How do I sound? Vowel production of multilingual students at Ma Chung University

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Article Info	Abstract
	This study aims to evaluate the Indonesian, English, and Mandarin vowel production of Ma Chung University students, a prominent Indonesian institution with a strong emphasis on workforce readiness. Given the university's language offerings encompassing Indonesian, English, and Mandarin, we employed a descriptive qualitative approach in acoustic-phonetic theory. Our respondent pool comprised of 15 PPBM (Chinese language major) students selected based on intermediate proficiency levels in all three languages, as indicated by TOEIC and HSK scores. First and second formant data for monophthongs were recorded in PRAAT tools and the data is compiled on Microsoft Excel, forming the foundation for Vowel Space Area (VSA). The data reveals a notable phenomenon: students' native language (Indonesian) influences their pronunciation of both the second (English) and third (Mandarin) languages. Particularly, English displays a distinct pattern of compressed vowel spread compared to the standard VSA table due to the lingering impact of L1 VSA. This effect accounts for observed vowel anomalies in student pronunciation. Importantly, this L1 and L2 influence is evident in their attempts to articulate L3 (Mandarin) sounds, exemplified by the significant deviation of /ə/ from the VSA. Moreover, students navigate a linguistic shift by modifying phonemes to align with their L1, inadvertently resulting in substantial deviations during English and Mandarin speech production.

INTRODUCTION

With the increasingly fierce competition in the labour market both at home and abroad, job seekers must improve their quality in order to get a job. According to the Badan Pusat Statistik (2021) there are 848,657 university graduates who do not have a job, with total unemployment reaching

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9,102,052 people in August 2021. This data certainly worries job seekers, especially students who have just graduated from universities.

As one of the leading universities in Indonesia, Ma Chung University pays great attention to the development of the labour market and has prepared its graduates to face competition in the labour market. Some of the skills given to all Ma Chung University students are Indonesian, English, and Mandarin languages. Mata Kuliah Umum (MKU) or Compulsory Courses of Indonesian, English, and Mandarin are undertaken by students in the first two semesters of their study. By equipping students with three languages, Ma Chung University is optimistic about the competitiveness of their graduates who are highly sought by potential employers.

The main purpose of this study is to determine the quality of spoken foreign language skills, which are Mandarin and English from Ma Chung University students. The ability to speak was chosen because of several factors. First, verbal language skill is the main indicator of a person's language skills that can be easily observed and assessed. Second, verbal language skill will be used during the most job interview. An interview in the employee recruitment process is an influential factor in the acceptance or rejection of job applicants (Swider et al. 2015). Thus, knowing the quality of Mandarin and English verbal production of Ma Chung University students becomes very important to do to control the standard quality of their foreign language skills.

LITERATURE REVIEW

Indonesian phonetics

Indonesian is an Austronesian language which is closely related to Malay. Malay served as the lingua franca throughout the Malay Archipelago for centuries, and a variant of Malay was adopted as the official language of Indonesia when independence was declared in 1945. The variation described here is usually referred to as Bahasa Indonesia Baku (standard Indonesian). Its autoglosonym is Indonesian. Indonesian is the official language and the language of instruction in schools. This language is used in a wider scope of social interaction, including inter-ethnic communication, religion, and mass communication. The population of speakers who use Indonesian as their first language is increasing, especially in the greater Jakarta area. An estimated 23 million people speak Indonesian as their first language and an additional 140 million speak it as their second language (Grimes, 1996)
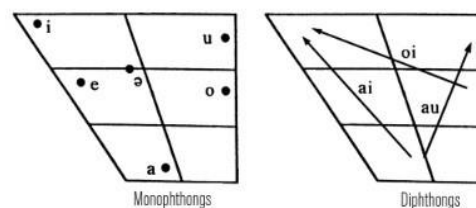
Figure 1.
Indonesian vowels (Soderberg & Olson, 2008)

The vowels /i,e,o,u/ are generally lower than [ɪ,ɛ,ɔ,ʊ] in closed syllables. Moreover, they are lower than [ɪ,ɛ,ɔ,ʊ] in the penultimate syllable that precedes the last closed syllable when the vowels of the two syllables are of equal height. These patterns are subject to regional variations. Both /e/ and /ə/ are written as 〈e〉, although /e/ can be written as 〈é〉 to emphasize the pronunciation. Diphthongs only appear at the end of the root.

English phonetics

As Ladefoged (1999)discusses in his description of American English, there are considerable variations in the phonetic characteristics of English spoken in North America, so that the phrases commonly used to describe American English are not entirely meaningful. The description of American English provided by Ladefoged is based on the Southern California dialect. According to Labov (2010), southern Michigan, particularly in its urban areas, is part of a relatively large dialect area in the interior of the north-eastern United States called the Northern Cities. Labov further elaborates that

the Northern Cities dialect cuts an irregular swath through the inner north-eastern city chain extending, approx., from upstate New York (e.g. Syracuse, Rochester, Buffalo), through northern Ohio (e.g. Cleveland, Toledo), southern Michigan (e.g. eg Detroit, Kalamazoo, Grand Rapids), north-western Indiana (eg Gary, Hammond), north-eastern Illinois (eg Chicago, Rockford) and south-central Wisconsin (eg Milwaukee, Madison). Speakers from neighbouring areas such as north-western Vermont, north-western Pennsylvania, and north-central/northeast Indiana seem to exhibit some of these dialect traits. Labov argues that the vowel shift that characterizes Northern Cities dialects is observed in its most advanced form in the region's largest urban areas, such as Detroit, Buffalo, and Rochester.

Vowels

Figure 2.
English vowels (Hillenbrand, 2003)

Mandarin phonetics

According to Figure 3, vowels [i, y, a, u] appear in both open syllables and syllables closed by nasal; [ɤ] appears only in open syllables. In open syllables, [i, y, u] is about cardinal, [a] = [a], and [ɤ] is slightly diphthongized from [ɤ] to [ʌ]. In nasally closed syllables [i, y] around cardinal, [a] = [a], and [u] = [ʊ]. [ə] is a middle vowel in a syllable closed by a nasal; in open syllables [ə] gets the suffix r, becomes [ɚ]. The example taken here is Mandarin from the Beijing area which incidentally is known as the standard Chinese language. This is due to the many regional variations or dialects in China.

Figure 3.
Chinese vowels (Lee & Zee, 2003)

Vowel Space Area (VSA)

The Vowel Space Area (VSA) is a two-dimensional area bounded by a line connecting the coordinates of the first and second formant frequencies (F1 and F2) of the vowel. The VSA evaluates speech intelligibility and represents the kinematic movement of the articulators. In addition, VSA studies can better identify vocal identity, speaker characteristics, speech development, speech style, and sociolinguistic factors that influence vocal production (Sandoval et al., 2013)

Vowel production by multilinguals

Multilingualism, whether at the individual or societal level, is highly common worldwide and

is now more widely acknowledged as the standard condition of linguistic understanding (Hammarberg, 2018); Rothman, 2015) Since the object of this research is multilingual speakers, the effects of Indonesian, English, and Mandarin on vocal production in the target language will also be discussed. This multilingual factor can be an explanation of anomalies that have the potential to appear when vowel analysis is carried out.

The effect of Indonesian as a first language on English vowel production has been discussed by Widagsa and Putro (2017) In their research, they compared the vowel production by a native English speaker with the vocal production of an Indonesian learning English as a foreign language. As a result, the VSA of native English speakers is wider than the VSA of Indonesians who study English, especially in their F1 scores.

Furthermore, there is a comparative study of Indonesian and Mandarin by Candra & Sukma (2020). This study aims to find the similarities and differences of monophthongs, vowel clusters, and allophone levels which are intended to help develop the discipline of comparative phonology between the two languages. This study produces 4 conclusions, which are:

First, the Chinese vowel system is generally more developed than Indonesian; Second, there is a contrasting rounding in the Mandarin monophthong system, which is not found in the Indonesian monophthong system; Third, the pronunciation in Indonesian is more in line with the spelling, while in Mandarin there are some mismatches between spelling and pronunciation. Fourth, Chinese vowel allophones are mainly caused by differences in the position of vowels in syllables, whereas in Indonesian they are mainly influenced by different syllable properties (Candra & Sukma, 2020).

The influence of Mandarin on English production has been discussed by Chen et al. (2001). In this study, the influence of Chinese on American English vowel production is explored. The therapeutic implications of these findings for Chinese speaking English as a second language are also discussed. The aim of this study was to determine which American English vowels are

problematic (or not) for people who speak Mandarin as their first language.

Trilingual Competence

The Ma Chung university students requires the mastery of three languages that has been mentioned which is Indonesian, English, and Mandarin. Trilingual competence is used to measure the proficiency of their language according to the data that has been analysed. This is done to know the tendency or orientation of the students when pronouncing the vowels in whether their pronunciation is affected across the languages. Hoffman (2001) stated "A related area of differences between monolingual and bilingual or trilingual competence concerns the structure and organization of the trilinguals competence with regard to their speech modes." Thus, it is important to address how being a trilingual can affect their oral speech performance.

In hopes to support the trilingual research that is a recent research area, diverse definitions emerge. Many approaches stem from bilingualism, viewing trilingual as its branch or extension. This study hopes to further improve the trilingual research study that are still recent in language learning and contributing to the subject for inspiring future researchers in trilingual study (Anastassiou et al, (2017).

METHODS

The main methodology of this research is descriptive qualitative utilising acoustic-phonetic theory. Acoustic phonetics involves examining the physical characteristics of speech and seeks to investigate sound wave patterns present in spoken language, including their diverse frequencies, amplitudes, and durations (Peterson & Shoup, 1966). The stages of the research method are as follows:

Data gathering

The data collection process began with the recruitment of respondents. 15 students majoring in PPBM (Chinese language major) were chosen

because they were judged to have mastered the three target languages (Indonesian, English, and Mandarin) at an intermediate level as evidenced by scores from the TOEIC and HSK tests. The respondents are native speakers of the Indonesian language. The respondents were asked to fill out a simple google form to get personal data and the results of the HSK and TOEIC tests. Filling out the google form is done only for the respondent selection process and will not be used as primary or secondary data in this study. After that, the respondents were asked to make a recording in the studio to obtain the primary data. They were asked to read 1 paragraph of different texts in Indonesian, English, and Mandarin with a total of 3 paragraphs. The recording process was carried out using a ZOOM H5 microphone and a Behringer UMC202HD sound card to get good recording quality. After that, all recordings will be coded as REC_(respondent number)_(language) (example: REC_7_ENGLISH) for data coding purposes in Microsoft Excel.

The paragraphs read by the respondents are as follows:

The North Wind and the Sun were disputing which was the stronger, when a traveler came along wrapped in a warm cloak. They agreed that the one who first succeeded in making the traveler take his cloak off should be considered stronger than the other. Then the North Wind blew as hard as he could, but the more he blew the more closely did the traveler fold his cloak around him; and at last the North Wind gave up the attempt. Then the Sun shined out warmly, and immediately the traveler took off his cloak. And so the North Wind was obliged to confess that the Sun was the stronger of the two (Soderberg & Olson, 2008).

北风和太阳争论谁的威力大。他们定义，谁能剥去行人的衣裳，就算谁胜利。北风开始猛烈地刮，行人把衣裳裹紧。北风终于刮累了，就让位给太阳。太阳用温暖的阳光照耀着，行人就解下了自己的衣裳。北风只好认输.

Sang Angin Utara dan Matahari sedang memperdebatkan siapa yang lebih kuat, ketika seorang pelancong datang dengan berbalut jubah hangat. Mereka sepakat bahwa orang yang pertama kali berhasil membuat pelancong melepas jubahnya harus diakui sebagai yang lebih kuat. Kemudian Angin Utara bertiup sekeras yang dia bisa, tetapi semakin dia meniup semakin erat si pelancong itu melipat jubah di sekelilingnya; dan akhirnya Angin Utara menyerah. Kemudian Matahari bersinar dengan hangat, dan segera pelancong itu melepas jubahnya. Akhirnya, Angin Utara harus mengakui bahwa Matahari lebih kuat (Soderberg & Olson, 2008).

Data analysis

The recording results will be analyzed using PRAAT software (Boersma & Weenink, 2018). All monophthongs in each language produced will be measured by their first and second formant. After that, first formant and second formant data for each monophthong will be recorded in a table using Microsoft Excel. The formant data in the Excel table will be used as the basis for creating a VSA for each respondent.

RESULTS

Data presentation is done in two ways. First, the overall data presentation uses the mean, median, and mode of the overall formant data. This is done to see the VSA pattern produced by all respondents broadly. The results of this data will be compared with the data in previous studies that have been mentioned in the literature review section. Second, if there are interesting patterns that appear in the data analysis, they will be discussed using customized VSA.

The results of the data will be presented in VSA chart table. This will show the vowels produced by the students across 3 different languages (Indonesian, English, and Mandarin) each with their VSA table charthe use of abbreviation is permitted, but the abbreviation must be written in full and complete when it is mentioned for the first time, and it should be written between parentheses. Terms/Foreign words or regional words should be written in italics. Notation should be brief and clear and

written according to the standardized writing style. Symbols/signs should be clear and distinguishable, such as the use of number 1 and letter 1 (also number 0 and letter O).
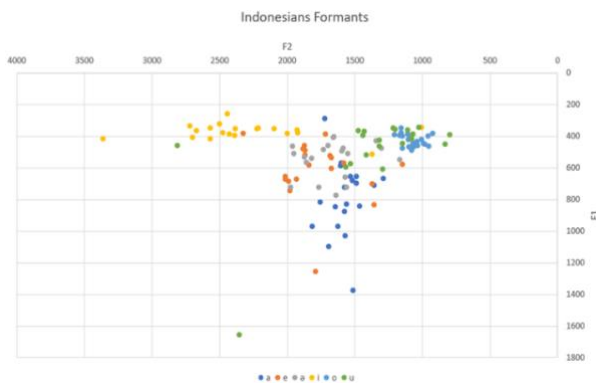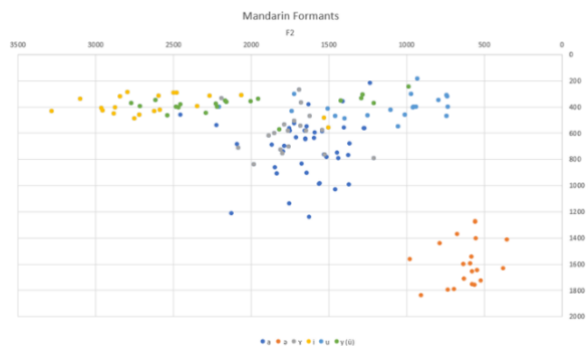

Figure 4.
Indonesian Vowel Chart

The first table that is going to be discussed is the Indonesian vowel production chart as shown in Figure 4. The figure consists of F1 and F2 formant with dots that indicate the vowel produced by Ma Chung University students. The Indonesian Vowel chart data shows that the pronunciation of the students is in line with the vowel chart. This is normal considering this is the native language of the students. The characteristics of Indonesian vowel chart is compressed and packed as the vowel doesn't spread wide unlike English and Mandarin vowel chart. Hence, this data shows that the student's pronunciation of the Indonesian language is on point.
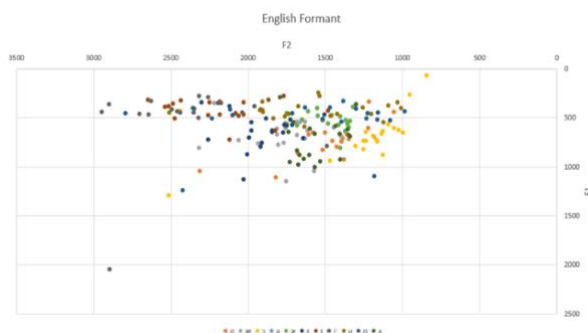
Figure 5.
English Vowel Chart

Figure 5 shows the English vowel production, and its dots represented the English production that the students have uttered during speaking. This data shows 2 things that are interesting when observed. Firstly, the vowel does not spread as much, and this is concerning considering the pronunciation of native English would be wider. Second, there are a few anomalies that have been stated earlier in the chapter. For example, the vowel [i:] is in the bottom of the vowel chart. From this we can infer that the pronunciation of English in Ma Chung students is still filled with inaccuracy shown from the few anomalies from the VSA English chart.

Lastly, figure 6 shows the Mandarin vowel chart with the dots also representing the vowel production by the students. Mandarin vowel chart shows the students are still struggling in pronouncing different vowels in Mandarin. The anomaly in this chart is even more severe than English. The vowel [a] is the most apparent anomaly with several data that shows the students are struggling when uttering the Mandarin words in a good manner.

Figure 6.
Mandarin Vowel Chart

DISCUSSION

Across the analysed audio data, there are multiple inaccuracies produced by the students. Vowel inaccuracy is the most prevalent based on the data that is shown in the results. Phonetic inaccuracies are assumed to arise from the segmental and prosodic differences between the two languages, whereby L1 competes (or

interferes) with production of L2. There are 3 languages that were compared and each of the languages shows a frequent vowel inaccuracy.

Firstly, the Indonesian language compared to English vowel space chart. The findings show that the L1 of students is Indonesian and when compared to their L2 or L3, it shows that the students still struggle producing vowels that does not appear in Indonesian language such as /iː, ε, æ, ʌ, ɔ/. In addition, the production of the students tends to merge the sound of /æ/ and /e/. Some studies (e.g. Sukaton, 2020) have supported this finding. The most inaccurate phonemes that was produced is /ɔ/ with the deviation being severe compared to other vowels. It can be inferred that students are struggling to utter these vowels because they are unfamiliar with the vowels. The /ɔ/ are scattered across the VSA with it being more in the area of vowel /ɪ/. The constraint in the vowel area showed that the speakers are struggling to develop their vowels unlike the native English speakers. Widagsa (2017) stated that "English, by contrast, has at least 11 vowels inventories. Vowels of English vary enormously by variety, many phoneticians have different perspective in defining the number of English vowels." This new added phoneme that are causing constrains withing the Indonesian speaker of English, they are struggling with the new phonemes introduced in the new language that are very different to their mother tongue of Indonesian which currently only has 6 monophthongs.

Secondly, when compared to Indonesian speaking Mandarin. The results show that /i/, and /y/ are heavily deviated from other phonemes. The /i/ and /y/ comes down into the territory of open lower back mouth. Which suggests that the inaccuracy is high at this point. Students are struggling to pronounce these phonemes as they are rounding their lips whilst pronouncing this vowel. It can be seen from the pronunciation that the students are influenced by their L1 and as a result lacks in contrast compared to a native speaking Chinese. According to Candra (2020) "Indonesian linguistic vowels possess rounded and unrounded lip sounds, but they do not create a contrast. Additionally, while certain Chinese

monophthongs can form words on their own, Indonesian monophthongs cannot. Lastly, both Chinese and Indonesian monophthongs can be positioned in the front, middle, or back of syllables with flexibility." From this we can infer that students whilst pronouncing Chinese vowels are struggle in discerning to differentiate the unknown vowels that is new for them.

The compiled formant inaccuracies across three different languages provided an interesting insight. Their L1 is interfering with their L2 and L3 pronunciation. Widagasa (2017) stated that "Differing from early learners, adult learners seemed to produce less movement in formant frequencies. They also noticed the different characteristics between L1 and L2." This tells us that the students L1 are interfering their L2 and L3 pronunciation because they are limiting their vowel space influenced by their L1 language which is Indonesian. English is the most apparent with the vowel spread being more compressed than the standard VSA table, this is because the students are still influenced by their L1 VSA that in turn limiting their vowel spread.

Vowel Space Area (VSA) Differences

To further amplify our findings on the inaccuracy of the VSA across the languages. In this next sub-chapter, we are going to draw comparison between the shape of the VSA from Ma Chung student's pronunciation and the standard VSA table across three different languages. This is done to prove the anomaly that have been stated in the previous chapter by using a red line to draw the shape and determine the quality of the vowels.
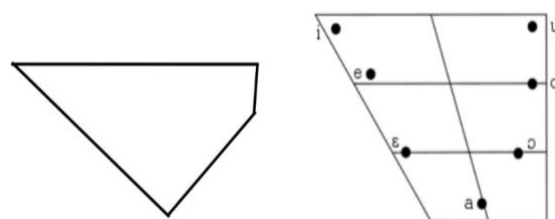
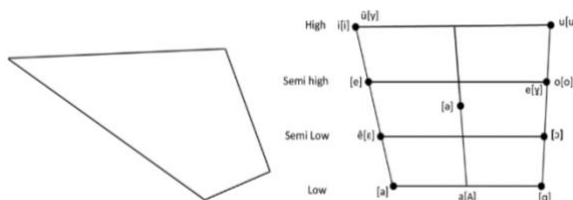**Figure 7.**
Comparing Indonesian VSA (Side to side)

The first VSA that is compared is their L1 which is Indonesian. There are no apparent formant shifts and errors in this VSA graph. Primary reason with it being their L1 or native language so it normal for them to have a good pronunciation of their native language. The vowel space graph from Student's still maintained its integrity when compared to the original Indonesian VSA. Hence, the shape and lines are still intact and suitable to be Indonesian VSA.
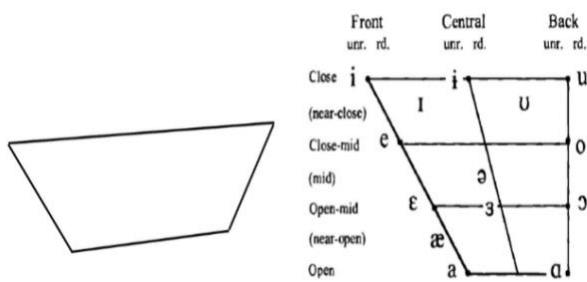
Figure 8.
Comparing English VSA (Side to side)

The second VSA table is English. In this VSA table shape, it shows that the formant shifts are not apparent. This is a problem because on the right picture which shows the standard VSA table for English, the vowel spreads more than the Indonesian vowel. The trapezium on the left is not in shape with the trapezium on the right indicating that the Ma Chung student's vowel productions are not good enough as the shape of their VSA does not match the standard English VSA table. There are multiple factors to this with one of them being that the Ma Chung students are still influenced by their L1 hence making their pronunciation to be less spread and more compressed such as their L1 (Indonesian).

Figure 9.
Comparing Mandarin VSA (Side to side)

As the last part, from the first glance Mandarin VSA vowel from the student's is even more severe because the shape stretches down into the bottom. The reason for this is the vowel /ə/ drags down into the low and back part of the VSA, further than the vowel /ɑ/. This is concerning as this shows that the students are still struggling in pronouncing the vowel from the two languages, that is their L2 and L3. Almost all the students failed to utter this phoneme which signifies that Indonesian students struggles to tell the difference between /ɑ/ and /ə/.

From the 3 compared VSA table above, it shows that the student's pronunciation is still not fulfilling and needs further improvement to hone their oral skill in pronouncing the vowels in both English and Mandarin.

Trilingual competence of Ma Chung Students

As stated from the previous chapter, three languages in Ma Chung university are required to be learned and it is included in the curriculum for passing the semester. This is an opportunity for the students to hone and expand their language skills. But after the data are presented, there are still severe deviations in the pronunciation of the words based on the VSA. The English and Mandarin VSA needed some attention because some of the phonemes are inaccurate. The outcomes demonstrate significant individual differences in how vowels are produced in the three languages, indicating that the linguistic backgrounds of these multilingual individuals influence the phonological aspects of their language systems (Kopečková et al. 2016).

The trilingual edge that Ma Chung university promised does not show its effectiveness in the data. Schroeder and Marian (2017) stated that trilingualism result in superior inhibitory control compared to bilingualism, given potential competition from non-target languages during production and comprehension. Yet, three studies involving young adults and children show no backing for extra inhibitory control benefits in trilinguals. This shows that even being trilingual

can still be left with an inadequacy in vowel control across the three languages (Schroeder & Marian, (2017).

There is an explanation for this phenomenon stated by Hoffman (2001) "A trilingual sentence may come about when the speaker starts an utterance in one language, and then inserts an English item which then triggers a switch to the third language. In other words, the English item causes the speaker "to lose linguistic orientation". This can explain the anomalies that have appeared in the vowel that is pronounced by the students. Theoretically, this is the cause of mixing the vowel because the students are still influenced by their L1 or L2 counterparts when they try to pronounce the L3 which is the Mandarin one. A case for this is /ə/ that is heavily deviated from the VSA. Furthermore, the students lose their linguistic orientation and proceed to jumble a few of the phonemes to better suit their needs from their L1 but in turn creates this drastic change and deviation when they are pronouncing the words orally.

CONCLUSION

Ma Chung university's students are required to master three languages to face the competitive job environment and preparing them for future job interviews and endeavours. After the data is compiled and analysed, there are still few concerning findings that provide valuable insight into the proficiency of the student's oral language across three languages (Indonesian, English, and Mandarin). The vowel inaccuracies contained mainly in their L2 (English) and L3 (Mandarin) is severe such are compressed and scattered with the notion being the students are still conflicting the vowel from L1 (Indonesian). The asymmetrical graph shape drawings when compared side to side also tells that the vowel inaccuracies are severe. This implies that being a trilingual can also affect their oral speech skills because they are still suiting the vowel to L1 and in turn losing their linguistic orientation. The results of this study serve as evidence that Ma Chung students still have difficulties to produce native-like vowels and

perform native-like spoken competence despite their relatively high TOEIC and HSK score. Our findings are in-line with the findings of previous research. Our recommendation is to focus the curriculum of Mandarin and English classes in Ma Chung University into productive language skills especially speaking skill.

ACKNOWLEDGEMENT

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