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Article

# English Vowels Pronunciation Accuracy: an Acoustic Phonetics Study with PRAAT

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**A B S T R A C T**

Examining pronunciation accuracy can be done both by analyzing speech production acoustically using PRAAT software and by taking minimal pairs as research data. The causes of mistake and the factors affecting pronunciation phonetically can be identified through this analysis. This research is aimed to measure the accuracy of the pronunciation of English vowel sounds by third-semester students majoring in English Education by comparing them to the standard pronunciation of English native speaker and to identify factors causing pronunciation problems. This descriptive qualitative research was conducted through several phases: (1) data collection, (2) data analysis, and (3) presentation of the result. The results showed that, out of four participants, there is only one participant who can distinguish front and back vowels correctly while the other three participants fail to distinguish them at certain vowel sounds. The most common mistake is at long and short vowels ([i:] : [I] and [u:] : [ʊ]). Participants fail distinguishing long and short vowels even though they have been informed that they are different. Furthermore, the problems of pronouncing [æ], [ɔ:], and [ɒ] varied across the participants. The first language interference, attitude toward English, and lack of motivation are indicated to be the factors affecting pronunciation.

## INTRODUCTION

English is one of the languages in the world which writing system is different from its pronunciation. This, of course, raises problems in English pronunciation, especially for non-native speakers who learn English. The problem is caused by the way letters represent sounds or vice versa. In English, one sound can be represented by different letters or the same letter can represent different sounds. Moreover, it is not hard to find one sound which is represented by a combination of letters or one single letter that represent more than one sound (Yavas, 2011). Because of those phenomena described previously, most native English-speaking children are familiarized with the only twenty-six English letters in forty-five or so different sounds speech sounds from a very young age (Ogden, 2009).

Native speakers learn these differences in sound and letters at an early age. Non-native speakers should also be familiarized with the sounds in English from the very beginning of English learning. However, some researches showed that the early teaching of English in the non-English speaking country, including Indonesia, does not

focus on pronunciation. Priority is often only given to vocabulary and grammar, but not to pronunciation. Teachers pay enough attention to grammar and vocabulary in learning foreign languages and they help students become skillful in listening and reading. Most teachers think that learning pronunciation is too difficult and monotonous for students (Harmer, 2007). In accordance with that statement, Gilakjani (2012) stated that the problem arising in the pronunciation teaching is although the role of English pronunciation is important in English language, many teachers do not pay enough attention to this important skill. As a result, pronunciation problems often occur and continue to middle and high school even to college. Indeed, pronunciation problems must also be caused by mother tongue interference, but if students have been familiarized with the correct pronunciation from the beginning of the learning process, the errors can be minimized.

As lecturers of Pronunciation Practice and English Phonetics and Phonology, the writers often found students who have difficulties in pronouncing certain English sounds, whether it is vowel or consonant. The participants of this present research who are the third-semester students of the English Education Program have received the Pronunciation Practice subject in the previous semester, the second semester. In the Pronunciation Practice class students are taught how to produce consonant and vowel sounds correctly. Hopefully, by studying English Pronunciation, pronunciation errors in English sounds will no longer occur or at least can be minimized. The students who have passed the Pronunciation Practice subject are considered to have enough knowledge and ability to pronounce words in English correctly.

In fact, from the observation, the writers have found that errors in the pronunciation, especially the pronunciation of vowel sounds, still frequently occur. The error is not only found in specific vowel position but at all possible positions, initial, medial, and final. In this research, the researchers wanted to see the accuracy of English vowels pronunciation of the third-semester students majoring in English Education. This analysis can be done by seeing it through acoustic phonetics study by utilizing PRAAT software which is a computer program for analyzing, synthesizing, and manipulating speech. PRAAT enables researchers to observe the spectrogram of each sound so that the vowel quality can be measured. PRAAT was developed in 1992 by Paul Boersma and David Weenink at the Institute of Phonetic Sciences of the University of Amsterdam (Boersma and van Heuven, 2001).

Discussing about vowel sounds in acoustic phonetics perspective, there is a relatively simple correspondence between tongue height, the advancement (frontness and backness) dimension of the tongue, and the relative positions of F1 and F2. The first formant relates to vowel height. Close vowels have a low F1, and open vowels have a high F1. The second formant relates to the advancement (frontness and backness) dimension of the tongue. Front vowels have a high F2, but back vowels have a low F2. Rounding the lips also lowers F2, so as we move through cardinals 1–8, F2 gets progressively lower (Ogden, 2009). Recent works in speech research have demonstrated that certain articulatory properties of speech sounds can be recorded, analyzed, and evaluated in computer laboratories, including the properties of vowel sounds. Some scholars have conducted researches on acoustics phonetics. Those studies tried to measure the accuracy of vowel pronunciation by non-native speakers with different mother tongues. Li (2004) conducted research examining the acoustic properties of Taiwanese adult learners' vowel pronunciation. Da, Tilman and Nurhayani (2015) conducted research that was aimed at describing the pronunciation errors of front vowels done by the first semester students of Timor Loorosa'e National University in Timor Leste. Moreover, Ganie, Maulana, and Rangkuti (2019) conducted research aimed at finding out the dominant errors of the pronunciation of English phonemes made by students from North Sumatera.

Those three studies have shown that participants have difficulties in pronouncing the English vowel correctly. Although the results of the analysis showed difficulties appear in different sounds in each study, the difficulties were generally caused by the interference of mother tongue. In this present research, the researchers try to find another factors that cause pronunciation errors besides the interference of mother tongue because it has already been the definite factor of pronunciation error. The researchers believe that there are other factors that greatly influence the improvement of students' pronunciation skills.

Overall, this research aimed to measure the accuracy of the pronunciation of English vowel sounds by third-semester students majoring in English Education by comparing them to the standard pronunciation by native speakers of English and to identify factors causing pronunciation error. By comparing the sounds of native and non-native speakers acoustically, the causes of pronunciation errors will be found.

## METHOD

To deal with the problem, this research employed a descriptive qualitative method which was based on the facts or phenomenon that occur empirically in amongst the users. The research design was undertaken to describe the data in the form of spoken words from the object of research that can be observed to obtain the picture of phenomenon in the students' pronunciation. The data in numerical information were involved to describe the vowel

quality by seeing the frequency of first formant (F1) and second formant (F2) of the pronounced phonemes.

This research was conducted with three stages of research, namely (1) data collection, (2) data analysis, and (3) presentation of the result. The data were collected from native and non-native English speakers' pronunciation. The data were in the form of monosyllabic minimal pairs. Monosyllabic minimal pairs were chosen because of some reasons. Minimal pairs are "pair of words that have the same sounds in the same order except for a single difference in sounds, and have a different meaning" (Yavas, 2011). This definition emphasizes that the correct pronunciation of a single different sound of the words within minimal pairs will be significant in differentiating meaning. Minimal pairs are also frequently used in pronunciation learning to prove the appearance of phonemic differences between two sounds.

The error in pronouncing those sounds will be influential. Furthermore, Mirza (1987) and Feldman, et. al. (2013) found that learning sounds that appear within words will be more helpful for learners to recognize the sounds than learning the isolated sounds. Hence, some keywords containing the analyzed sounds are needed for they enable learners to contrast different vowel sounds. Because of those reasons, the monosyllabic words with CVC patterns were chosen as the data to be analyzed.

Data recording was done by downloading the native speaker's voice from lexico.com powered by Oxford and the recording of the students' voices. Four participants were chosen randomly as the informants in this project. They were students of the English Education Program studying in the third semester. The data were recorded by using a laptop and a headset.

In accordance with students' attitude, the data were taken through interview. The approach to interviewing included the direct elicitation. The interview was done individually through tightly controlled conversation so that the data needed can naturally emerge (Wray, A, Trott, K, & Bloomer, 1998). These individual interviews were done to avoid one person's influence on another person.

In analyzing phase, the recorded data were transferred into PRAAT software. The analysis was done by finding the formant frequency (F1 and F2) of each vowel pronounced by students. The F1 and F2 of the students were compared to the F1 and F2 of a native speaker to examine the error or the accuracy of students' pronunciation. A native speaker's pronunciation was used as the comparison because it was considered a standard pronunciation. The results of the analysis were presented formally in the form of a description. This phase was also completed with the identification of factors affecting students' pronunciation based on the interview done to each participant questioning about their process of pronunciation learning and their habitual activities concerning English pronunciation.

## RESULTS AND DISCUSSION

### 1. The Comparison between Native and Non-native Vowel Quality

The following table 1 and 2 reveal the frequency of F1 and F2 of an English native speaker whose voice was recorded from lexico.com powered by Oxford. This voice was used as the standard and would be compared to participants' pronunciation due to the assumption that a native speaker has more accurate vowel qualities than participants who are not native speakers of English.

From the results of the identification that have been done by using PRAAT software, it was found that the frequency of F1 and F2 of vowel sounds in minimal pairs are as follows:

**Table 1** Front Vowel of English Native Speaker

| Word | Sound | F1 | F2 |
|---|---|---|---|
| peach | [i:] | 395 | 2024 |
| pitch | [I] | 543 | 1926 |
| head | [e] | 636 | 1855 |
| had | [æ] | 820 | 1670 |

It is seen in Table 1, the F1 frequency of front vowels [i:] and [I] of both words in minimal pairs are significantly different. This discrepancy shows the variation of tongue height when both words are uttered. The sound [i:] as long-high vowel has F1 which is lower than F1 of the short-high vowel [I] it is higher than [I]. Furthermore, the frequency of F2 of sound [i:] is slightly higher than F2 of the sound [I] because both are equally front vowels, but [i;] is a little bit more fronted than [I].

The next minimal pair that contains front vowel sounds is head: had. The sounds in contrast [e] and [æ] are two front vowels with different tongue heights, open-mid and open, so F1 is also different. The higher sound [e] has a lower F1 than the lower one [æ ]. For F2, the sound [e] is more fronted than [æ], therefore the F2 of the [e] is higher than F2 of [æ]. From the distinct frequency of F1 and F2 of both sounds, it can be concluded that the pairs of words are pronounced in different ways. The sound [i:] must be pronounced differently from [I] and [e] must also be different from [æ].

**Table 2** Back Vowel of English Native Speaker

| Word | Sound | F1 | F2 |
|---|---|---|---|
| fool | [u:] | 529 | 953 |
| full | [ʊ] | 599 | 1137 |
| cool | [u:] | 556 | 1126 |
| call | [ɔ:] | 672 | 910 |
| hoot | [u:] | 493 | 1268 |
| hot | [ɒ] | 686 | 1157 |

In this research, the researchers took three minimal pairs to compare the quality of the back vowel contained by each pair. In Table 2, sounds in contrast [u:] and [ʊ] in the words fool and full are two high-back vowels with different

vowel qualities which are indicated by the differences in the frequencies of F1 and F2. Besides the slight difference in tongue height (F1) and vowel length, [u:] and [ʊ] are also different in terms of the advancement (front/back) dimension of the tongue although both of them are back vowels. Because [ʊ] is more fronted than [u:], the frequency of F2 is higher than the one of [u:].

Minimal pair of cool and call compares vowel [u:] and [ɔ:]. These sounds, in contrast, are dissimilar in vowel quality which is indicated by the difference between F1 and F2 of both sounds. [u:] is a high vowel that has lower F1 than [ɔ:] which means that the tongue position of [u:] is higher than the one of [ɔ:]. The frequency F2 [u:] is higher than the frequency F2 [ɔ:] because [u:] is more fronted than [ɔ:]. In the vowel chart [ɔ:] it is at the furthest position of the tongue so that its F2 is the lowest among all back vowels.

The next minimal pair is hoot and hot that has sounds in contrast [u:] and [ɒ]. The height of the tongue of these two sounds is significantly different, as designated by the difference of both sounds F1 frequencies which is relatively big. This is because [u:] is a high-back vowel so it belongs to a closed vowel while [ɒ] is a low-back vowel that requires an open jaw. Moreover, [u:] is back vowel which is slight more fronted than [ɒ]. That is why the F2 of [u:] is higher than F2 of [ɒ].

The results of the F1 and F2 analysis of front and back vowels contained by the minimal pairs pronounced by the native speakers of English above will be the comparison to measure the accuracy of the pronunciation of the front and back vowels by the participants. The following are the results of the F1 and F2 analysis of each front and back vowels of each participant.

**Table 3** Front Vowel of Participant 1

| Word | Sound | F1 | F2 |
|---|---|---|---|
| peach | [i:] | 505 | 2281 |
| pitch | [I] | 477 | 2274 |
| head | [e] | 634 | 2021 |
| had | [æ] | 613 | 1998 |

Table 3 reveals the diversity between F1 and F2 of front vowels in the minimal pairs pronounced by the non-native speaker with the ones pronounced by a native speaker. It is seen that F1 of [i:] is higher than F1 of [i] where it should have been lower because [i:] is higher than [I] so that it is more closed then [I]. Moreover, in terms of tongue advancement, the two sounds also did not show a significant difference. The F2s are on almost the same frequencies. These results indicate that participant 1 cannot distinguish yet how to pronounce long-high vowel [i:] and short-high vowel [I].

Furthermore, the vowel quality of open-mid vowel [e] and open [æ] in the minimal pair pronounced by participant 1 also does not show a significant difference where it should have been significantly different as exemplified by native speaker pronunciation in Table 1. These results again show that the participant 1 has not been able to distinguish the pronunciation of vowel [e] and [æ] so that the two words in the minimal pair are pronounced relatively the same.

**Table 4** Back Vowel of English Participant 1

| Word | Sound | F1 | F2 |
|---|---|---|---|
| fool | [u:] | 625 | 1679 |
| full | [ʊ] | 635 | 1632 |
| cool | [u:] | 566 | 1633 |
| call | [ɔ:] | 707 | 1087 |
| hoot | [u:] | 285 | 1142 |
| hot | [ɒ] | 744 | 1181 |

It is shown in Table 4 that the minimal pair fool and full with contrasting sounds [u:] and [ʊ] as the contrasting sounds show the minimum difference in F1 which is only 10 Hz. It means that the tongue height when both sounds are pronounced are very much alike. The difference of F2 between the two sounds is not prominent, where it should have been as shown by the ones of the native speaker. Even further, F2 [ʊ] is lower than F2 [u:] when it should have been higher because [ʊ] is more fronted than [u:]. Still, these results indicate that participant 1 has not been able to distinguish the pronunciation of long, high-back vowel [u:] from short high-back vowel [ʊ].

For the minimal pair cool and call with [u:] and [ɔ:] as contrasting sounds, it appears that participant 1 has pronounced the two sounds quite accurately. When F1 of both sounds are compared to the F1s of the native speaker, it can be said that they are almost the same. On the other hand, F2 is quite different from that of native speakers. Both sounds are pronounced with F2 much higher than native speaker's which means [u:] and [ɔ:] participants are more fronted than those of native speakers.

Finally, minimal pair hoot and hot with [u:] and [ɒ] as sounds in contrast. When it is compared, F1 [u:] and F1 [ɒ] are significantly different. Indeed, both of them are at a much different height of the tongue. [u:] is pronounced with the high tongue position while [ɒ] is pronounced with the low tongue position. The frequency of the F2 of both sounds is also ve ry much different even though both are back vowels but [u:] is a little bit fronted than [ɒ]. However, specifically for the word hoot, when the F1 of sound [u:] as compared to the native speaker's, it shows a significant difference. This might be caused by the lack of accuracy in setting the tongue height by participant 1 when pronouncing the word.

**Table 5** Front Vowel of Participant 2

| Word | Sound | F1 | F2 |
|---|---|---|---|
| peach | [i:] | 404 | 2104 |
| pitch | [I] | 509 | 2003 |
| head | [e] | 601 | 1789 |
| had | [æ] | 735 | 1601 |

The first and second formants of four front vowel sounds contained by two minimal pairs pronounced by participant 2 appear to be accurate because the frequencies are very close to those of the native speaker, as can be seen in Table 5. The F1 and F2 patterns of the vowel [i:] and [I] show significant differences indicating that both sounds are pronounced accurately as is the case with native speaker pronunciation. Likewise, with open-mid and open vowel [e] and [æ] which have different frequencies of F1 and F2 which denote the different way of their pronunciation. This result shows that student participant 2 does not have a problem in pronouncing front vowels.

**Table 6** Back Vowel of Participant 2

| Word | Sound | F1 | F2 |
|---|---|---|---|
| fool | [u:] | 539 | 1197 |
| full | [ʊ] | 563 | 1183 |
| cool | [u:] | 527 | 1107 |
| call | [ɔ:] | 744 | 992 |
| hoot | [u:] | 545 | 1148 |
| hot | [ɒ] | 694 | 1287 |

The pronunciation of back vowels in two minimal pairs by participant 2 is accurate. It is seen in Table 6 that participant 2 can distinguish the long high-back vowel [u:] and the short high-back vowel [ʊ] in the minimal pair fool and full. When it is compared to the back vowel sounds of the native speaker, F1 of participant 2 is approaching the native speaker's pronunciation. However, there is a slight difference in the frequency of F2, where F2 [u:] should be smaller than F2 [ʊ] because [u:] is more fronted then [ʊ]. A very small distance between F2 [u:] and [ʊ] by participant 2 shows that when pronouncing these two sounds, his advancement dimension of the tongue is relatively the same.

The accuracy of the pronunciation of the sound [u:] and [ɔ:] by participant 2 can be seen from the frequency of F1 and F2. Compared to F1 and F2 of the native speaker, they are very close to the native speaker pronunciation. F1 [u:] is lower than F1 [ɔ:] because it is more closed than [ɔ:] and F2 [u:] is higher than F2 [ɔ:] because it is more fronted than [ɔ:]. In conclusion, participant 2 can distinguish between the close vowel pronunciation [u:] and close-mid vowel [ɔ:].

Participant 2 also performed an accurate pronunciation of minimal pair hoot and hot which contrasts sound [u:] and [ɒ]. The first and second formant frequencies of both sounds are close to the ones of the native speaker indicating that he can set his tongue in proper height and position. It means he can distinguish the high back vowel [u:] with low back vowel [ɒ] by placing the tongue in the right position when pronouncing these words.

**Table 7** Front Vowels of Participant 3

| Word | Sound | F1 | F2 |
|---|---|---|---|
| peach | [i:] | 453 | 1740 |
| pitch | [I] | 463 | 1855 |
| head | [e] | 606 | 1999 |
| had | [æ] | 601 | 1993 |

From table 7 it can be seen participant 3 has a problem in distinguishing the pronunciation of closed and closed-mid vowels as well as open and open-mid vowels. There is no significant difference between the F1 frequencies of [i:] and [I] as well as [e] and [æ]. Those facts reveal that participant 3 pronounced the two words in these two minimal pairs in the relatively the same way. There is no vowel length difference between [i:] and [I]. In addition, the height of the tongue when pronouncing those two sounds is relatively the same. It is indicated by the F1 frequency which is very close to one another. The tongue advancement problem is also seen here, that F2 [I] is higher than F2 [i:], where the opposite should be the case because [i:] is more fronted than [I]. Vowel [i:] should be articulated by pushing the tongue forward so that the tip of the tongue touches the back of the lower ridge, while in pronouncing [I], the tip of the tongue is slightly pulled back followed by the reduction in tension ([I] should be pronounced more relaxed) because [I] is the lax counterpart of tense [i:].

The pronunciation of two vowel sounds that should be different but pronounced the same is also seen in the minimal pair [e] and [æ]. The participant pronounces the two sounds in the same way as seen from the very close F1 frequencies of the two sounds. This shows that the difference in tongue height is not visible even though the two sounds are in different positions, open-mid and open (mid and low) vowels. Compared to the native speaker, the participant tends to pronounce [æ] in the same way she pronounces [e] where it should have been different because [æ] should be more open than [e].

**Table 8** Back Vowel of Participant 3

| Word | Sound | F1 | F2 |
|---|---|---|---|
| fool | [u:] | 535 | 1178 |
| full | [ʊ] | 530 | 1160 |
| cool | [u:] | 458 | 1362 |
| call | [ɔ:] | 547 | 1200 |
| hoot | [u:] | 449 | 1115 |
| hot | [ɒ] | 482 | 1104 |

Table 8 represents the distinction between participant's formant and the ones of the native speaker are seen in F1 and F2 frequencies. It seems participant 3 cannot distinguish vowel [u:] and [ʊ] because the frequency of both formants is very much alike. The long high vowel [u:] should be slightly higher than the short high vowel [ʊ] as shown by the native speaker in Table 2. The F2 of [ʊ] should have been higher than [u:] because it is more fronted. But, the participants failed to do it.

The distinct tongue height and tongue advancement when pronouncing [u:] and [ɔ:] causes a significant difference between these two sounds. The participant 3 succeeded in

differentiating them where F1 and F2 frequencies fit the standard pattern. However, F1 and F2 of the participant are much different from the ones of the native speaker. It might be caused by an improper tongue position.

Furthermore, participant 3 failed in distinguishing vowel [u:] and [ɒ] which should be different doe to the significant difference of tongue position. F1 [u:] should have been much lower than F1 [ɒ] because it is much more closed and F2 [u:] should have been slightly higher than F2 [ɒ] it is more fronted. Contrary to the standard given, F1 of both sounds pronounced by participant 3 are alike.

**Table 9** Front Vowels of Participant 4

| Word | Sound | F1 | F2 |
|---|---|---|---|
| peach | [i:] | 430 | 1823 |
| pitch | [I] | 493 | 2028 |
| head | [e] | 621 | 1984 |
| had | [æ] | 717 | 1852 |

Table 9 depicts the difference in F1 frequency between two words in the minimal pair peach and pitch. Although the difference is not very significant, only 63Hz, this already shows that the participant has distinguished the height of the tongue when pronouncing [i:] and [I]. As the case of participant 3, the comparison of the frequency of F2 participant 4 is somewhat different from that of the native speaker. F2 [i:] should be higher than F2 [I] because [i:] is a little bit more fronted than [I]. Vowel [i:] should be articulated by pushing the tongue forward so that the tip of the tongue touches the back of the lower ridge, while [I] is pronounced with the tongue tip is slightly pulled backward followed by a reduction in tension (pronounced more relaxed) because [I] is shorter than on [i:].

From the F1 and F2 frequencies of [e] and [æ], it is shown that the participant 4 can already distinguish the pronunciation of the two sounds. Sounds [æ] is lower than [e] so that it has higher F1 frequencies. However, when it is compared to sound [æ] of the native speaker, the participant's tongue should have been lower so that F1 will be higher and its difference with [e] will be more significant. Regarding tongue advancement, it appears that [e] of participant 4 is indeed more fronted than [æ] indicated by F2 [e] is higher than F2 [æ].

**Table 10** Back Vowel of Participant 4

| Word | Sound | F1 | F2 |
|---|---|---|---|
| fool | [u:] | 641 | 1102 |
| full | [ʊ] | 648 | 1192 |
| cool | [u:] | 703 | 1269 |
| call | [ɔ:] | 786 | 1081 |
| shoot | [u:] | 627 | 1764 |
| shot | [ɒ] | 744 | 1904 |

When compared to the native speaker pronunciation, minimal pairs of cool and call with [u:] and [ʊ] as the sounds in contrast by participant 4 can be said to be less accurate, as represented in Table 10. It can be seen from the comparison of the frequencies of the F1 vowel [u:] and [ʊ] which are relatively the same. The pattern shown is quite accurate where F1 [u:] is lower than F1 [ʊ] which shows the tongue position [u:] is slightly higher than [ʊ] and it needs more muscular effort to articulate as it is a tense vowel. However, the insignificant differences between those frequencies show that participant 4 failed to distinguish these two sounds.

Meanwhile, the accurate pronunciation was identified in the minimal pair cool and call. Participant 4 was able to distinguish the sounds [u:] and [ɔ:] as was evidenced by the pattern of all frequencies which fits the one of the native speaker. However, the difference between participant and the native speaker frequencies are quite much. It might be caused by an improper tongue position.

The same problem was also found in minimal pair hoot and hot. It has followed the native speaker's pronunciation but the significant differences were also found in the frequencies of F1 and F2 when the ones of the participant were compared to the native speaker. It means that the participant 4 can distinguish the sounds but, still, is not able to put the tongue in the correct position.

Based on the previous discussion, the results show that inaccurate pronunciation still occurs among students who have passed the pronunciation practice course. There some problems found in pronouncing front and back vowels. The average results of F1 and F2 formant frequency measurements showed that (1) Only one of the four participants can pronounce the English vowel sounds in a way that is close to the quality of the native speaker vowel. Participant 2 has been successful in differentiating English front and back vowels; (2) Generally, pronunciation errors occur in front vowels [i:], [I], [e], and [æ] where participants are less able to distinguish long vowels and short vowels and distinguish the height of the tongue (F1) and the advancement (front/back) dimension of the tongue (F2) when pronouncing the front vowels. Those two formants are less accurate which causes the vowel sounds pronounced by participants to have different qualities from the sound of the native speaker vowels. They have known that those long and short vowels are different phonemes in English which also differentiate meaning, but still, it is hard for the participants to pronounce them differently; (3) The less accurate pronunciation made by the participants articulating English back vowels. Mistakes were commonly found in the pronunciation of long high back vowel [u:] and short high back vowel [ʊ]. Again, it is related to the vowel length. They tend to pronounce [u:] and its counterpart [ʊ], in the same way. Meanwhile, the differences in the position of the tongue between the close-back vowel [u:] with the close-mid [ɔ:], and close-back [u:] and open back vowels [ɒ] make the participants able to differentiate them as seen from the similarity of the

participants' pattern of formant frequency with native speakers'. However, much different frequency participants' formant and the native speaker's formant may be caused by the lack of accuracy in placing the tongue.

**2. Factors Affecting Pronunciation**

Kenworthy in Frazier and Brown (2001) stated that native language, age, exposure, innate phonetics ability, identity and language ego, attitude, and motivation and concern for good pronunciation are some of factors that affect pronunciation This present research is still limited to the pronunciation of English vowels. It has not touched consonant and supra segmental features of sound which has a profound effect on the accuracy of pronunciation. However, from this present study on four students majoring in English education, the writers found that pronunciation errors were caused by several factors. The main factor causing pronunciation problems is the first language factor, which is Indonesian language in this respect.

From the form given to the participants concerning their biodata and from the interviews that the researchers have conducted with the four participants, the results showed that the first language of the four participants was Indonesian. One of them spoke Javanese as her mother tongue, but when she grew up she speaks Indonesian in her daily life. Dardjowidjojo (2009) explains that from the point of Contrastive Analysis, when language A contains certain sounds that do not exist in language B, then it will cause problems for someone speaking language B in learning language A, and vice versa. Indonesian phonetics and phonology are different from English' from some aspects. This is what has been found in the participants' pronunciation. Sometimes they failed to pronounce a certain sound because the sound does not exist in Indonesian. From the articulatory phonetics point of view, Indonesian has speech sounds that are different from English in the way to produce the sounds, including vowel sounds.

There are some fundamental differences regarding the Indonesian and English vowel sounds. Indonesian does not distinguish between long vowels and short vowels which have a significant difference in English because they also distinguish word meaning. Variations found in Indonesian front and back vowel sounds are not as complicated as English vowel sounds. Compared to English, Indonesian has lesser vowels. There are controversies about the number of Indonesian vowels. Some say that there are nine, eight, seven, and some other say there are only six vowels. This phenomenon occurs due to the vernacular interference (Dardjowidjojo, 2009). Moreover, Dardjowidjojo (2009:54) stated that "due to the fact that English has at least eleven vowels, and there is no consistency of pronunciation in Indonesian, there is a great problem for Indonesians learning the English vowels. This is the first factor influencing their vowel pronunciation".

Another factor is the participants' attitude toward language. From the results of the interviews we conducted with participants, three of them admitted that it was rather difficult to distinguish vowel sounds because from the very beginning of pronunciation learning they already had the mindset that pronunciation course was difficult. Once they have been introduced to English vowel symbols and how to pronounce them, they have already had a negative attitude that those sounds are confusing and they are hard to distinguish. The writes found that this is also the result of their early English learning where they had never been given special knowledge about pronunciation. Hence, they were offered this course, they were not ready to accept it and they found it is difficult. The negative attitude toward English then continues with low self-motivation to be able to pronounce English correctly.

Finally, low motivation has been a factor that makes things worse. The low motivation is marked by the lack of self-awareness to enrich their pronunciation knowledge outside of class hours on campus. Some learners are not particularly concerned about their pronunciation, while others are. Kenworthy in Frazier and Brown (2001) stated that the extent to which learners' intrinsic motivation propels them towards improvement will perhaps be the strongest influence of all six of the factors in this list. The Pronunciation Practice course given to students lasts for approximately 2 hours 30 minutes, once a week. This time allocation is inadequate due to a large number of students in one class and a large amount of material that has to be delivered. By being aware of this situation students should have more motivation to increase their knowledge of pronunciation outside of the class hours. Many media can be used to help them improve their English pronunciation. A lot of applications on smartphones are available and can be used for learning aids. However, the lack of self-motivation remains the most influential factor in learning.

From the description above it can be seen, actually, with a positive attitude towards English and strong motivation from within, the first language factor can be overcome. Indeed, the first language accent may not be omitted, but at least it can be reduced by intensive practice.

## CONCLUSION

Examining speech production acoustically will help us to consider whether a speaker pronounces words correctly or not. Boersma and Weenink (2001) have created a very useful software that can show us the visual representations of speech sounds so that they can be analyzed. Segmental features including vowel sounds have been a challenge for English learners since the phonetics and phonological diversities of languages. The results of this present research have shown that there are vowel sounds that are often

mispronounced by participants. There is only one participant who can pronounce the minimal pairs correctly. Meanwhile, the other three participants failed to distinguish certain sounds. The most common mistake was when the participants has to distinguish long and short vowels ([i:] : [I] and [u:] : [ʊ])]. The participants failed to distinguish long and short vowels even though they have been informed that they are different. The first language interference attitude toward English, and lack of motivation are indicated to the factors affecting pronunciation.

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