondary important and when it comes to pronunciation we often have at best only basic oral skills and slight knowledge of phonetics” (p. 1). Most of the learners are always facing many problems concerning the acquisition of accurate pronunciation. Leather (as cited in Couper, 2003), mentions the age as an affective variable that could influence the acquisition of the targeted language. He posits that the more the learner becomes older the more difficulties in attaining native-like speaker will be, because the brain has already categorized sounds and it is difficult to be changed (ibid.).

Despite the fact that pronunciation still exists in the courses, it has been taught implicitly and did not teach explicitly or ‘systematically’ to cover the main aspects of English phonology (Couper, 2003). That is to say, it is more effective if that system of second language explained in the lecture explicitly with more practice to raise learners’ awareness about its structure. Phonological awareness defined by *The Literacy Dictionary* (as cited in Abshir, 2006) as “an awareness of sounds heard in words, syllables, onsets and rimes and phonemes. Phonemes are the smallest individual units of sound in language. Phonemic awareness is an awareness of sounds comprising the spoken word” (p. 1). Also, Venkatagiri and Levis (2007) state that “Like other metalinguistic abilities, phonological awareness is a construct, which is measured by how well learners can focus on the
structure of the L2 system, in this case, the phonology” (p. 263). In their experiment Venkatagiri and Levis (ibid.), provide types of skills, which could be included in the domain of phonological awareness with some tasks to assess those skills:

1. Blending phonemes into syllables and syllables into words, e.g., the teacher says /s/.../u/.../n/, and then the learners should blend the sounds together to form meaningful word.

2. Phonological manipulation is the ability to add, delete, substitute, or rearrange phonemes or groups of phonemes within a word or a phrase. Three tasks were used to measure these skills:
   i) Initial consonant deletion: present a picture with a name starts by consonant, the participants pronounce the word without the first consonant.
   ii) Final consonant deletion: the same procedure of the previous one but the consonant is at the end of the word.
   iii) Spoonerisms is the exchange of initial sounds of words in two-word phrases.

3. Phonological segmentation is the ability to decompose a word into phonemes and syllables, which is the opposite of phonological blending. Two tasks were used to test this ability: number of sounds in words and number of syllables in words.

4. Rhyming and alliteration abilities include identification and production of rhyming and alliterating words. (pp. 267-268)

Giving importance to ET will help both genders develop their mental abilities. Therefore, raise students consciousness and awareness are very essential issues in the process of acquiring a second language (Smith, 1981; as cited in Couper, 2003). It works as a tool to help students develop their spelling and pronunciation knowledge. According to Hewings (2004), most students believe that phonological awareness raises their exposure to learning a second language. Gordon et al. (2013) posits that this process of awareness
should be implemented in terms of "Explicit Phonetic Instruction" (EPI) that focused on teaching 2L phonological aspects explicitly (these features will be tackled in the next section). In other words, studying pronunciation means studying phonology (Couper, 2003).

Raise students awareness about how sounds are made through ‘diagrams’, ‘explanation’, or ‘demonstration’ exercises is very important to snatch their attention every time the sound appears in a conversation or a cassette in order to train the student’s ears (Sárosdy et al., ibid.). Therefore, the teacher presents the phonetic symbols simultaneously with the present of meaning when teaching a new word. Furthermore, s/he should inform the learners that there is no sound interpretation from the 1L sound system to the 2L system to avoid mispronunciation (Alves and Magro, 2011). According to Derwing and Munro 2005 (as cited in Saito, 2011), “students learning 2L pronunciation benefit from being explicitly taught phonological form to help them notice the difference between their own productions and those of proficient speakers in the 2L community” (p, 46). Moreover, Different pronunciation studies have investigated the benefits of EPI (e.g., Singer, 2006; Foote, Holtby, & Derwing, 2011; Papachristou, 2011; Scanlon, 2011; Echelberger, 2013), but the application of SEG and SUPSEG features of phonology in the laboratory training studies have not been conducted widely in the classroom instruction (Gordon et al., 2013) nor investigated acoustically.

1.4 The role of pronunciation instruction

The role of pronunciation in the EFL classrooms still debated (Echelberger, 2013). Therefore, if the instruction of teaching phonological features embedded in a language course as a separate module, learners will have opportunities to adopt new sound system (Chela-Floves, 2001; as cited in ibid.) and have more opportunities to practice it.
Moore (2001) makes an empirical study of two groups in which he investigates the effectiveness of formal instruction/ET on the acquisition of pronunciation. The experimental group receives pronunciation instruction while the control group receives no instruction. The study found that pronunciation instruction made an effect on the development of pronunciation in contrast to other group (ibid.). In their study, which includes a survey of 201 adults ESL learners and teachers living in Canada, Foote et al. (2011) observe that learners at different levels saw pronunciation instruction as a helping tool in learning 2L. 83% of respondents agree that it is very important for beginners, 91% agree that it is important for intermediate learners, and 82% believed that pronunciation instruction is important for other occupations like medical and some jobs that demand communication (Foote et al., 2011; Yates, 2002). The importance of teaching pronunciation is playing as an effective tool in all the levels.

In his 2003 article, Couper suggests a syllabus in which he proposes some steps that he believes are important for learners to develop their pronunciation. By the use of explicit pronunciation, the students will:

1) Recognize the importance of pronunciation.

2) Develop an awareness of their areas of deficiency.

3) Develop the ability to monitor their own pronunciation, getting the students to record themselves.

4) Learn to focus on the pronunciation of native speakers and try to use this as a model.

5) Develop their auditory memories and thus the ability to retain and imitate sounds.

6) Develop physical control over motor skills.
7) Lower their affective filters. (pp. 56-57)

All these steps make the learner study in independent atmosphere where the goal is to attain the TL.

2. Explicit vs. Implicit pronunciation teaching

From the conventional beliefs about the unimportance of pronunciation, which could not be taught and can be "picked up" by learners, made pronunciation instruction absent in the 2L/FL classrooms (Silveira, 2002; Johandar et al., 2012). It is still considered as a neglected aspect in many language programs. Gilbert, (2010), points out that pronunciation seems to be the ‘orphan’ of 2L research. In the same year, Derwing posits that it is unfair to blame only learners for their failure to achieve native-like speaking, and most “L2 teachers are often worried that they aren’t well prepared to teach pronunciation, or even to incorporate some pronunciation activities into their regular language classrooms. They feel as though they don’t know where to start” (Derwing, 2010, p.26). This fact affects negatively the process of learning a second language.

Learning to master a 2L is difficult to achieve especially in the field of phonology (Papachristou, 2011). Therefore, teachers use different instructions to fill in the gap all the missed points: the explicit instruction/teaching and the implicit one. The former called explicit because “it is unambiguous and direct approach to teaching that includes both instructional design and delivery procedures” (Archer & Hughes, 2011, p. 1). Moreover, it is considered as a ‘cognitive approach’, which leads to ‘explicit knowledge’ (Stern, 1992; as cited in Duan, 2008). Beltchenko (2010) defines this instruction as directing student’s attention toward specific learning by providing explicit methods of teaching for speaking and listening activities while the latter is characterized by as “more extensive conversational practice given instead; no information handouts listing situationally
appropriate utterance tokens provided instead; listening to tapes of their own language behavior; feedback is teacher-initiated, giving rules but with holding metapragmatic explanations” (House, 1996; as cited in Duan, 2008, p. 40), which makes opposite to the explicit one.

Formal / direct/ Explicit Instructions are different names to the same function. Alves and Magro (2011) hypothesize that “Drawing students’ attention to what may differ from the native to the target language is one of the purposes of adopting explicit instruction in pronunciation classes”. In addition, they state that “explicit instruction includes not only the linguistic explanation of the target itself, but also all the pedagogic steps which lead students to better opportunities to use the linguistic aspects that are being explained” (Alves & Magro, p. 74). For Hewings (2004) Teaching pronunciation is treated as a ‘low priority’ in the teaching process, but if students give ‘high priority’ to the way of uttering words in their learning, this process will be taken into consideration by curriculum designers.

Many studies support the use of ET in FL settings (e.g., Couper, 2003). Abshire (2006) conducts an experiment entitled “exploring implicit versus explicit methods of teaching phonemic awareness instruction to kindergarten students”, in which he tested both methods on two groups, one received explicit instruction and the other one received implicit instruction. He found that "explicit, direct instruction method appears to provide greater academic achievement over an implicit method" (Abshire, ibid, p. 84). Papachristou (2011) also investigates the effectiveness of both methods but on the acquisition of English vowels by Greek children. He found the same results of Abshire’s research. Consequently, a systematic shift will notice from “extensive teacher input and little student responsibility initially — to total student responsibility and minimal teacher involvement at the conclusion of the learning cycle” (Papachristou, 2011, p. 2).
Additionally, collaborative work should be employed between the teachers and the learners, in which teachers form instructions by taking into consideration the learners needs (Derwing et al., 2011) and the learners consider learning the phonological rules as important as other TEFL courses in order to meet their interests and gaps in the speaking context.

2.1 Different materials and methods used by the Explicit teaching method

In the classroom of pronunciation, it is very important to choose the materials that are useful for both teachers and learners (Fraser, 2001). Different experts use different methods and materials in this kind of instruction (Explicit Teaching). One of the methods is to divide the content into small sets and taught as a part of a whole. It starts by ‘setting the stage for learning’ then clear explanation of what to do (tell the students things that will be taught) followed by ‘modeling’ (showing how to do things), finally practicing the learned things with direct feedback until ‘independence’ reached (Beltchenko, 2010, & Park, 2011). Furthermore, ET deals with ‘modeling skills, behaviors, and thinking’, i.e., the teacher thinking loudly when working with students (Archer & Haughes; Beltchenko, *ibid*). some researchers use ‘songs and rhymes’, ‘poems’ and ‘tongue twisters’ as a warming up activities while ‘CDs and multimedia CD-ROM’ used by them as authentic materials (Sárosdy et al., 2006). Others consider minimal pairs, drilling, modeling, transcription, and dictionaries as an effective tool (Atkielski, 2005; Jahandar et al., 2012). For a long time, many teachers use these activities to enhance pronunciation abilities.

Minimal pairs are two words that are similar in sound, but have one phonemic difference between them and can be very challenging to pronounce, e.g., *bad* and *bed*. Those minimal pairs cause a student problem depends on the phonetic of their native language. In the case of Japanese learners, *fat* and *hat* cause EFL learners problems, because Japanese language lacks the /f/ phoneme (Fryer, 2005). Another example, the
problem of *eel* and *heel* for French learners of English would arise because French language lacks /h/ sound (*ibid*.). That is why most students have many difficulties between hearing a sound and pronounce it, which make them mix up words and meanings. According to Fryer (2005), teachers should provide learners with minimal pair activities in order to reinforce the student’s listening and speaking abilities by: 1) increase the students’ awareness of what minimal pairs are, why they are difficult, and what kind of problems they cause. 2) Tell the students that minimal pairs would not hinder their communicative abilities, but they should put more focus on the pairs that cause trouble to them.

In 1995, Mark Hancock publishes interesting book entitled *Pronunciation games*. This latter is used as a resource for teachers, which contain photocopiable materials for use in the classroom. Elements of Pronunciation presented in form of games that designed to raise student awareness about English pronunciation aspects using Received Pronunciation accent (RP). Furthermore, it contains “great variety of activities, from competitive games to problem solving puzzles, from activities involving learners working individually to group and whole-class activities” (Hancock, 1995, p.1). It focuses on the prosodic feature as well as segmental one.

All these activities encourage them to be involved in communication activities like how to use dictionary, ‘scanning’ the texts, discussing the topics, and use ‘effective strategies’ like focusing on the main details and ideas while listening (Scanlon et al., 2011) as well as raise the learners’ awareness about the accurate pronunciation.

3. **Searching difficulties that may hinder pronunciation teaching or learning**

For many students, learning to study grammatical rules and acquiring English vocabulary is easier than applying them in a continuous conversation. For that reason,
considering the psychology, difficulties, and problems of pronunciation is very important in relation to teaching pronunciation.

### 3.1 Psychology of pronunciation

Psychology is one of the aspects that have been ignored in pronunciation teaching. In most cases, learning to speak is considered more personal, which makes our sense of speak bounds up with the rhythm of our first language (Gilbert, 2010). Therefore, it is common for students to feel uncomfortable when they hear themselves speak with the rhythm of the 2L (ibid.). Other researchers like Jones (2002), adds the issue of sociology to psychology that has big attribution on the way of speaking. He states, “the way individual pronounces has much to do with his or her personality & psychological or emotional state at any given time” (p. 184). Therefore, pronunciation ‘needs to be tied in with work on the individual’ value set, attitudes and socio-cultural schemata’ and the focus of pronunciation teaching should be ascribed to a particular sociological context (Penningtom, 1995, p. 104; Brown, 1989; as cited in Jones, 2002) that may affect both genders.

The characteristic or the psychology of the person affects positively and negatively his/ her capacity of pronunciation. Alag (2014, in press) conducts a qualitative study in which she discussed EFL Algerian learner’s test anxiety. 60% of learners indicated that phonetic courses and tests are the most complex factors that raise their anxiety because they have difficulties in transcribe words correctly as well as have difficulties in applying the rules of English phonology in accurate form (ibid.). These facts can affect negatively learners’ psychology, which make them avoid participate in pronunciation classroom. A solution for that is to help FL learners overcome this anxiety and make them think that it is not a negative point if they mispronounce any word but rather to focus their attention on developing their pronunciation by further practice.
3.2 Why pronunciation is difficult to learn?

Pronunciation is the most challenged aspect for both teachers and learners. Many researchers consider teaching and learning pronunciation as a difficult task to achieve. Fraser (1999), a senior lecturer in linguistics at New England University, proposes several concepts and ideas relate to pronunciation. He states that pronunciation is not a cognitive ‘knowing-that’ but it is also physical ‘knowing how’ which makes learners need motivation and time to practice it, and it has a significant cognitive component, which is much less knowledge (ibid.). Additionally, there is no ‘well-established’ systematic way of deciding what to teach, when, and how to do it (Darcy, Ewert, Lidster, Chen, & Wang, 2011; Foote et al., 2011). Therefore, the teacher should choose the adequate type of instruction that suites the learners needs

Darcy et al (2011) states different expert’s views about problems the learners may face in acquiring 2L pronunciation in a textbook titled “Bringing pronunciation instruction back into the classroom”. These problems are:

1) Selection and ordering of essential pronunciation features (Prator,1971; Jenner, 1989; Derwing, Munro & Weilse, 1998)

2) Addressing production and perception.

3) Distribution in the curriculum in terms of learner proficiency.

4) Lack of carry-over (Brown, 1972)

5) Limitation materials for instruction

6) Lack of teacher training (low confidence) (Derwing, 2010, p.9)

Another important difficulty that has been noticed is that most SL and FL learners face many problems in pronouncing the individual sounds. For example, confusing the use of
vowels /æ/ and /ə/ in different positions, cause misleading in understanding (Sárosdy, et al., 2006). For that reason, the teacher should implement ET in the classroom as a tool in order to: contribute better level of production, and to identify the effects, which is caused by 1L transfer on the acquisition of 2L phonological system (Alves and Magro; as cited in Hariri, 2012). Taking about the influence of the 1L is very important. On the one hand, since the current study is directed to EFL Arabic (Algerian) learners, it is very important to point out some difficulties Arabic learner may face in the process of acquiring a second language (in this case English language). English and Arabic languages have two different systems not only in the number of vowels that each language has but also in ‘the dynamics’ that manipulate the two systems (Odisho, 2005). These dynamics ascribed to the difficulties in connection vowel system and syllable structure, which make acquiring other language system very difficult (ibid.). In other words, “Many learners whose L1 lacks contrastive sounds of L2 tend to substitute L2 sounds for the nearest sound available in their L1” (Cruttenden, 2008; as cited in Ali, 2013, p. 1). According to Odisho (ibid.), any sound system of a given language represents a ‘psycholinguistic or mental construct’.

He states that

When one says that a given language has a /p/ phoneme, it simply means that this phoneme occupies a slot in the brain of the native speaker. This mental construct of the native sound system usually creates a phonetic bias against non-native sound. Expressed differently, the gradual evolution of the phonological system of the native language seems to blunt the skills of an adult in his/her phonetic sensitivity to sounds of other languages. (Odisho, 2005, p. 23)

A significant example is the confusion usage of /p/ and /b/ sounds by Arabic EFL learners (ibid.). Arabic is considered as /p/ less language, and many of foreign Arab learners have

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1All the phonetic symbols in this research were writing by Doulos Sil, which is a software that is used to write different types of writings, inter alia., International Phonetic Alphabet
“difficulties in mastering that sound because ‘P’ remains psycholinguistically unrecognized in the brain of the native Arab learners of English” (Odisho, 2005, p. 23).

From what stated before, we can notice how much pronunciation is difficult to learn. According to Fraser (1999), the phonological system has a radical difference between: 1) what learners think they are saying, 2) The phonetic description of the sound that they are producing, and 3) how could FL teachers describe learner’s speech. All these facts lead to miscommunication between learners and teachers.

3.3 Is the problem teaching pronunciation, or how to teach it?

Many researchers give us an insight about the importance of teaching and raising student’s awareness about pronunciation. Yet, the way of teaching pronunciation is still debated, i.e., whether the problem is teaching pronunciation or how to teach it (Fraser, 1999). Supporting that view, Sàrosdy et al., (2006) quote that

Most English teachers make students study grammar and vocabulary, practice functional dialogues but they make little attempt to teach pronunciation in any overt way. They may feel they have too much to do and they may claim that without a formal pronunciation syllabus and without specific pronunciation teaching, many students seem to acquire pronunciation in the course of their studies. (p. 78)

For that reason, Nascova et al. (2013) conduct a research in which they explore the perspectives of teachers training in pronunciation and who work in an EFL classrooms in different European countries. They found an evident fact that “training in pronunciation pedagogy does not generally include a separate pronunciation-oriented course, but rather is made up of smaller intervals of theoretical lectures and / or pronunciation activities as part of more general TEFL courses” (Nascova et al., 2013, p. 33). This fact has been noticed in EFL Algerian classrooms as well.
As we have mentioned before, most of the researchers agree about the fact that FL learners, especially who studying English as a 2L, learn pronunciation via other modules and not explicitly as a separate module. For example, EFL Algerian learners study pronunciation via a module called ‘phonetics’ just for two years, without any real practice to what is being taught. This fact makes both genders lose their confidence while speaking. Therefore, EFL teachers should be guided on how to conduct this mission, how to implement pronunciation instruction in the curriculum to cover the questions of when, what, and how to teach pronunciation.

4. Gender-based element to pronunciation accuracy of advanced EFL learners

Some researchers use the term ‘sex’ and others use the term ‘gender’. The former refers to biological categories while the latter refers to social categories. It is very important to diagnose their differences in the classroom, because “some effects on speech may be biological and some social and it may be difficult to see which has the larger influence” (Jahander et al., 2012, p. 1). Henton, 1995 (as cited in ibid.) conducts a study in which she investigates cross-language variation in vowels of both genders, she found that women produce more ‘open-mouthed’ variants of vowel than man which means that women speech is produced phonologically more explicitly than men do (ibid.). She states that these differences are due to the use of standard or prestigious form by women and non-standard by men (cultural interference) (Jahander et al., 2012). Furthermore, women “occasionally pronounce a declarative sentences more like a question, that is, raises her Fundamental frequency toward the end of the sentence” (Brend, 1971; as cited in Karlsson, pp. 20-21). On the other hand, other differences that characterize both genders are ‘physical sex’ (structure of the vocal folds) which is the focus of the current research (see section 3).
Byrd, 1992 (as cited in Jahandar et al., 2012), investigates the use of vowels by both genders. He states that “men, who speak faster, tend to reduce their vowels to schwa more often than women” (p. 2) and she thought that women have a set of reduced vowels (ibid.). Therefore, to test the aspects of pronunciation, there should be an acoustic analysis of both genders voices.

**Conclusion**

In this section, I examined the history and the importance of pronunciation in the EFL classroom, as well as the importance of raising the students phonetic awareness, and the role of pronunciation instruction was highlighted. Additionally, I explored the merits of various types of pronunciation instruction with more focus on the explicit one, different materials and methods used by ET methods were mentioned. Furthermore, I tackled the issues that may hinder teaching and learning pronunciation namely: psychology of pronunciation, difficulties in pronunciation and the problem of teaching pronunciation. Finally, gender-based element to pronunciation accuracy of advanced EFL learners was mentioned briefly.
Section 3: Acoustic studies of English vowel sounds

Introduction

Last section, the significance of teaching pronunciation explicitly via raising the students awareness about the phonological elements, SEG and SUPSEG, shows positive results by many teachers and researchers as well. According to O'Connor (1980) any sound made by moving the organs of speech, and “if those movements are exactly repeated the result will always be the same sound” (p.9). In other words, if these organs do not move in the way that should be, sounds will be pronounced in a different manner, and this is what happen for a lot of EFL learners when they mispronounce sounds. The reason lies behind the interference of the mother tongue (Chelliah & de Reuse, 2010; Odisho, 2005), i.e., L1 simply lacks a distinction that L2 uses. In fact, neglecting 1L accent is impossible for any EFL, and getting rid from that accent is not logic (Moghaddam, Nasiri, Zarea, & Sepehrinia, 2012). It requires understanding, intensive practice and the desire to change (Dauer, 1993). Therefore, adding a new phonological system should be the prime focus of those learners.

Each person has his/her own characteristic that distinguishes him from others, especially in terms of cross-gender differences. These differences between male and female voices make researchers in debate.

Since the research focuses on the effectiveness of Explicit Teaching on both gender’s /æ/ and /ə/ accurate pronunciation, This section is organized in the following way: first, provide some basic information about the phonological features with more focus on the vowel system; The difference between cross-gender biological differences will be described; source and filter theory will be mentioned briefly, and finally the acoustic measurements will be explained in terms of: Formant frequency (F1, F2), and vowel duration.
1. Phonological Elements

Teaching/learning English as a foreign language in schools or universities means teaching/learning Received Pronunciation accent (RP). In the early of 20th century, Jones (1917) named it “PUBLIC SCHOOL PRONUNCIATION”, then later on changed to (RP) (Roach, 2004). This accent is used as a standard in describing the phonetic of British English pronunciation for centuries (ibid.). From that point we can draw a departure for the English sound system.

Moghaddam et al., (2012) define pronunciation as “language feature which easily distinguishes native speakers from non-native speakers of languages in general and English in particular” (p.215). Furthermore, pronunciation means utterences that are constructed by sequence of words. For many researchers (Dellwo, Huckvale, & Ashby, 2007; Johandar et al., 2012; Ladefoged, 1975; Meyer, 2009; Roach, 1991, 2002, 2004), these words are described in terms of phonological systems which can be divided into:

![Figure 1.1. Main components of phonological features](image)

Therefure, these features are defined by Hall (2007) in terms of “acoustic and / or articulatory realization which provide the link between cognitive representation of speech and its physical manifestation” (p. 312). Teachers question
should not be whether to teach SEG or SUPSEG features, but which is the appropriate feature that correlates with the aim behind teaching pronunciation, i.e., to teach SEG (to achieve an accurate pronunciation) or SUPSEG (to be fluent in speaking). Dalton and Seidlhofer, 1994 (as cited in Johandar et al., 2012, p. 5) mentions attractive approaches to teach pronunciation: First, ‘Bottom-up’ approach deals with teaching individual sounds and focuses on “teach the segments first, the suprasegmental features will be subsequently acquired without the need of formal instruction”. Second, the ‘Top-bottom’ approach focuses on patterns of intonation, i.e., “once prosodic features are in place, the necessary segmental discrimination will follow” (ibid.). Therefore, it is very important to use the first approach initially, because the teacher will explain word segment explicitly while the SUPSEG will be acquired implicitly.

1.1 Segmental features

The English language phonological system may have more sounds than learners use in their mother tongue. As a consequence, learners should listen and practice those sounds and phonemes to differentiate between them and those of native language (Yates, 2002). Peter Roach (2002, p. 2) indicates that RP always described as having a large amount of vowels in which the air gets out of the mouth with no obstruction from the tongue. These vowels can be categorized into:

1. short vowels: pit pet pat putt pot put another
   i e æ ʌ a o ə ə

2. long vowels: bean barn born booh burn
   i: a: ɔ: u: ɔ:

3. diphthongs: bay buy boy non ow peer pair poor
   eɪ i ai ɔi əʊ ə əʊ əʊ

While the consonants, where the air mechanism is opposite to the vowel sounds, are divided into:
1. Plosives:
   \[p \quad b \quad t \quad d \quad k \quad g\]
   Pin  bin  tin  din  kin  gum

2. Affricates:
   \[ʧ \quad ʤ\]
   chain  Jane

3. Fricatives:
   \[f \quad v \quad ð \quad s \quad z \quad ñ\]
   fine  vine  think  this  seal  zeal  sheep  measure  how

4. Nasals:
   \[m \quad n \quad ŋ\]
   sum  sun  sung

5. Approximants:
   \[l \quad r \quad w \quad j\]
   light  right  wet  yet

1.1.1 English vowels

The system of English vowels are characterized by 3 features: degree of backness, vowel hight, and the degree of lip rounded. Starting by the degree of backness, Ladefoged (1975) explains clearly the position of the tongue in the process of uttering vowel sounds: first, when the tongue is stationed in the front of the mouth, the empty space takes a particular shape, in which affects the sound. This position is called ‘front vowels’; for example, /e/ in men and /æ/ in man. Furthermore, if the tongue moves to the back of the mouth, different air shapes will create, which produces the ‘back vowels’, e.g., /u:/ in loot or /ɔ/ in lot. In addition, there is another position between front and back position, named ‘central sounds’ such as /ɜ:/ in turn or /ə/ in ten.

Another factor affects the air space in the mouth when uttering the vowel, which is the ‘hight’ of the tongue. For example, the /i/ in if, /e/ in ten, and /æ/ in hat are front sounds but differ in the hight. For the first vowel, the tongue raises toward the roof of the
mouth. Therefore, a high vowel produces, in this case /i/. For the second vowel, the
tongue lowers toward the bottom of the mouth, a ‘low’ vowel will be pronounced, which
is /æ/ as in sat while in between a ‘mid’ vowel like /e/ in ben or /ɜː/ in firm is created
(Ladefoged, 1975). Acoustically, the high-low position represents as a first formant while
the front-back position represents as a second formant (Beigi, 2011; Ladefoged, 1975).
These vowels can differentiate in the quality (the way vowels are articulated) as well as
quantity (duration) Papachriston (2011) which are the main focus of the current research.

![Vowel quadrangle](https://www.facebook.com/pages/English-Phonetics-and-Phonology/)

**Figure 1.2. Different vowel positions in the mouth**

Finally, O’Connor (1980) states that the different shapes of the mouth affects
strongly the vowel system. For instance, if you say *he* and *who*, the shape of the lips
change. For the first word, it takes the flat shape /hɪ/ and for the second word, the lips
change to round shape /hɔ/. Therefore, the fricative sound /h/ for both words are the same
if we pronounce it individually, but when it is followed by a vowel, the shape of the lips
changed.

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O'Connor (ibid.) posits that “each of the letters we use to show pronunciation may stand for more than one sound: but each of the sounds represented by one letter has a great deal of similarity to the other sounds represented by the same letter” (p.9). That is why in a group of sounds, each of them are represented by one letter in the phonetic alphabet which is called phonemes, and to represent these phonemes ‘phonemic transcription method’ is used (ibid.). So, in the previous example he and who represent the single phoneme /h/.

In the process of learning English pronunciation, the learners should acquire all the vowels in order to avoid pronouncing sounds in an identical way, especially in words and longer utterences. According to O’Connor (1980)

If the learner uses a particular sound in a word where an English speaker uses a different sound belonging to the same phoneme, the effect will be odd; he will not be misunderstood that could only happen . . . but he will not be performing in an English way. (O’Connor, 1980, p. 10)

For example, The difficulty in pronouncing the english vowels /æ/ is that many languages have only two vowels to indicate the three english vowels /e, æ, ӕ/ which result in disregarding the distinction between /e_æ/ especially by Polish, Russian, German, and Hungarian learners. i.e. they tend to make ‘bed’ and ‘bad’ identical, while Japanese and Spanish learners have no distinction between /æ_ə/ in which they make ‘bad’ and ‘bed’ identical (Wells, 2005). Therefore, the role of the teacher should exhibit in these cases by providing more explicit and direct teaching with practise to show how the words are exactly pronounced

In addition to what stated before, long utterences are also important, because we do not speak using isolated words but rather connecting sounds and words to make larger utterence. O’Connor (1980) tackles 2 main points in relation to that point
1. In a longer English utterance, some of the words are treated as being more important to the meaning than others, and it is necessary to know which these words are and how they are treated in speech. Words which are not regarded as being particularly important often have a different pronunciation; for example, the word *can* which is pronounced /kæn/ if it is said by itself, and is often pronounced *kan* within a phrases like *you can have it* /uː kæn hæv it/. 

2. The rhythm of English must be mastered. (p.11), i.e., to achieve the exact duration in uttering a word

All what have been stated should be explained clearly and explicitly by the teacher for more accurate pronunciation and also should be taken into consideration while conducting the acoustic analysis of the sounds.

2. **Cross-gender biological differences**

   Since we are searching for the difference between male and female voice, biological differences may give different acoustic speech, viz.: vocal tract structure, tongue shape and position.

2.1 **Vocal tract**

   For many authors and scientists, cross-gender acoustic differences are caused by anatomical variation that could be changed during puberty (Karlsson, 1992; Samuelsson, 2006). In that period, the larynx of boys grows rapidly which makes the vocal cords thicker and longer than girl’s vocal cords (*ibid*). In the process of exhalation, the air moves out of the lungs through a wind-pipe to the larynx. This latter consists of “two small bands of elastic tissue . . . lying opposite each other across the air passage, these are the vocal cords” (O’Connor, 1980, p. 13). Therefore, the vocal folds (vocal cords) are considered as the important apparatus in larynx that affect the production of speech. According to Stevens (2000), vocal folds consist of two bounds of tissue, and it is located
parallel to each other in an ‘anterior-posterior’ position. The length of the vocal folds differs between 13-17 mm for female adults and 15-23 mm for male adults (Cob, Dejonckere, Calderon, & Kaynar, 2009). Above them directly located the second paired folds called ‘ventricular folds’, these latter rounded by a cover and a muscle which differs from male to female in its thickness, about 4 mm, and 2.5 mm, respectively (as shown in figure 1.3) (ibid.). Stevens (2000) also describes the volume of vocal tract in terms of

1. The space between the outer walls of the tract (rear pharyngeal wall, soft palate, hard palate)
2. and the inner surface of the mandible (including the floor of the mandible formed by the mylohyoid muscle). (Stevens, 2000, p. 24)

All these characteristics change between 130 cm³, and 170 cm³ for adult female and male, respectively. Additionally, these volumes could be increased to about 150 (females) and 190 (males) if the mandible lowered by 1 cm (Cob et al., 2009). The consideration of the airway volume that forms the vocal tract differs for both genders. For females, is about 40 - 60 cm³ while males is about 60 – 80 cm³ (ibid.)

Figure 1.3. Vocal folds in an open and closed position (Sinai, 2014)

2.2 Tongue

On the other hand, the second organ that affects the sound production is the tongue. This latter is considered as an active organ in the mouth in which it has a big role
in controlling the air in the process of inhalation and exhalation, and in which it differs from both genders. For female adult, the volume of the tongue is about 90 cm³ and for adult males is about 110 cm³ (ibid). All these differences will show big variation from one individual to another in terms of Formants.

3. Source and filter theory

Stevens (2000) in his book *Acoustic Phonetics* describes the mean of source and filter. He states that the acoustic aspects which represent the speech sound production is the main responsible for the source of sound in the vocal apparatus (ibid.). The source of sound for speech is the glottis (Quasi-periodic laryngeal source). Since The air must pass through the vocal tract before exit the mouth, it acts as a filter or ‘resonator’ in order to humid some frequencies and intensifying others (ibid.). The intensified frequencies are the formants that we see on a spectrogram. All these aspects depend largely on the shape of the vocal tract and time, because articulations move with time (Ladefoged, 1975; Stevens, ibid.).

4. Acoustic measurements

According to Ladefoge (1975), “the objective of any science is to be able to measure the things that are being described. so, that they can be expressed in terms of valid, reliable, and significant numbers” (Ladefoged, 1975, p. 165). Analyzing any sound acoustically means searching for its position in the mouth, or testing the spectrum of that sound. This technique is done by exploring how much energy is presented at different frequencies. All the sound characteristics are represented on a spectrograph screen, “A device that translates a sound into visual representation of its component frequencies” and in which the time is represented on the x-axis and frequency on the y-axis (Ladefoged,
1975, p. 170). In order to get authentic results in terms of numbers, Praat\(^3\) program is used as a tool to analyze acoustically the sounds. This program has some options used to measure sound positions in the mouth, Inter alia, Formant frequency, and vowel duration.

### 4.1 Formant Frequency

One of the acoustic analysis measurements is the comparison of Formants. Formants are defined as peaks in the energy spectrum of vocalic sounds, which correspond to the resonant frequencies of the vocal tract. The frequencies of the resonances characterize vowel quality (i.e. vowel height and vowel frontness) (Harrison, 2004, p. 2). With vowels, the form of the formant determines which vowel you hear, and at any point of time, there may be any number of formants (op.cit). According to Ladefoged (1975)

> The formants that characterize different vowels are the result of the different ways in which the air in the vocal tract vibrates. Every time the vocal cords open and close, there is a pulse of air from the lungs. These pulses act like sharp tapes on the air in the vocal tract. This body of air is set into vibration in a way that is determined by the size and shape of the tract. (Ladefoged, 1975, p. 169)

The Formant with lowest frequency is called F1 (Gut, 2013) and is relate to vowel height. The formant with the next high frequency called F2, and it relates to vowel frontness (\textit{ibid.}) whereas the formant with more high frequency called F3 and so on. According to Gut (2013), “for the differenciation of vowels in a particular accent it is usually sufficient to refer to the first two or three formants” (p. 234). The exact value of each frequency at each point is displayed in the unit Hertz , i.e., cycles ber seconds (HZ). For example, the first two Formants of /ɜ:/ vowel in \textit{bird} would be 650 HZ for F1 and 1593 HZ for Formant two (female voice) while for male voice F1 (513) and F2 (1377) (Roach, 2009).

\(^3\) A free scientific computer software package for the analysis of speech in phonetics
According to Hillenbrand et al., 1995 (as cited in Pepiot, 2013) vowel formants of female speakers tend to be located in a higher frequency than men vowel formants.

### 4.1.1 Measurements of formants

Formants can be measured by different ways. The most common way is through the generation of spectrograms. According to Harrison (2004), Spectrograms are “computer generated plots which show speech energy across frequency over time” (p. 2). Figure (1.4) shows spectrogram in the above part of screen while the lower part shows formants of three vowels /i/, /u/, /a/, respectively.

![Figure 1.4. Spectrogram and Formants of three vowels /i/, /u/, /a/](image)

According to Harrison (*ibid.*), “Formant values can be measured from spectrograms by placing a cursor at the location of the darkest point within a formant and reading off the value of the cursor on the frequency axis” (p. 3). The position of each formant of vowel indicated by dotted lines that displayed in the spectrogram (Gut, 2013). For example, for measuring F1 of the first vowel /i/, click on the dotted formant line and the value would be displayed.
When comparing Formants in vowels produced by different speakers (which is the case of this study) it has to borne in mind that due to the physiological differences between speakers (see 2.1, 2.2), two vowels that sound the same are likely to have different formants. All the formants can be interpreted in a form of chart in which the values of first Formant are displayed on the vertical axis whereas the values of second Formant are displayed in horizontal axis, and both of them in inverse order. This arrangement shows that “vowels are positioned in such an acoustic map similarly to how they are usually arranged in IPA vowel chart” (ibid.). Ladefoged (1993) mentioned that when two different speakers pronounce sets of vowels with the same phonetic quality, the relative positions of these vowels on a Formant chart will be the same, but the absolute values of the Formant frequencies will differ from speaker to speaker.

4.2 Vowel duration

It is very important to make a distinction between ‘length’ and ‘duration’. Length is used to see how long the sound ends, for instance; if I listen to recordings like /biːt/, /bɔːt/, /bit/, and /bet/, I can judge them by their length whether the syllable contain long vowels like the first 2 words or short like the second 2 words (Roach, 2009). Furthermore, if I used software Praat or any laboratory instrument/ tool to measure these recordings. The vowel could be 100, 110, 170, or 180 milliseconds respectively of the previous words. Therefore, measurement of duration is done (ibid.). In the process of uttering sounds, Vowel duration differs by both genders oral production. For Samuelssson (2006), female vowels are longer with a great difference between short and long vowels, because men and women attempt to change their voices to achieve ‘perceptual product’, which require more differences in articulatory speed.
Conclusion

On the one hand, as the study shows, the substitution of certain phonemes can produce misunderstanding the message that could affect the accurate pronunciation. Therefore, this section gave special attention to segmental features (vowels). Furthermore, the characteristics that distinguish both genders’ biologically also displayed (vocal tract and tongue). Moreover, source and filter theory was mentioned. Finally, the acoustic measurements of Formants frequency with vowel duration were displayed clearly.
Chapter 2

Methods and materials used to investigate EFL Algerian learners
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Section 1: Methodology

Introduction

Pronouncing correct sounds is the main difficult task for many students. In other words, they lack the ability to pronounce the basic elements of phonological features. This study aimed to investigate how EPI in the primary area of segmental features affects EFL Algerian learner’s accurate level of pronunciation and whether there is an acoustic difference between male and female /æ/, /ə/ Formant values.

In this section, I discuss the methods and materials used to obtain data for this research: participants and setting, research design, instruments and materials, and finally the procedure.

1. Participants and setting

At the beginning of this research, the target population was 44 participants from first year LMD students, in the department of English at L’arbi Ben M’hidi University, Oum El Bouaghi. However, I realized that first year students do not have enough knowledge about the phonological rules unlike second year. It will be difficult to analyze speech with no prior knowledge about segmental features. Therefore, I decided to change the level and the number of student to 20 participants from second year LMD students in the department of English at L’arbi Ben M’hidi University, Oum El Bouaghi. They have approximately enough access to English phonology that makes them the representative sample to be tested.

The research sample devoted into experimental group, and control group. The former consists of ten participants divided equally into five females and five males while the latter is composed of ten participants as well (five females and five males). The sample was selected by purpose. I focused on the equality in the number of students.
to: examine gender differences in phonetic processing skills, and because cross-genders do play a significant role in determining the articulatory concept. All the participants are aged between 20 and 24. I neglected olders for two reasons. On the one hand, “learners of different ages may respond differently . . . to different kind of teaching approaches and task types” (Brown, 1992; as cited in Jones, 2002, p. 179). On the other hand, “older speakers have less control over their articulation” (Chelliah & de Reuse, 2010, p. 254). Furthermore, educational background of the students (phonological awareness) was taken into account.

I faced some problems concerning selecting male participants. First, the maximum number of males in each classroom does not exceed five males. Therefore, gathering male students from different classrooms into one group was impossible because none of them want to miss attending the official sessions. Second, the control group had no exposure to phonological features in the second semester, because they do not have teacher of phonetics unlike the experimental one. All the subjects are native Arabic speakers studying English as a second language and most of them speak French and Shawiya language. All of them were completely anonymous, i.e., their names will not be mentioned anywhere in the data. None of them smokes, no vocal tract or dyslexia problems, and totally voluntaries.

2. Research design

Due to the nature of this research, an experimental study that belongs to quantitative research design will be used. This type of research is used to test the hypothesis that leads to “valid conclusions about relationships between independent and dependent variables” (Key, 1997). The independent variable is ‘gender’, which is also named predictor variable. However, the dependent variable is ‘Explicit Teaching’.

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1 It is a variety of Berber language that is spoken by eastern Algerian people.
Quantitative research differs totally from the qualitative research in which the former uses statistics and numbers to interpret the findings while the latter uses words to interpret the outcomes.

3. **Instruments and materials**

   3.1 **Linguistic material**

   For analyzing the acoustic features of vowels, a list of eight isolated words with CVC syllable structure were used in this study as a linguistic material to conduct pre-post tests. Those words were divided equally into two parts: the first part consists of four words with vowel nucleus /æ/, while the other part consists of four words with vowel nucleus /ə/. Each part will be recorded in a form of sentence with small pause between each word.

   The goal of those materials is to provide data to investigate how phonemic vowels like /æ/ and /ə/ in isolated words can affect the following phonetic variables of a syllable: duration, F1 and F2. The chosen words are shown in the table below.
Table 2.1

Isolated words that were used in the pre-post recording tests

<table>
<thead>
<tr>
<th>Syllable structure</th>
<th>Word</th>
<th>Transcription</th>
</tr>
</thead>
<tbody>
<tr>
<td>CÆC</td>
<td>hat</td>
<td>hæt</td>
</tr>
<tr>
<td></td>
<td>man</td>
<td>mæn</td>
</tr>
<tr>
<td></td>
<td>can</td>
<td>kæn</td>
</tr>
<tr>
<td></td>
<td>bad</td>
<td>bæd</td>
</tr>
<tr>
<td></td>
<td>For</td>
<td>fær</td>
</tr>
<tr>
<td></td>
<td>her</td>
<td>hær</td>
</tr>
<tr>
<td></td>
<td>sir</td>
<td>sær</td>
</tr>
<tr>
<td></td>
<td>was</td>
<td>waz</td>
</tr>
</tbody>
</table>

In creating the word list, the order of the words was randomized to remove any ordering effects.

Unlike the linguistic materials that were used in the pre-post recording tests, treatment sessions used photocopiable materials, which focused on games followed Mark Hancock *Pronunciation games* book. These games are: ‘Go Fish’, ‘join the dots’, ‘hidden names’, ‘Cluster busters’, and ‘Dictation computer’ (Hancock, 1995). The list of materials that were utilized in the treatment sessions can be found in appendices A1, B2, C1, C2, and D. These games were paced and sequenced according to complexity. Furthermore, other activities retrieved from different sources from the internet websites were used: minimal pair and Tongue twisters activities (see appendices A2, B1).
3.2 Analytical instruments

To measure acoustically the chosen words, Praat was used to analyze the pre-post recording samples of this study to measure the Formants, which represent the degree of backness and vowel height.

Since the aim of this study is to investigate whether both genders, via explicit phonetic instruction, will achieve accurate pronunciation, I will measure acoustically their recordings of vowels with CæC syllable and CaC syllable. In the process of analyzing data of the pre-post recording tests, I used Formant values of (table 2.2), that were proposed by Ladefoged (1975) and Johnson(2003) as a reference to be compared with the participants’ Formant values.

Table 2.2

*Formant values that were used as a reference in the data analysis*

<table>
<thead>
<tr>
<th>Vowel</th>
<th>F1 (HZ)</th>
<th>F2 (HZ)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>/æ/</td>
<td>690</td>
<td>1660</td>
<td>Ladefoged (1975)</td>
</tr>
<tr>
<td>/ə/</td>
<td>500</td>
<td>1500</td>
<td>Johnson (2003)</td>
</tr>
</tbody>
</table>

4. The procedure

This study was conducted over 4-week time frame. It commenced the second week of March 2014 and culminated last week of April 2014. Purposive sampling
methods were utilized to reveal acoustically second year students articulatory differences before and after treatment session.

Taken together, both participants in the experimental and control group shared the same pre-post recording tests, i.e., the same linguistic materials were proposed to both groups. However, there were two characteristics that distinguish participants in the experimental group from the control group. First, the former received EPI that was directed by the teacher of phonetics using ‘bottom-up’ approach as well as the practical sessions that I conducted during 2 weeks lasting 2 sessions per week. On the other hand, the control group did not receive any treatment or experimental manipulation that the treatment group received. By comparing instructed learners in the experimental group with uninstructed learners in the control group. The two salient questions surrounding this exploration include:

1. Does explicit phonetic instruction affect EFL Algerian learner’s /æ/ and /ə/ accurate pronunciation?
2. Is there any acoustic difference between EFL Algerian male Formant frequencies and female formant frequencies?

4.1 The recording tests

The study of sociolinguistic variation considered as a branch of dialectology, which emerged in 1960s as a result of an inadequate methods used in studying dialects. Data collection, using tape-recording conversations, plays an essential role in the study of sociolinguistic variations because it is the only way to gain ‘valuable insight’ about person's language use as well as enable researchers to collect many examples of the same feature from each speaker recorded (Britain, 2002). Within a single person some linguistic features may pronounced differently.
Hearing any sound depends on its acoustic structure. Therefore, it is very important to describe this kind of acoustic for many reasons: 1) in order to explain why certain sounds are confused with one another, and 2) to specify sounds (such as vowels) that are difficult to describe in terms of articulatory movements (Ladefoged, 1975, p. 159). We can get all these information via recording the speech of the speaker by a tape recorder, which shows photographs or ‘X-rays’ that exhibits what the speaker is exactly saying (ibid.)

4.1.1 Pre-recording test

The pre-test was exposed to both groups, experiment and control group, in the mid of March 2014 to test their articulatory production of /æ/, /ə/. Participants were tested in a quiet language lab, at L’arbi Ben M’ hidi University, Oum El Bouaghi, during two sessions lasting approximately 1 hour each. To obtain results that would reflect an advanced research, it was decided that high quality recordings should be made.

4.1.1.1 Recording method

Before starting the recordings, tested words were presented visually to all the participants on the green board, then they were instructed the goal of the recording and how it would proceed. All the participants were allowed to practice the tested words before the recording began. However, the students would not be corrected if they mispronounced the used words after the practice.

As the recording began, each subject was asked to read the word list contains four words with CæC syllable in a natural way (normal speech rate), leaving a pause in between each word. Then the other four words with CœC syllable were recorded used

---

2Is a type of Radiography that is use as an instrument to visualize the internal structure of the vocal tract (Williamson, 2014).
the same method. “word list recording should be made to elicit the required vowels rather than free speech, or a read passage . . . it guaranteed the required number of tokens of each vowel, assuming that the list was read correctly” (Harrison, 2004, p. 12). The data were recorded directly onto a Lenovo S100 notebook using mono record sound by Praat software and an attached headset (sensitivity about 105dB/mW and Frequency response 20~20,000Hz) placed few inches from their mouth. All recordings were saved in WAV file format with a quantization of 16 bits and a sampling rate of 44.1 kHz. Each record for each student saved immediately in a separate file to facilitate the acoustic analysis stages.

The recording sessions were conducted in time where all other students were studying. Windows and doors were shut to receive pure speech and minimize background noise interference. The recording lasted approximately 5 minutes for each speaker.

All subjects were not told about the purpose of this study before the recording session to avoid changing their speaking style. After the recording, the subjects were informed about the study objective. They were also told that their names will not be mentioned and their recordings would be used only for acoustic analysis.

4.2 The treatment

In the EFL Algerian curriculum, phonetic module is taught only one session per week with no real practice, which makes reaching accurate pronunciation unreachable. I asked the teacher of phonetics to put more emphases on teaching segmental features via using ‘bottom up’ approach that focuses on teaching explicitly students who have difficulties in pronouncing vowels and consonants (segmental features) (Dalton & Seidlhofer, 1994; as cited in Johandar et al., 2012). However, to practice the learned
aspects, I took the permission from the teacher of oral expression to conduct in the treatment sessions that took two sessions per week for a total of two weeks (50 minutes each session).

4.2.1 The experimental group

During the pre-recording session, I asked the participants of the experiment group whether they are familiar with phonological features or not. They respond, “We know them just in sheets and books with no real practice”. This impression made me think closely to find appropriate activities that suite their needs, because “one of the real challenges in instruction is to bridge the gap between theory and practice given the disconnection between research in 2L phonology and the real practices in the classroom” (Derwing & Muntro, 2005; Levis, 1999; as cited in Gordon et al., 2013, p. 195).

Different sources were used in this research: (1) internet websites, (2) activities and games proposed by Hancock (1995). Since the participants were familiar to some degree with phonetic rules that they are studying in the phonetic session by the teacher of phonetics, this will lower their stress, and cause them participate in new types of activities and exercises that were introduces to them at the beginning of each session. The activities that were used in the treatment sessions were focused on IPA vowel chart, minimal pair words, transcription, CVC syllable, and the central vowel /ə/.

4.2.1.1 Week 1

4.2.1.1.1 First session

An overview about the exact pronunciation of IPA vowel chart was introduced as a warming up activity in each session. During the first session, ‘Go Fish’ game was used as CVC short vowel word game in a form of minimal pair activity. By starting the game, all the participants were divided into 5 groups each of which consists of 2
students (see Appendix A1), and then the game was introduced to the participants. For example, player 1 requests a card (“Do you have HEET?”) and then player 2 has to hand over the word he or she heard. If player 2 mistaken in providing the targeted word. Player 1 would say “No, I want HEET, not HIT”, with the hope that students will become more aware of the difference between /iː/ and /ɪ/, i.e., the student will have to use the right sounds to request the right words.

The game was aimed to make the participants practice accurate pronunciation of different sounds (segmental features), which they can encounters to achieve correct use of it and to control their speech to avoid misleading other students while uttering minimal pair words. By the end of the session, other different minimal pair words were practiced orally by the participants (see Appendix A2)

4.2.1.1.2 Second session

During the second session of the first week, ‘Tongue twisters’\(^3\) were used as a warming up activity. I informed the participants that doing mistakes do not matter; even teachers and native speakers fall in doing mistakes in that kind of difficult activities. What matters is to make students get used to practice pronouncing words rapidly (see Appendix B1).

Before starting the second type of games, I checked participant’s general knowledge about word transcription by writing some transcribed words on the board, in order to. After that ‘join the dots’ game were conducted as an activity to practice word and phonetic transcription. In that game, each student received a picture that contains scattered words in form of dots and list of transcribed words. The dots must be joined in the order shown by the words in the list to get the final painting (see Appendix B2). By

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\(^3\)A phrase that is designed to be difficult to articulate properly. It relies on rapid alternation between similar but distinct phonemes
the end of the game, all the participants drilled the used words. According to Chelliah and Reuse (2010), it is very important to know how words heard and transcribed because through time, these transcriptions become accurate.

4.2.1.2 Week 2

4.2.1.2.1 Third session

Two games were used during that session. In order to make the participants understand the game, this is ‘Hidden names’ game. I wrote some words on the board and I asked the participants to diagnose the shared sound among the words

```
eight  rain  face  plate
```

Here the shared sound is /eɪ/. I gave each student a picture that contains hidden names of family members. To find the targeted names, I asked the participants to find the common sound that all the words in each column shares (like the example that I wrote on the board), and then the participants should put these sounds together, in transcribed form, to get the targeted name (see Appendix C1). The aim behind using this game is to raise the student’s awareness about word transcription. Finally, I asked the participants to drill the used words orally for more practice. That game took about 20 minutes.

The second game was ‘Cluster busters’ (see Appendix C2), which is focused on develop student’s awareness about CVC syllable. Using that kind of games make the participants diagnose that one vowel can be expanded into different words by adding different consonant sounds while keeping the same syllable CVC. For example,

```
or  ought  port  Sport  sports
```
4.2.1.2.2 Fourth session

The fourth session was focused on the use of weak forms, which is the intermediate vowel /ə/ that is also the focus of the current research. Before engaging in the activity, I wrote some sentences on the board and I asked the participants to read the underlined words in its weak form as a warming up activity

1. WHAT’S her NAME?

2. WHAT’S your NUMBER?

3. JOHN can SWIM

(The full list is in Appendix D1)

However, most of them fail to do so. Then I read all the sentences loudly many times to make the participants diagnose the right utterance of the unstressed words. The game that was used named ‘Dictation computer’. First, each participant took one paper contains sentences dictated by a computer, i.e., the computer printed exactly a native speaker’s voice in which he used the weak form in his speech. After that, I asked them to extract the errors from the sentence that were made by the computer and find the right words to match them with their responses in the right hand column (see Appendix D2). The aim behind this game is to make the participants practice the use of /ə/ intensively as well as recognize its importance in the speech.

The order of the chosen activities were designed to make the participant move from a learner that was least conscious of speech to most conscious of the phonological rules.
4.2.2 The control group

The control group did not receive any EPI by the teacher of phonetics as well as they did not receive any further practice in the oral session as the experimental group did.

4.3 Post-recording test

During the week after the last session of EPI with further practice in the oral expression sessions, the same participants were recorded the same speech sample using the same procedure that was followed in the pre-test. Pre-post recording tests were used before and after teaching, to investigate whether pronunciation instruction affected both genders’ accurate level of pronunciation or not. However, the time that was chosen to conduct the post-test did not suite the overall setting. There was a lot of noise outside the classroom that could affect in some cases the results. Furthermore, the recording took place in classroom unlike the pre-test that was recorded in a language lab.

Conclusion

In this section, participants and setting were clearly displayed. Research design was mentioned. Instruments and materials that were used in the current study were highlighted. Finally, procedures were explored clearly.
Section 2: Acoustic measurements

Introduction

Uttering words in isolation differ totally from uttering them within a context (whether in front, middle, or end). This could make a shift from vowel to other vowel, e.g., using /kæn/ in isolation can be changed into /kən/ within a sentence. Therefore, in order to restrict the range of speech data (because of time constraints), I decided to limit the study to the analysis of vowels just to isolated words. Furthermore, no discussion and analysis is included for the vowel duration measurements due to the same reason (constraints of time).

Since sounds travel from the speakers’ mouth to listeners’ ear through the air in waveforms (vibrations), it is possible to analyze these vibrations using ‘mathematical techniques’, i.e., by using special computer software that produces spectrogram (Roach, 2002). Analyzing the speech acoustically can be “more objective and scientific than the traditional auditory method which depends on the reliability of the trained human ear” (Roach, 2002, p. 3). This is the aim behind using that type of analysis, which I built the current research on.

This section describes the methods used to analyze the Formant values recorded by Praat. The first step of the analysis started by methods of analysis like segmentation and labeling, followed by data analysis that focuses on comparing Formant values obtained for the experimental group in the pre-post recording test using acoustic charts and statistical analysis.

1. Data measurements

In order to see the effectiveness of explicit instruction on both genders accurate pronunciation, and whether there is an acoustic difference between both genders
Formant values, I decided to analyze the first two Formants of the two vowels (/æ/ and /ə/) which represent the neutral center vowel of the lexical set CVC.

1.1 Methods of analysis

1.1.1 Segmentation and labeling

As mentioned in the recording sessions, each of the 20 participants recorded two sentences. Each of which consisted of list of four words read with small pause between each word. First sentence contained words with /æ/ nucleus vowel (Figure 2.1) and the other one with /ə/ nucleus vowel (Figure 2.2). Each sentence was saved directly into Praat program in a separate WAV file make up a total of 40 sentences (two for each student).

Figure 2.1. Sentence with CæC syllable pronounced by female speaker

Figure 1.2. Sentence with CaC syllable pronounced by male speaker
All the WAV files were analyzed by Praat (version 5.3.39). First, each word was extracted from the frame sentence by moving the curse and highlighting the dark peaks in the spectrogram. The aim is to segment the sentence into separate words using Praat textgrids accompanying each sound file.

Figure 2.3 shows how sentence with CVC syllable was segmented into the target words.

In addition to that, each segmented word (e.g., can) also extracted individually to other WAV file. Each CaC and CaC syllable of the target word was measured manually by segmenting and labeling the word into its components to reach the target vowel, e.g., /kæn/ segmented into /k æ n/ (see figure 4). by using the same procedure, the chosen vowel was extracted from the word by moving the curse from the vowel onset time to the vowel offset time then it converted into other separate WAV file labeled by its name (for further adequate acoustic analysis).
Figure 2.4 Shows how the word can be segmented into its components

This operation was recurred manually for each sound within each word syllable for each participant in the pre-post recording tests in order to measure the experimental and control group formant values. We can deduce that, the total number of vowels that were measured in the current study made up of 320 vowels (16 for each student). Running through this procedure is very significant to ensure that Formant values were stated in the same way for each analysis through all the recordings to avoid missing any point.

The required information of the acoustic features such as F1, F2, and vowel duration were extracted from each segmented sound by logging the start and end time of each token (as mentioned before), then the desired section of a vowel would be selected using the curse (Figure 2.4). The result values were converted directly into an Excel spreadsheet, where each data point was labeled for such features as gender, and Formants for each student. Finally, statistical analysis (paired t-test) was done using QI Macros 2014 in Excel.
2. Data analysis

Once all the Formant measurements were obtained, the values were transferred to an Excel spreadsheet. These values were displayed in a form of plots (acoustic map) showing each gender /æ/ and /ə/ place of articulation. In addition to that, in order to assess the significance of these differences it was necessary to carry out a statistical analysis on the data. A paired t-test was used to compare the recordings that were gathered before and after the treatment sessions.

The current study addresses two main questions:

1. Does explicit phonetic instruction affect EFL Algerian learner’s /æ/ and /ə/ accurate pronunciation?
2. Is there any acoustic different between EFL Algerian male Formant frequencies and female formant frequencies?

In the current study, the two questions will be analyzed separately into two parts. The first question will be analyzed in two forms: plotting the Formants in a form of acoustic map, and using statistical analysis to see whether there is any significant progress in the student’s pronunciation or not. However, the second part, which is related to the second question, will be analyzed using paired t-test statistical analysis to see whether there is an acoustic difference between both genders’ Formant frequencies.

2.1 First hypothesis

To investigate the first hypothesis, “the average formant frequencies can be taken to plot an acoustic map in which vowels are positioned according to the frequency of their first two formants” (Gut, 2013, p. 234). To gain an acoustic map, Formant frequencies averages were plotted with Ladefoged and Johnson Formant values in a form of chart. I used this type of chart to investigate both genders accurate level of
pronunciation before and after the ET. For more scientific analysis, the same hypothesis was tested statistically using paired t-test that it is used “to compare two population means where you have two samples in which observations in one sample can be paired with observations in the other sample” (Shier, 2004, p. 1). For example, observing the same subjects before and after treatment sessions.

2.1.1 Measuring Formants using Acoustic map

2.1.1.1 Experimental group before and after treatment session

2.1.1.1.1 /æ/ Formant values

Formant frequencies averages that I gathered in the pre-post recording sessions (Table 3.1, Table 3.2) were compared with Ladefoged /æ/ Formant values (Figure 2.5) to see whether there is a significant difference in /æ/ pronunciation before and after ET.

Table 3.1

*Formant value averages of each word (with CæC structure) pronounced by all male and female speakers of the experimental group (pre-recording test)*

<table>
<thead>
<tr>
<th>Gender</th>
<th>Word</th>
<th>F1(HZ)</th>
<th>F2(HZ)</th>
<th>Gender</th>
<th>Word</th>
<th>F1(HZ)</th>
<th>F2(HZ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>hat</td>
<td>911</td>
<td>1819</td>
<td>Male</td>
<td>hat</td>
<td>825</td>
<td>1523</td>
</tr>
<tr>
<td></td>
<td>can</td>
<td>827</td>
<td>1860</td>
<td></td>
<td>can</td>
<td>740</td>
<td>1583</td>
</tr>
<tr>
<td></td>
<td>bad</td>
<td>788</td>
<td>1904</td>
<td></td>
<td>bad</td>
<td>735</td>
<td>1497</td>
</tr>
<tr>
<td></td>
<td>man</td>
<td>756</td>
<td>1799</td>
<td></td>
<td>man</td>
<td>647</td>
<td>1727</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>821</td>
<td>1845</td>
<td></td>
<td></td>
<td>737</td>
<td>1583</td>
</tr>
</tbody>
</table>
Table 3.2

Formant value averages of each word (with CæC structure) pronounced by all male and female speakers of experimental group (post-recording test)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Word</th>
<th>F1 (HZ)</th>
<th>F2 (HZ)</th>
<th>Gender</th>
<th>Word</th>
<th>F1 (HZ)</th>
<th>F2 (HZ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>hat</td>
<td>816</td>
<td>1711</td>
<td>Male</td>
<td>hat</td>
<td>720</td>
<td>1460</td>
</tr>
<tr>
<td></td>
<td>can</td>
<td>835</td>
<td>1916</td>
<td></td>
<td>can</td>
<td>696</td>
<td>1586</td>
</tr>
<tr>
<td></td>
<td>bad</td>
<td>811</td>
<td>1856</td>
<td></td>
<td>bad</td>
<td>620</td>
<td>1450</td>
</tr>
<tr>
<td></td>
<td>man</td>
<td>677</td>
<td>1751</td>
<td></td>
<td>man</td>
<td>617</td>
<td>1570</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>785</td>
<td>1808</td>
<td></td>
<td></td>
<td>663</td>
<td>1516</td>
</tr>
</tbody>
</table>

Figure 2.5. Acoustic map of CæC place of articulation of the experimental group before and after treatment sessions
2.1.1.2 /ə/ Formant values

Formant frequencies averages of Table 3.3 and 3.4 were compared with Johnson /ə/ formant values (Figure 3.6) to see whether there is a significant difference in /ə/ pronunciation before and after ET.

Table 3.3

*Formant value averages of each word (with CəC structure) pronounced by all male and female speakers of experimental group (pre-recording test)*

<table>
<thead>
<tr>
<th>Gender</th>
<th>Word</th>
<th>F1 (HZ)</th>
<th>F2 (HZ)</th>
<th>Gender</th>
<th>Word</th>
<th>F1 (HZ)</th>
<th>F2 (HZ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>for</td>
<td>573</td>
<td>1164</td>
<td>Male</td>
<td>for</td>
<td>553</td>
<td>1273</td>
</tr>
<tr>
<td></td>
<td>her</td>
<td>767</td>
<td>1550</td>
<td></td>
<td>her</td>
<td>653</td>
<td>1519</td>
</tr>
<tr>
<td></td>
<td>was</td>
<td>618</td>
<td>1129</td>
<td></td>
<td>was</td>
<td>564</td>
<td>1180</td>
</tr>
<tr>
<td></td>
<td>sir</td>
<td>693</td>
<td>1623</td>
<td></td>
<td>sir</td>
<td>573</td>
<td>1518</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>663</td>
<td>1366</td>
<td></td>
<td></td>
<td>586</td>
<td>1372</td>
</tr>
</tbody>
</table>
Table 3.4

*Formant value averages of each word pronounced by all male and female speakers of experimental group (post-recording test)*

<table>
<thead>
<tr>
<th>Gender</th>
<th>Word</th>
<th>F1 (HZ)</th>
<th>F2 (HZ)</th>
<th>Gender</th>
<th>Word</th>
<th>F1 (HZ)</th>
<th>F2 (HZ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>for</td>
<td>633</td>
<td>1537</td>
<td>Male</td>
<td>for</td>
<td>510</td>
<td>975</td>
</tr>
<tr>
<td></td>
<td>her</td>
<td>671</td>
<td>1582</td>
<td></td>
<td>her</td>
<td>535</td>
<td>1407</td>
</tr>
<tr>
<td></td>
<td>was</td>
<td>570</td>
<td>1286</td>
<td></td>
<td>was</td>
<td>507</td>
<td>945</td>
</tr>
<tr>
<td></td>
<td>sir</td>
<td>644</td>
<td>1636</td>
<td></td>
<td>sir</td>
<td>476</td>
<td>1625</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>629</td>
<td>1510</td>
<td></td>
<td></td>
<td>507</td>
<td>1238</td>
</tr>
</tbody>
</table>

*Figure 2.6. Acoustic map of CǝC place of articulation of the experimental group before and after treatment sessions*
2.1.2 Measuring Formants using Statistical analysis

The average values gathered from different calculations among experimental group (in the acoustic chart) show how the results, across both genders, vary from the reference results of Ladefoged and Johnson. However, it is not possible to state a final statement concerning the variation of the Formant measurements from the plots alone. Therefore, it was necessary to carry out a quantitative analysis in order to evaluate the significant of the differences.

Since F1 related to vowel high-low position and F2 related to vowel front-back position (Beigi, 2011; Ladefoged, 1975), I used paired t-test for each type of Formants to the experiment groups before and after treatment session. In other words, I compared the values of F1 before treatment session with the values of F1 after treatment session and the values of F2 before treatment with the values of F2 after treatment in order to see whether EPI had an influence on both genders accurate level of pronunciation or not.

Once all the Formant measurements were obtained by one analysis procedure, for each speaker, measuring each vowel individually, Formant values were relocated to an excel spreadsheet to be tested using QI Macros 2014\textsuperscript{4}. To do that, the average of each vowel Formant for the total number obtained from the female and male speakers was calculated using paired t-test. This measurement was done to all vowels, with CaC, CaC syllable, pronounced by both genders in the experimental group before and after treatment session. Paired t-test is used “to assess whether two sets of data generated from a common source under different circumstances have the same mean” (Harrison, 2004, p. 28). For example, it is used to compare ‘before’ and ‘after’ scores in experiments to determine whether significant change has occurred.

\textsuperscript{4} It is a software program that can be installed in excel. The QI Macros Statistical tools option is used to simplify the hypothesis testing and automatically interpret the results.
Paired t-test main formula

\[ t = \frac{\bar{X}_D - \mu_0}{s_D / \sqrt{n}}. \]

Where \( \bar{X}_D \) is the mean of the change scores, \( \mu_0 \) is the hypothesized difference (0 if testing for equal means), \( s_D \) is the sample standard deviation of the differences, and \( n \) is the sample size. The number of degrees of freedom for the problem is \( n - 1 \).

In the analysis below \( P \) is called \( P \) value or calculated probability, which is the estimated probability of rejecting the null hypothesis (H0) of a study question when that hypothesis is true. The term significance level (alpha) is used to refer to a pre-chosen probability and the term "\( P \) value" is used to indicate a probability that you calculate after a given study. If your \( P \) value is less than the chosen significance level, whether 0.1 or 0.05, then you reject the null hypothesis i.e. accept that your sample gives reasonable evidence to support the alternative hypothesis (H1) (Price & Oswald, 2006).

2.1.2.1 Paired samples t-test for experimental group /æ/ and /ə/ vowels

In this test, the significant level (alpha) is (0.05).

1. H0: there is no significant difference in both genders’ accurate pronunciation after explicit phonetic instruction sessions

2. H1: there is a significant difference in both genders’ accurate pronunciation after explicit phonetic instruction sessions

2.1.2.1.1 Female /æ/, /ə/ statistical analysis before and after treatment

The comparison was conducted separately for each type of Formant, i.e., F1 before treatment was compared with F1 after treatment and the same thing for F2.

A paired t-test was used to compare /æ/ F1 mean of females in pre-post sessions. The results indicated that there is no significant difference between F1 values of /æ/ in
the pre-test ($M = 820.65, SD = 66.93$) with F1 values of /æ/ in the post-test ($M = 784.65, SD = 72.62$), $t(3) = 1.204, P = 0.31$. Furthermore, the same procedure was done with F2 and the results indicates that there is no significant difference between F2 values of /æ/ in pre-test ($M = 1845.35, SD = 46.28$) with F2 values of /æ/ in the post-test ($M = 1808.45, SD = 94.42$), $t(3) = 1.076, P = 0.36$.

The same results was found with /ə/, a paired samples t-test indicated that there is no significant difference between F1 values of /ə/ in the pre-test ($M = 662.75, SD = 85.53$) with F1 values of /ə/ in the post-test ($M = 629.40, SD = 42.94$), $t(3) = 1.011, P = 0.38$. Additionally, the same results was found with F2 values; there is no significant difference between F2 values of /ə/ in the pre-test ($M = 1366.40, SD = 255.92$) and F2 values of /ə/ in the post-test ($M = 1510.05, SD = 154.98$), $t(3) = -1.734, P = 0.81$.

### 2.1.2.1.2 Male /æ/, /ə/ statistical analysis before and after treatment

For male speakers, the same procedure was followed. However, the results were different. There is a significant difference between F1 values of /æ/ in the pre-test ($M = 736.85, SD = 72.70$) and F1 values of /æ/ in the post-test ($M = 663.45, SD = 52.51$), $t(3) = 3.446, P = 0.04$. On the other hand, with F2 the results indicated that there is a significant difference between F2 values of /æ/ in the post-test ($M = 1582.60, SD = 103.01$) and F2 values of /æ/ in the post-test ($M = 1516.35, SD = 71.14$), $t(3) = 1.981, P = 0.14$.

For the /ə/ vowel, a paired samples t-test indicated that there is a significant difference between F1 values of /ə/ pre-test ($M = 585.70, SD = 45.76$) and F1 values of /ə/ post-test ($M = 506.80, SD = 23.92$), $t(3) = 4.520, P = 0.02$. On the other hand, F2 results indicates that there is no significant difference between F2 values of /ə/ in the
pre-test \((M = 1372.35, SD = 172.90)\) and F2 values of \(/a/\) in the post-test \((M = 1237.85, SD = 333.68)\), \(t(3) = 1.504, P = 0.23\).

### 2.2 Second hypothesis

#### 2.2.1 Statistical analysis

For the second hypothesis that asks the question whether there is an acoustic difference between EFL Algerian females’ vowel Formants values and male vowel Formant values. Paired t-test was used as well, which is used to determine if means (i.e., averages) are the same or different, i.e., by comparing the mean of genders within the same group.

#### 2.2.1.1 Paired t-test for both genders acoustic differences

To investigate both genders acoustic differences in a level of significance (0.05), I hypothesize that

1. \(H_0\): There is no significant acoustic difference between EFL Algerian female \((/æ/ \text{ and } /ə/)\) Formant values and male \((/æ/ \text{ and } /ə/)\) Formant values.

2. \(H_1\): There is no significant acoustic difference between EFL Algerian female \((/æ/ \text{ and } /ə/)\) Formant values and male \((/æ/ \text{ and } /ə/)\) Formant values.

Before carrying out the paired t-test, the mean and standard deviation was calculated using Excel. Mean (abbreviated \(M\)) is the sum of the scores divided by the number of scores. The mean is just one measure of the central tendency of a set of scores, but the mean is the most common and the most useful. However, standard deviation (abbreviated \(SD\)) is “the average amount by which the scores in a set differ from the mean” (Price & Oswald, 2006).
Table 3.5

*Mean and standard deviation of both groups in the experimental group (post-test)*

<table>
<thead>
<tr>
<th>Gender</th>
<th>Vowel</th>
<th>Mean F1 (HZ)</th>
<th>SD</th>
<th>Mean F2 (HZ)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female (n=5)</td>
<td>æ</td>
<td>785</td>
<td>72.6</td>
<td>1808</td>
<td>94.4</td>
</tr>
<tr>
<td></td>
<td>ø</td>
<td>629</td>
<td>42.9</td>
<td>1510</td>
<td>155.0</td>
</tr>
<tr>
<td>Male (n=5)</td>
<td>æ</td>
<td>663</td>
<td>52.5</td>
<td>1516</td>
<td>71.1</td>
</tr>
<tr>
<td></td>
<td>ø</td>
<td>507</td>
<td>23.9</td>
<td>1238</td>
<td>333.7</td>
</tr>
</tbody>
</table>

The paired sample t-test indicated that F1 (HZ) frequencies of /æ/ made by female speaker \((M= 784.65, SD= 72.62)\) was significantly higher than F1 (HZ) frequencies of /æ/ made by male speaker \((M= 663.45, SD= 52.51), t(3) =4.284 , P= 0.02\). Moreover, for the F2 measurements, the results indicated that F2 (HZ) frequencies of /æ/ made by female speaker \((M= 1808.45, SD= 94.42)\) was significantly higher than F1 (HZ) frequencies of /æ/ made by male speaker \((M= 1516.35, SD= 71.14), t(3) = 5.999, P= 0.009\).

For the /ə/ vowel, a paired samples t-test indicated that F1 (HZ) frequencies of /ə/ made by female speaker \((M= 629.4, SD= 42.94)\) was significantly higher than F1 (HZ) frequencies of /ə/ made by male speaker \((M= 506.8, SD= 23.92), t(3) = 5.587, P = 0.01\). On the other hand, F2 results indicated that there is no significant difference between F2 values of /ə/ female speakers \((M = 1510.05, SD = 154.98)\) and F2 values of /ə/ male speakers \((M= 1237.85, SD= 333.68), t(3) = 2.308, P =0.10\).
Conclusion

In this section, I described the methods used to measure Formant values using Praat program, then I used different types of analysis to analyze the measured data. The next section will explore the results and discussion as well as the pedagogical implications, suggestions, and limitations will be highlighted.
Section 3: Results and conclusions

Introduction

The quantitative data that I collected in this study attempted to answer the two research questions. Investigating the effectiveness of explicit phonetic instruction in the primary area of segmental features on both genders’ pronunciation accuracy is the first question that needed to be answered. Likewise, the second question attempted to investigate whether there is an acoustic difference between EFL Algerian females’ Formant frequencies and males’ Formant frequencies. To answer the research questions, participants were recorded isolated words before and after pronunciation instruction. For the first question, I used two types of analyses: plotting formants using acoustic chart and statistical analysis using paired t-test. However, for the second question I used only paired t-test to differentiate acoustically vowel properties of both genders.

Section 3 concludes this study with results and discussion of the major findings and their implications. The limitations of the study are also discussed, and suggestions for further research are offered.

1. Results and discussion

In light of the findings presented in the analysis above, the two research questions that this study set out to explore can both be answered in the following statements.

With respect to the first part of the question, comparisons of the pre and post-recording speech sample scores showed improvement in males’ pronunciation with CæC structure while females showed small improvement in pronunciation concerning the same structure. However, for CœC structure, males showed statistically significant difference, but this difference is displayed negatively in the acoustic map as being deviating from the target reference (see Figure 3.6). For females, the statistical analysis
did not show any significant difference but viewing the acoustic chart, females showed more improvement after ET with CəC structure.

Even though the Formant values plotted around the targeted reference, it is considered as an accurate pronunciation, because, achieving the level of accuracy does not mean to have a native-like accent but it is a subcategory of intelligibility (Jahandar, 2012). Furthermore, when two different speakers pronounce sets of vowels with the same phonetic quality, the relative positions of these vowels on a Formant chart will be the same, but the absolute values of the Formant frequencies will differ from speaker to speaker (Ladefoged, 1975). We can deduce that both genders have accurate pronunciation. Therefore, we accept the alternate hypothesis and say that Explicit Instruction has an effect on EFL Algerian learners’ accurate pronunciation of both genders /æ/ and /ə/ vowels.

For the second question that asks, whether there is an acoustic difference between EFL Algerian female Formant frequencies and male formant frequencies? The results showed that there is a significant difference between female Formant values and male formant values. Females’ Formant values of /æ/ and /ə/ were higher than males (see Table 3.5) and this support the findings of many researchers that female Formant frequencies tend to be higher than males’ Formant frequencies (Karlsson, 1992; Pepiot, 2013). The differences in the frequencies can be ascribed to the anatomical variations of the vocal tract that distinguish each gender, which is described clearly in the theoretical part of the research.

2. Pedagogical implication

As an EFL learner and researcher, it is very important not to consider just TEFL courses, like most EFL teachers do. If possible, there should be an extra focus on
teaching phonetics and phonology not in terms of language lab but in terms of phonology lab, i.e., make the students practice what phonological aspects represent.

Understanding how speakers learn to produce a foreign language is influenced by different insights of phonology, acoustic phonetics and articulatory phonetics (Davidson, 2011). For example, the Algerian context focuses more on the articulatory one with few sessions and no real practices while auditory and acoustics are put aside. This research highlighted an important aspect, which is acoustic phonetics. Little researchers investigate the acoustic properties of EFL Algerian learners’ pronunciation. This fact draws a departure to open the door for that important aspect.

Many researchers support conducting an acoustic study that is related to observing one’s articulatory progress in pronouncing. According to Wilson and Gick (2006), articulatory studies focus “at the articulators (e.g., the tongue, the lips, the jaw, etc.) and can often give a more accurate picture of the actions performed by the pronunciation learner” (p. 148). Furthermore, “If learners are able to see directly the articulators, then they probably have an improved perception of the articulatory adjustments needed to improve their pronunciation” (ibid.). The formant values helps the researcher to provide visible evidence to show the progress, i.e., to evaluate whether the learner is making progress in pronunciation or not. The plotted chart of vowel positions will be a diagnostic tool because it helps to provide evidence of students’ pronunciation in comparison with the Standard English pronunciation. However, plotting the Formants in a form of chart seems not enough to help students improving pronunciation. How to transform the formant values into clear and meaningful pronunciation instruction is what EFL teachers should focus on.
O’Connor (1980) in his book *better English pronunciation* asks an important question in a title named “Lend me your ears”. He says that “if the speech depends on hearing, and books don’t talk, what are you to do?” (p. 3). This question makes the reader opens a window to see the concept of teaching/learning pronunciation from other angle. Therefore, depending only on the theoretical aspects is not enough. The learner should hear English, but hearing only is not enough. They should listen to it not for meaning but for the sound of it *(ibid.)*. Reaching the term of pronunciation improvement can be implemented by the use of Praat in the course design of phonetic module, i.e., make the learners have extra exposure to English language by using that program as a tape recorder. This program can be used as a tool to record, and repeat any part of speech in which the learner has difficulty with as well as is used to analyze and manipulate the learners’ pronunciation in terms of Formant values. This will help them develop the ability to monitor and assess their own pronunciation (by comparing the Formants in each record), recognize the importance of reaching the accurate language as well as develop the auditory abilities while listening.

For most EFL teachers, the thing they concern most is how they help students get rid of mother tongue accent and become more English native-like. In fact, most of the pronunciation materials rarely discuss the role of acoustic studies. One of the effective ways to improve students’ pronunciation is to provide them with more than one session per week using balanced approaches in the process of teaching pronunciation, which are: ‘top-down’ and ‘bottom-up’ approaches. The former focuses on SUPSEG features including intonation, linking, reduction, stress, rhythm, and fluency. This approach demands students to put much effort on listening and communicating or using authentic materials in the activities, while the latter is designed for students who have problems with pronouncing vowels and consonants, i.e., SEG
features (Roach, 1998). Both approaches can show positive results while tackling them explicitly.

2. Limitations

There are many limitations in study that can affect the current research. Time constraints affected the research a lot because at the beginning I decided to analyze three types of tokens: Formant values of isolated words, Formant values of the same words within a context, and vowel duration of all the vowels. However, I tackled just the first type. Additionally, difficulties in gathering participants in one group, as well as the fact that the control group has no teacher affects somehow the results because any experiment should compare two types of instructions: the traditional with the tested one. Furthermore, the administration prevents me to carry out any experimental session that is why I conducted just two weeks. Likewise, the differences between the pre-post recording sessions affected the results. The obstacles that I found from the administration, made finding place to gather participants to carry out the post-test impossible. However, the teacher of oral expression helped me to record the participants but in a noisy atmosphere. In addition to that, the small size of the participant (20 subjects) makes it difficult to generalize these findings to all EFL Algerian learners. Therefore, it is difficult to say if the significant differences that both genders achieved after the treatment sessions were caused solely by the pronunciation instruction used during the study, or if there were other factors that affect the post-recording findings, such as increased exposure to English language both in and outside the classroom, such as extensive listening to English music. Finally, I found difficulties in choosing the appropriate type of tests, because each token has two values to be measured (F1 and F2) as well as difficulties in finding the Formant values of /ɒ/ vowel to be used as a
reference in the acoustic analysis, because little work is done by researchers concerning /ə/ vowel.

3. **Suggestions for Further Research**

Despite the fact that, this research answers the proposed questions, it also opens the window for many questions that could be examined through further research. The creation of a similar study that utilizes a control group that study other type of instruction (e.g., implicit teaching) would provide more answers in regards to how great the effectiveness of EPI on the learners’ accuracy improvements. In addition, a similarly designed study that use isolated words within a context in different positions as well as analyzing the vowel duration could yield more conclusive results. To this end, the study relied on measuring only the first two vowel Formants while lip movement, and active tongue movement still absent in that study. Further research into the role of cultural aspects rather than anatomical one would be an interesting parallel to this study.

Finally, the analysis of speech by means of instruments can be acoustic (studying the vibrations caused by speech sound) or articulatory (studying the movements of articulations, which produce speech sounds) (Roach, 2009). There are different techniques used for different instrumentals, for the acoustic analysis (which is the focus of the current study), spectrograph that is a picture produces in the computer that shows the analysis of Formant frequencies is used as a technique to analyze the speech. However, this research lacks the analysis of articulatory aspects that is used different techniques and could be used in further studies: 1) *Radiography* (x-rays) which is used to examine vocal tract activities. 2) *Laryngoscopy* is used to inspecting the inside of the larynx. 3) *Palatography* is used as a tool to record patterns of contact between tongue and palate. 4) *Glottography*, is used to study the vibration of the vocal folds (*ibid.*).
Conclusion

This section examines the results and discussion of the findings as well as their implications. Furthermore, limitations of the study are mentioned, and suggestions for further research are offered.
General conclusion

This study took place in Oum El Bouaghi at Larbi Ben M'hidi University by EFL Algerian learners. The aim of this study was to determine how EPI affects EFL Algerian learners’ accurate pronunciation and whether there is an acoustic difference between both gender’s /æ/ and /ə/ formant values. This study employed quantitative methods that is used experimental design and depends on numerical data to investigate the target points. Results from the study were based on a variety of data collection methods, including pre-post recording speech samples. These samples were analyzed using a computer program named Praat, which is used to analyze the sounds to see its place of articulation as well as the acoustic properties of the vowel.

Ten EFL Algerian adult learners participated in the experimental group (5 females and 5 males). All of them recorded 1) speech samples that consist of isolated words in the week prior to the treatment session and 2) the same speech samples in the week following the instruction. The teacher of phonetics conducted the classroom instruction that focused on teaching segmental features in phonetic session. However, I focused on further practice in oral session. The practical sessions took two weeks, with instruction provided an average of two times a week for 50 minutes each session.

The other group of study that participated in the control group consisted of ten students as well (5 females and 5 males). The participants of this group had no teacher of phonetics. Therefore, they did not receive any instruction during the current study. However, they were recorded with the same procedure of the experiment group. The speech samples that were recorded in the pre-post recording tests were measured using Praat program and the results were analyzed statistically.
I chose to focus on pronunciation for second year LMD EFL Algerian learners based on growing concern around the lack of pronunciation instruction and real practice in EL classrooms as well as to fill in the gaps of previous studies that were conducted by Lain (2013) and Mokri (2013). In other words, the Algerian curriculum provides EFL classrooms with one session of phonetics per week for two years, but in fact it is not enough for achieving accurate level of pronunciation. Through my own observations in the practical classroom, I noticed that many of the learners lack the ability to speak accurately. However, by the end of each session, the learners enjoyed the pronunciation instruction and found it helpful to them. Most of the participants asked me for the handouts that were used during the sessions to be practiced at home. This supports the idea that all of them agree about the fact that they lack real practice of the phonological rules.

These observations caused me to become intrigued by the concept of teaching the phonological rules intensively more than one session per week. It is claimed by some researchers that “if an adult EL learner can be taught the features of English that characterizes its voice quality settings, there is a good chance that their pronunciation of segmentals will noticeably improve” (Esling & Wong, 1983; Jenkins, 2000; Kerr, 2000; as cited in Echelberger, 2013). As a result of this research, I decided to instruct the learner-participants in English voice quality settings (how words are articulated) during the instructional period. Training exercises and games that I used in the treatment session can be found in Hancock (2005) pronunciation games book, as well as I used some activities retrieved from internet websites. This study set out to investigate whether or not this type of instruction will help EFL Algerian learners improve their pronunciation. The results indicated that ET has a positive effect on achieving the accurate level of pronunciation. It also attempted to investigate whether there is an
acoustic difference between both genders’ Formant values. The analysis showed Formant frequencies of female learners were higher than males. Finally, a full description of the classroom instruction can be found in the practical part. Additionally, photocobiable handouts can be found in the appendices, along with speech samples that were used in the recording tests as well as Formant values averages of each words pronounced by males and females.
List of references


Appendices

Appendix A1. Go Fish game that is used in the first session of the experiment

Appendix A2. Minimal pairs that are used at the end of the first session of the experiment

Appendix B1. Tongue twisters that is used as a warming up activity in the second session of the experiment

Appendix B2. Join the dots game that is used in the third session of the experiment

Appendix C1. Hidden names game that is used in the third session of the experiment

Appendix C2. Cluster buster game that is used in the third session of the experiment

Appendix D1. Sentences that are used as a warming up activity in the fourth session of the experiment

Appendix D2. Dictation computer game that is used in the fourth session of the treatment
Appendix A1

Go Fish game that is used in the first session of the experiment

This game is best played in pairs or small groups – a really fun way to practice homophones!

Make a list of the homophone pairs you’ll use, and write each word on a separate index card or piece of paper. Make as many decks of cards as you’ll need depending on the number of groups you’ll have. Each group gets a set of cards; each student gets five cards. The remaining cards are put in a draw pile. The goal of the game is to find the matching homophone by asking another student if they have “a word that sounds like…” For example:

Student 1 (S1): Do you have a word that sounds like “plane”?

Student 2 (S2): Yes, I do. (hands over “plain”)

Now, to keep the matching pair the S1 must use both words correctly in a sentence or two. If S2 does not possess the homophone he/she has to say, “Go fish!” and S1 takes a card from the draw pile.

The used minimal pair words were retrieved from (http://iteslj.org/links/search.cgi?query=minimal+pairs)
### Appendix A2

**Minimal pairs that are used at the end of the first session of the experiment**

**Minimal pair 1**

<table>
<thead>
<tr>
<th>bought</th>
<th>boat</th>
<th>but</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bought</strong></td>
<td><strong>Saw</strong></td>
<td><strong>Call</strong></td>
</tr>
<tr>
<td>Boat</td>
<td>No</td>
<td>So</td>
</tr>
<tr>
<td>But</td>
<td>Cut</td>
<td>What</td>
</tr>
</tbody>
</table>

**Minimal pair 2**

<table>
<thead>
<tr>
<th>late</th>
<th>let</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Late</strong></td>
<td><strong>Name</strong></td>
</tr>
<tr>
<td>Let</td>
<td>Get</td>
</tr>
</tbody>
</table>

**Minimal pair 3**

<table>
<thead>
<tr>
<th>bed</th>
<th>bad</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bed</strong></td>
<td><strong>Head</strong></td>
</tr>
<tr>
<td>Bad</td>
<td>Had</td>
</tr>
</tbody>
</table>

**Minimal pair 4**

<table>
<thead>
<tr>
<th>feel</th>
<th>fell</th>
<th>fill</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Feel</strong></td>
<td><strong>See</strong></td>
<td><strong>Meet</strong></td>
</tr>
<tr>
<td>Fell</td>
<td>Egg</td>
<td>Wet</td>
</tr>
<tr>
<td>Fill</td>
<td>Will</td>
<td>It</td>
</tr>
</tbody>
</table>
Minimal pair 5

<table>
<thead>
<tr>
<th>Luck</th>
<th>But</th>
<th>What</th>
<th>Fun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Look</td>
<td>Took</td>
<td>Cook</td>
<td>Book</td>
</tr>
</tbody>
</table>

Minimal pair 6

<table>
<thead>
<tr>
<th>Hat</th>
<th>Cat</th>
<th>Back</th>
<th>Map</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart</td>
<td>Dark</td>
<td>Start</td>
<td>Park</td>
</tr>
<tr>
<td>Hot</td>
<td>Not</td>
<td>Body</td>
<td>Got</td>
</tr>
</tbody>
</table>
Appendix B1

Tongue twisters that is used as a warming up activity in the second session of the experiment

example 1

Peter Piper picked a peck of pickled peppers.

A peck of pickled peppers Peter Piper picked.

If Peter Piper picked a peck of pickled peppers,

Where's the peck of pickled peppers Peter Piper picked?

example 2

Something in a thirty-acre thermal thicket of thorns and thistles thumped and thundered threatening the three-D thoughts of Matthew the thug - although, theatrically, it was only the thirteen-thousand thistles and thorns through the underneath of his thigh that the thirty year old thug thought of that morning

example 3


Luck's duck licks lakes.


example 4

Mary Mac's mother's making Mary Mac marry me.

My mother's making me marry Mary Mac.

Will I always be so Merry when Mary's taking care of me?

Will I always be so merry when I marry Mary Mac?

dexample 5

A Tudor who tooted the flute

tried to tutor two tooters to toot.

Said the two to the tutor,

"Is it harder to toot or

to tutor two tooters to toot?"
Appendix B2

Join the dots game that is used in the third session of the experiment

**Puzzle 1**

To find out what the cat is doing, match the phonetic transcriptions to words in the picture. Then join the dots by these words in the same order as the list of phonetic transcriptions. Some dots may be used twice.

```
1 /bɑːn/  buy
2 /bɔː/  bar
3 /jʌŋ/  young
4 /bɛə/  bear
5 /bɛt/  June
6 /jʌˈz/  bore
7 /bɛər/  bear
8 /bɔːl/  your
9 /jɔ/  your
10 /bɛt/  you

bone

burn
```

**Puzzle 2**

To find out what the bear is doing, match the phonetic transcriptions to words in the picture. Then join the dots by these words in the same order as the list of phonetic transcriptions. Some dots may be used twice.

```
1 /θʌŋk/  think
2 /bɹi:/  three
3 /ˈbɑːð/  bath
4 /wʌn/  one
5 /wɛn/  was
6 /wɛt/  wet
7 /ʃu/  shoe
8 /ˈwoʊ/  won
9 /peɪdʒ/  page
10 /pleɪs/  place

wine

when

think

paid

was

plays
```
Appendix C1

Hidden names game that is used in the third session of the experiment
Appendix C2

Cluster buster game that is used in the third session of the experiment

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIME (2)</td>
<td>WHY (2)</td>
<td>ICE (2)</td>
<td>KEY (2)</td>
<td>LOCK (2)</td>
</tr>
<tr>
<td>ILL (2)</td>
<td>EIGHT (3)</td>
<td>ACHE (3)</td>
<td>RAY (3)</td>
<td>WHOLE (2)</td>
</tr>
<tr>
<td>WIN (2)</td>
<td>OWE (3)</td>
<td>LAY (3)</td>
<td>TEA (3)</td>
<td>COOL (2)</td>
</tr>
<tr>
<td>NECK (2)</td>
<td>PAY (3)</td>
<td>EYE (3)</td>
<td>ART (3)</td>
<td>ACE (2)</td>
</tr>
<tr>
<td>POT (2)</td>
<td>EYES (2)</td>
<td>HELL (2)</td>
<td>THING (2)</td>
<td>IN (2)</td>
</tr>
</tbody>
</table>
### Appendix D1

Sentences that are used as a warming up activity in the fourth session of the experiment

<table>
<thead>
<tr>
<th>SENTENCE</th>
<th>TRANSCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHAT’S her NAME?</td>
<td>/ wɒts ə neɪm /</td>
</tr>
<tr>
<td>WHAT’S your NUMBER?</td>
<td>/ wɒtsjʊər ˈnumər /</td>
</tr>
<tr>
<td>JOHN can SWIM</td>
<td>/ dʒɔn kən /</td>
</tr>
<tr>
<td>TEA for TWO</td>
<td>/ tiː fətuː /</td>
</tr>
<tr>
<td>the PRICE has FALLEN</td>
<td>/ dɪˈpraɪʃəzflən /</td>
</tr>
<tr>
<td>FISH and SHIPS</td>
<td>/ fɪʃ ənd ˈʃɪps /</td>
</tr>
<tr>
<td>GO to BED</td>
<td>/ ɡəʊtə bed /</td>
</tr>
<tr>
<td>DOGS are FRIENDLY</td>
<td>/ dɒgz ə ˈfrendlɪ /</td>
</tr>
<tr>
<td>HAVE a DRINK</td>
<td>/ hæv ə dɹɪnk /</td>
</tr>
<tr>
<td>WHAT does SARAH DO?</td>
<td>/ waʊtdeɪəzseɪrə duː /</td>
</tr>
</tbody>
</table>
Dictation computer game that is used in the fourth session of the treatment

The dictation computer prints exactly what it hears. Sometimes, however, there is more than one possibility and the computer makes a mistake.

Find the errors in the computer’s work in the left hand column. Then match the sentences with their responses in the right hand column.

Use the responses as clues if you have difficulty finding the mistakes.

D2

1. Alaska if she wants to come with us.

2. I can pose music for TV programmes.

3. The office has changed into civilian clothes.

4. Did you see the way to go? He was at the next table a minute ago.

5. In this newspaper, the TV guide is on the sent a page.

6. I picture book off the floor.

7. Will you ever for give me?

8. This map shows all the citizen railways in the country.

9. Spy does are not really insects you know.

10. Coke and Pepsi arrival companies.

A. Who changed into civilian clothes?

B. Yes; I saw him going into the kitchen.

C. You’ll ask who?

D. Really? It used to be on the back page.

E. I didn’t know you were a composer.

F. Only if you promise never to do it again.

G. They look like insects to me!

H. Oh thanks. I didn’t realise I’d dropped it.

I. Do you think so? I think they work together, myself.

J. It doesn’t show the smaller places then?
Résumé

Cette recherche tente de fournir une preuve expérimentale de savoir si l'enseignement phonétique explicite affecte niveau précis de EFL apprenant algérien de la prononciation et si il ya une différence acoustique entre les deux sexes / æ / / ə / fréquences et formants. D'un intérêt particulier, cette recherche tente de répondre à la question suivante: Est-ce que l'enseignement phonétique explicite, dans la zone primaire de caractéristiques segmentaires, incidence sur la prononciation de l'exactitude de l'apprenant EFL algérien? Quelle est la différence acoustique entre hommes et femmes fréquences / æ / et / ə / Formant? Les participants étaient vingt apprenants Université algérienne de l'anglais à Larbi Ben M'hidi Université. Ils ont été répartis également en deux groupes: groupe expérimental se compose de dix sujets répartis à parts égales en cinq femelles et cinq mâles et groupe de contrôle composé de dix participants répartis à parts égales en cinq femelles et cinq mâles ainsi. Dans le processus de réalisation de cette recherche, des mots isolés ont été utilisés comme tests de pré-enregistrement de poste pour les deux groupes. Cependant, l'enseignement phonétique explicite avec plus de pratique était le noyau principal de la séance de traitement. Programme Praat a été utilisé pour mesurer acoustiquement les enregistrements. Cependant, tableau acoustique et l'analyse statistique ont été utilisés pour examiner l'importance du traitement sur la variable explicative (de genre). Pour la première question, les résultats indiquent qu'il existe une différence significative dans la prononciation exacte des deux sexes après l'enseignement explicite. Pour la deuxième question, l'analyse acoustique a montré que EFL algérienne femmes / æ / / ə / fréquences et Formant étaient plus élevés que les fréquences de formants masculins. L'étude a également proposé un certain nombre de suggestions pour les recherches futures.
ملخص

يحاول هذا البحث تقديم الأبحاث التجريبية عما إذا كان تدريس اللفظ بوضوح يؤثر على مستوى النطق لدى طلبة اللغة الإنجليزية في الجزائر. أظهرت الأبحاث أنه للرد على الأسئلة التالية: هل تدريس اللفظ بوضوح من ناحية الحروف اللينة يؤثر على دقة النطق للطلبة؟ هل هناك فروق في ترددات الصوت للحروف 'ا' و 'ء' بين الجنسين؟ عدد المشاركين في هذا البحث عشرين طالبًا من جامعة العربي بن مهدي، الإسماعيلي. تم تقسيمهم بالتساوي إلى مجموعتين. مجموعة تتكون من عشرة مشاركين (خمسة ذكور وخمسة إناث) والمجموعة الأخرى تتكون أيضا من نفس العدد مقسم بالتساوي إلى خمسة ذكور وخمسة إناث. في عملية اجراء هذا البحث، كل مشارك سجلت كلمات مفردة كاختبار بدائي ونهائي وتعتبر تعلية اللفظ الواضح. متى هذا الياج ظهر هذا الباحث الذي من خلاله تستطيع أن تجيب على الأسئلة السابقة. تم استخدام برامج برات لقياس التسجيلات سمعيا. كذلك الرسم البياني للصوتيات والتحليل الإحصائي يقدم بحثاً مفصلاً عن تأثير التعلية اللفظية الواضحة. نتائج السؤال الأول تظهر فرق كبير في دقة النطق من كلا الجنسين بعد تطبيق التعلية اللفظية الصريحة. أما بالنسبة للسؤال الثاني، فنتائج التحليل الصوتي تظهر أن ترددات أصوات النساء في الجزائر أعلى من الرجال.