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Phonological Process of Japanese Affricates [dz] and [ts] of Javanese Native Speakers

Misaki Shinohara[1], Dr. Agus Subiyanto, M.A.[2]

Diponegoro University, Semarang, Indonesia

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Abstract

Indonesia now has the second largest number of Japanese language learners in the world after China. Among those many learners, there are those who use the Japanese language in part of their lives by working and studying in Japan, or working at Japanese companies in Indonesia. In Japanese language education, the aim is to teach learners to be able to communicate correctly with Japanese people. In order to communicate correctly, it is essential to remember words and learn the correct structure of sentences, but phrasing is also necessary for comfortable conversation. Pronunciation and accent accuracy are also very important in these verbal communications. It is common for learners to be misunderstood due to mistakes in pronunciation or accent, or to have trouble understanding what they are saying to Japanese people. Pronunciation and accent articulation can be tricky. At times, many learners do not notice the difference in sounds, or cannot move their mouths and tongues according to Japanese pronunciation. The reasons for this difficulty include the features of Japanese that are not found in other languages as well as the mother tongue interference. There are some Japanese pronunciations that are not in their native language. Learners often replace such unknown Japanese phonemes with familiar pronunciations. Its pronunciation is chosen from among mother tongues. Indonesia is a multiethnic and multilingual country. Among them, Javanese is spoken by a lot of people in Indonesia. There are some characteristics in the pronunciation of Japanese learners whose mother tongue is Javanese, and it is believed that these characteristics are related to their mother tongue. Japanese has affricates [dz] and [ts]. These affricates are said to be pronunciations that many Japanese learners around the world find difficult. Javanese native speakers also have difficulties to make [dza], [dzɯ], [dze], [dzo], and [tsɯ], correctly. Analysing learners' phonological processes and the cause of this phonologically. This research will provide hints for improving the pronunciation of Javanese native speakers.

Keywords: Affricate; Javanese; Mother tongue interference; Phonological process

1. Introduction

Indonesia is the country that as second largest number of Japanese learners in the world. According to a 2018 survey by the Japan Foundation, there are 709,479 Japanese language learners in Indonesia. According to a survey by the Immigration Services Agency (2022), the number of Indonesians residing in Japan is 83,169, a 39% increase from the previous year. Currently, Japan is facing a declining birthrate and aging population, which is becoming a social problem. Foreseeing the future of Japan, many companies are accepting foreign students and technical interns more actively than before. The important thing in teaching Japanese is for learners to be able to communicate in Japanese. Communication is not just one-way talking. It is important to be able to understand and communicate with other people. To communicate, other than vocabularies and grammar, pronunciation and accent are also important. Mistakes in pronunciation or accent can lead to misunderstandings and questions.

[1] *Misaki Shinohara. Email: misakishinohara@students.undip.ac.id*
Telp: +62 819-0152-7123

Because of mispronunciation and accent error, it makes difficult to convey the feeling, thought, and idea of learners themselves when they had conversation with Japanese people. Akagi (2022) also emphasizes the importance of pronunciation in Japanese communication. Problems with learners' pronunciation include not only the transfer of meaning, but also difficulties in hearing, emotional misunderstandings, and accents of foreigners (Ogawara and Kono 2009; Akagi 2022). Mostly, learners have their own accent when they speak Japanese. It is quite common for language learners to have their mother tongue's accent when speaking a foreign language. Indonesian learners of Japanese are doing the same way.

Indonesia is a multi-ethnic and multilingual country. The common language is Indonesian, however, in many cases the language of the ethnic group becomes their mother tongue. Among reginal languages in Indonesia, Javanese is the local language with the largest number of speakers in Indonesia, and is mainly spoken by residents of Central Java and East Java. Javanese has various dialects. Kanisius (2006) indicated the comparison between Javanese dialect standard and dialect in Banyumas and East Java. The standard of Javanese language is Javanese in Solo and Yogyakarta. They have differences not only vocabulary, but also their phonetics. They have their own accent when they speak Javanese. Therefore, it is possible that a learner of Japanese language who is a native of standard Javanese has different articulation from other learners who are natives of Javanese in East Java when they speak Japanese. Due to regional factors and the number of speakers, there are many different types and variations of the Javanese language (Yahya 2023). Standard Javanese and regional Javanese have common phonetic symbols, but there are differences in social and cultural phrasing, accent intensity, and so on. There is Semarangan which is a part of Javanese language which is spoken by people in Semarang city in Central Java. Semarangan has the unique feature in their language. According to Suryadi (2015), Semarangan is a language that people who speak with respect to the person they are speaking to, and they speak softly. For observation, it is focused on Javanese native speakers who study Japanese at university, especially Semarangan native speakers.

There are several studies on the pronunciation of Japanese by non-native Japanese speakers. Because Indonesia is a multiethnic and multilingual country, even if Indonesian is the common language, it is not able to bundle all Indonesian speakers together in the phonology of foreign language learning. Here are some previous studies that back these up:

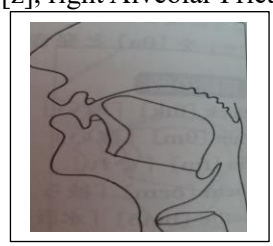
Hernawati (2015) pointed out and described differences in the pronunciation of Japanese fricatives between Javanese and Sundanese native speakers. Her purpose of study is to clarify the pronunciation characteristics of Japanese fricatives [s z ɕ ʑ] in Indonesian learners of Japanese whose native languages are Javanese and Sundanese. As a result, she was arguing that they are due to the mother tongue interference of each native language. Therefore, there are different ways to articulate in some Japanese words between Javanese natives and Sundanese natives.

According to Nurhayati (2016), [z] is lamino-alveolar. Lamino-alveolar sounds are the sounds of a language in which an articulation process occurs with the active articulator lamina and the passive articulator with the teeth base. In addition, English dictionary indicated that Lamino-alveolar is explained that a sound pronounced with the tip of the tongue on the upper gums. The tip of the tongue is a sound that is articulated by the tip of the tongue. What should be understood here is that the same phonetic symbols can be articulated differently.

However, Kato(2016) described that the Japanese /z/ is voiced alveolar fricative. Therefore, [z] sound in Javanese is Lamino-Alveolar fricative and [z] in Japanese is alveolar fricatives. Both belong to alveolar fricative consonants. The difference is one is Lamino-Alveolar and another is Alveolar. By comparing both explanation of Nurhayati (2016) and Kato (2016), it is defined that Javanese and Japanese have different articulation of [z] sound. The way of articulations are : Lamino-Alveolar sticks the tip of its tongue to the gums as

explained above. Fricative sticks a tip part of tongue to the gums. (Figure 1) Therefore, Their [z] sounds are subtly different. Therefore, the affricate [dz] which is articulated by Javanese natives seems to be different from Japanese [dz].

Figure 1 [z]sound ; left Lamino-Alveolar [z], right Alveolar Fricative [z]



Najoan (2013) studied about Japanese pitch accent and long vowel for teaching Indonesian students. He defined that both pitch accent and the length of vowel sound are influenced when Indonesian learners pronounce Japanese language. In addition, he pointed out misunderstandings and confusion in communication due to mispronunciation with some examples.

It must be careful to observe the phonological process of learners. According to Kawai (2011), although phonological processing at the word level is not identified, phonological processing may be identified at the sentence or conversation level. In addition, Kawai indicated that it is necessary to observe the phonological process underlying articulation, not just a phonetic articulation.

In order for Japanese learners not to trigger phonological processes, it is necessary to know the phonological rules of Japanese. According to Akutsu (2017), phonological theory attempts to express phonological phenomena as rules. In Japanese, these include double consonant, devoicing of vowels, borrowing (“Japaneseization” of foreign words), and adding accents. Knowing these rules will help Japanese learners avoid the situation that “If you pronounce this part incorrectly, the meaning will be different”. For example, there is a rule that double consonant should be geminated before unvoiced consonants. Double consonant is a phenomenon that tends to occur in Japanese words of Chinese origin. Japanese has “voiced” and “voiceless” sounds. If the consonant "+ voiced" is pronounced as "-voiceless", there is a risk of misunderstanding by Japanese speakers. For example, [s] is voiceless, but [z] is voiced. /kasu/ and /kazu/ have completely different meanings. /kasu/ also has bad meanings such as dreg and bore. /kazu/ is a number. Mistaking voiceless and voiced sounds like example can be very misleading.

Every language has a distinctive phonological system. According to Kawahara (2015), the accent system of Japanese both show regularity and complex exceptions at the same time. Japanese accent is pitch accent which is tone high and low. There is accent patterns. Syllables are as accent-bearing units. Japanese uses mora. A deficient mora combines with the preceding mora and constitutes the second half of a syllable. The default accentuation in Japanese is that the syllable containing the antepenultimate mora receives accent (Kawahara 2015). Phonological length of second element has short and long. There are also pitch accents on verb and adjective. Japanese verbs and adjectives contrast is simply a matter of accented vs. unaccented. For example adjective /atsui/ has two meanings with different accents. Atsu’+i means “hot”, and Atsu+i means “thick”. Accent pattern of affix depends on what affix comes to. Therefore, it has phonological rules in each affix. There is "Vowel devoicing". Vowel devoicing is that Vowels between two voiceless consonants or those that are word-final and preceded by a voiceless consonant devoice in Japanese. Such pitch accents are thought to affect learners' pronunciation.

American Speech-Language-Hearing Association (2018) described about speech sound disorders. Speech sound disorder has two categories 1) Functional and 2) Organic. Functional problem is classified two categories: Articulatory and Phonological. Organic aspect is classified three categories: Neurological, Structural, and Perceptual. Neurological problems are about apraxia and dysarthria. Structural problem is about cleft palate and structural deficits due to trauma or surgery. Perceptual problem is about hearing impairment. The association indicated that it is often difficult to cleanly differentiate between articulation and phonological disorders in functional speech sound disorder; therefore, many researchers and clinicians prefer to use the broader term, "speech sound disorder", when referring to speech errors of unknown cause.

The articulation approach targets the deviation of each note. The goal is to produce exactly the desired sound Phonological/linguistic-based approaches target groups of sounds with similar error patterns. A phonological approach is often chosen to help internalize phonological rules and generalize to other sounds in the pattern. Generalization is to facilitates the carryover of difficult sound productions of syllables, words, phrases/sentences and conversational speaking. The Association states the following about the influence of accents:

Accents are the distinctive way a language is pronounced by a group of people speaking the same language and are a natural part of spoken language. Accents are also regional. A foreign language accent occurs when a set of phonetic characteristics of a language is inherited when a person learns a new language. The first language acquired by a bilingual or multilingual individual can influence phonetic pronunciation and acquisition of phonetic rules for subsequently acquired languages. There is no superiority or inferiority to the accent. Accents, like dialects, are not a speech or language impediment, they just reflect differences.

Wardani (2019) found that Javanese has13 consonants /ʒ, v, θ, ð, z, ʃ, f, g, k, d, ʧ, ɳ, j/ and 17 vowels [æ],[ɛə], [iː], [eɪ], [aʊ], [əː], [ɔː], [uː], [ɒ], [ɪə], [əʊ], [ʊ], [ɑː], [ɪ], [ʊə], [ɔɪ], and [aɪ]. However, 14 English sounds /p, b, t, s, h, ʤ, m, n, l, r, w, ʌ, ə, ɛ/ were pronounced unambiguously by Javanese learners. In addition, she stated that mother tongue interference makes pronunciation difficult. Looking at the result, [z] sound is not included the clearly correct sound in English. However, there is data that the affricate [ʤ] is pronounced clearly, so it is possible for Indonesians to pronounce the affricate correctly.

Maekawa (2011) defined the Japanese /z/ as having a fricative [z] and an affricate [dz]. He then investigated where in words the [z] and [dz] pronunciations were used most often. The affricate appears most prominently in the position before the mora (mora 1). And when the following vowel is [i] or [e], affricate is likely to occur. Affliction is very likely to occur if the preceding segment has a /N/. Gender is also associated with rupture rate. Females were found to have a higher rupture rate. It was pointed out that women have clearer pronunciation. The pose located just before /z/ had the greatest influence as a factor that promoted reputation of /z/. In addition, when the pause was located just before the short unit including /z/, the affrication was promoted. In addition, the affricate was accelerated when the geminate or syllable consonant was placed just before /z/.

There are two ways of written word of /zu/ in Japanese such as ズ and ヅ. According to Kato (2016), ズ and ヅ don't have no pronunciation distinction, today. However, there was a difference in pronunciation in the past. Historical syllabary spelling was used until World War II. ふじ/fuji/ and ふぢ/fuji/ were one of examples of historical syllabary spelling. ふじ is a name of mountain, and ふぢ is a name of flower. The pronunciation distinction of /ji/ is じ[ʑ] and ぢ[dʑ]. However, there was confusing similarities in pronunciation, therefore, they were unified. Takayama (2009) defines that affricates are produced in correlation with existing fricatives. Both [ʑ] and [dʑ] are similar in Japanese. Therefore, it can be allophone.

Therefore, there is a distinction between [ʒ] and [dʒ] in English, however, [dʒ] and [ʒ] are not clear distinction in Japanese. [z] and [dz] are also classified in the same way. In the general definition [dz] is usually at the beginning of word, and [z] is positioned at the middle of words. However, [dz] is pronounced with a weak affricate, therefore, it is similar to [z].

In the previous study, the phonetics of Japanese learners whose mother tongue is Indonesian or Javanese have been conducted, but the phonological processes have not yet been studied. Therefore, I will study the Japanese phonological process of Javanese (Semarangan) native speakers, and study how their pronunciation is articulated by observing actually the way learners speak. In this research, I investigate and analyze the Japanese affricate [dz] and [ts] that Javanese natives have difficulty with.

The hypotheses that accompany Japanese pronunciation are: 1) Affricate [dz] and fricative [z] are as allophonic relationship. 2) Plosives are omitted when articulating [dz] and [ts] affricates, which are unfamiliar to Javanese native speakers. The questions of this study is these below: (1) What kind of phonological process do Javanese natives tend to make when they speak Japanese affricate? (2) What are the factors that lead to phonological processes?

To approach to solve the problem, investigate three things. First, identify Japanese phonological process of Javanese natives. After that, describing each identified phonological process. Finally, explore the factors that cause the phonological process.

Although there are previous studies that have pointed out the Japanese affricate sounds of Indonesian learners, few studies have focused on the phonological process. Therefore, this research aims to improve learners' pronunciation by pursuing phonology rather than phonetics.

The expected result of this paper is to derive the process to achieve correct pronunciation from the learner's phonological process.

2. Methods

To find out learners' phonological process, the research conducted Qualitative research method. Qualitative research is of an investigative or exploratory nature and is used by researchers to observe human habits and behaviour. Human behaviour is complex, but observational approaches in social research involve monitoring and explaining participant behaviour (Adedoyin 2020). In this research, mother tongue interference will be related. It is necessary to observe not only their voice, but also shape of mouth and tongue. I have to observe how they try to articulate their voice close to the Japanese pronunciation. Then, compare their phonological processes with Javanese phonetic chart.

A qualitative approach is used for deeply analysing a problem and build theories and hypotheses. It is also used to understand the root causes, opinions and motivations behind it and to discover trends in opinions and thoughts. It is considered a subjective approach because it involves observations and descriptions rather than pure statistical data. To collect accurate data, there are requirements below:

1) This study targets native Javanese (especially who speak Semarangan) learners of Japanese.
2) The survey is conducted under the same conditions such as educational background, age group, and their language background.
    i. In order to obtain equal data, I look for the learners whose educational background and school year are the same. The conditions of participants' educational background are: (1) university students, (2) Japanese major, and (3) sophomore. I have a reason to choose sophomore students. They should understand Japanese words at least they have heard about the given words. Freshman often read without understanding the meaning because their

vocabulary is still poor. In order to conduct research more smoothly, I chose sophomore.

ii. Gender is not important for the requirement of collecting data because my target is not including male and female languages.

3) The voice data will be collected from 10 Javanese natives in Semarang (Semarangan natives).

4) Their both parents are also required as Javanese natives.

Learners get a vocabulary card (List 1) and a sentence card (List 2) as below.

List 1. Vocabulary card

No.	Japanese	Meaning
1	**ぜ**ったい /**z**ettai/	Absolutely
2	しずか /shi**z**uka/	Quiet
3	ございます /go**z**aimasu/	(the end of a polite sentence)
4	どう**ぞ** /dou**z**o/	Please
5	**つ**かれます /**tsu**karemasu/	Tired
6	あ**つ**い /a**tsu**i/	Hot
7	せいかつ /seika**tsu**/	living

List 2. Sentence card

No.	Japanese sentence
1	**ぜ**ったいに、ごうかくします。 **Ze** t ta i ni gookaku shimasu
2	ここは、しずか です。 Kokowa shi**zu**ka desu.
3	おはようございます。 O ha yoo go**za**imasu.
4	どう**ぞ**、きをつけて。 Doo **zo**, ki o tsukete.
5	**つ**かれました から、やすみましょう。 **Tsu**karemashita kara, yasumimashou.
6	きょうは、あ**つ**いです。 Kyou wa a**tsu**idesu.
7	にほんの せいかつは、どうですか。 Nihon no seikatsu wa, doudesuka?

Learners read these cards three times each. Affricate [dz] and [ts]are at the beginning, the middle, or at the end of words. The reason to read both vocabulary card and sentence card is to observe these two items below:

1) Phonological process in connection of preceding and following phonemes (vocabulary card and sentence card) For example, in the word /a**tsu**i/, preceding phoneme /a/ or the following phoneme /i/ influence to pronounce /tsu/ or not?
2) Phonological processes with lexical connections (sentence card) For example, " Nihon no seika**tsu** wa, doudesuka?" Pay attention the connection "tsu" in /seika**tsu**/ with "wa"

The procedure of this study is shown as below:

Step 1
Learners read these cards three times. While they are reading, they are recorded video. The observation was with taking a note.

Step 2
Review video and comparing the note which is taken when learners were speaking. By listening their pronunciation carefully, find out their unnatural sound, and fill in the check list to make the result of phonological process (pronunciation and accent) and evaluate naturalness of their speech.

Pronounced most frequently among 3 times, if learners pronounce 3times differently, the 2nd one is taken as data because it is possible that they couldn't read fluently at the first time.

In 3rd time, learners read faster than other two times because the third time is the last time to read, therefore, it can be lack of concentration.

In the right side of evaluation sheet, there are levels of transmission. Evaluate their pronunciations into three levels:
2= can be transmitted without problems
1= somehow transmitted
0= cannot be transmitted
Observe movement of their mouth carefully in the video to find out the feature of their pronunciation to find out their phonological process.

Step 3
After phonological process were found, analyse the factor to be the cause, and compare with their mother tongue to find out the correct articulation.

3. Result and Discussion

After analyses the data of learners, explains the problem of learners' pronunciation errors, presents the phonological process, and clarifies how and why the phonological process occurs.

3.1 Analysis data of observation

Based on analysed data, phonological process are found and explained. In addition, find out the factor why phonological process are occurred. **Table 1** is the aggregated result. This result shows that the articulation of the Japanese affricate [dz] and [ts].

Table 1. Learners' phonological process (vocabulary)

Word	Correct Pronunciation and Accent	Error Mark the error and write the error sound.	Natural /Unnatural	% of learners
ぜったい	**dze**／ttaiˉ /**ze**ttai/	se／ttaiˉ	0・1・2	30
		ze＼ttaiˉ	0・1・2	30
		ze／ttaiˉ	0・1・2	20
		dzeʰ／ttaiˉ	0・1・2	10
しずか	ɕi＼**dzɯ**ᵝka /shi**zu**ka/	si＼dʒuka	0・1・2	30
		si／dʒuka	0・1・2	10
		ɕi／dʒuka	0・1・2	20
		si＼zuka	0・1・2	10
		si＼səka	0・1・2	10
ございます	go／**dza**ima＼sɯᵝ /go**za**imasu/	go／dzaimasɯᵝ	0・1・2	10
		go／za＼imasɯᵝ	0・1・2	20
		go／saima＼sɯᵝ	0・1・2	20
どうぞ	do＼:**dzo** /dou**zo**/	do／:zo	0・1・2	40
		do＼uzo	0・1・2	10
		do＼:so	0・1・2	10

つかれます	tsɯᵝ／karema＼sɯᵝ /**tsu**karemasu/	sə／garema＼sɯᵝ tsu／karema＼sɯᵝ tsu／karema＼sɯᵝ * [t] is very weak tsɯᵝ／karema＼su sə／karema＼sɯᵝ t͡ʃu／karema＼sɯᵝ	0・1・2 0・1・2 0・1・2 0・1・2 0・1・2 0・1・2	10 10 20 10 30 20
あつい	a／tsɯ＼i /a**tsu**i/	a／tsui a／tsɯi a／ttsu＼i atsu／i	0・1・2 0・1・2 0・1・2 0・1・2	40 20 20 10
せいかつ	se／:katsɯᵝ⁻ /seika**tsu**/	se／ikatsu se＼:katsɯᵝ⁻ se／ika＼tsu se／ikatsɯᵝ⁻ se／ikat͡ʃu	0・1・2 0・1・2 0・1・2 0・1・2 0・1・2	50 10 10 20 10

3.1.1 Learner's articulation of [dz]

[dz] at the begging of the word, learners who are able to [dz], however, /z/ tended to be exaggerated by the presence of /d/. An affricate produces both a "plosive" and a "fricative" at the same time, but learners pronounce [dz] by extending the plosive and then adding the fricative. Therefore, there is sound emphasis. Other learners lack plosive sound, and directly pronounced [z] or [s]. Affricate [dz] is replaced to fricative [z] or [s], therefore, they have phonological process which is called deaffrication. If the word starts with an affricate, there is no phoneme before the affricate, and since it is the beginning, /z/ articulation is relatively easy. 60% of learners could pronounce /z/. 30% of learners pronounced /s/, however, the only difference between /s/ and /z/ is that /s/ is voiceless and /z/ is voiced. The tongue position and pronunciation are the same. Therefore, articulation /s/ is one step of achieving /z/. However, even though /s/ and /z/ are just a difference in vocal cord vibration (voiceless and voiced), the words will not be conveyed to the other people if these are misused. If the affricate is in the middle of word, 60% of learners tend to pronounce [ʑ]. Previous studies of Hernawati (2015) have shown that Javanese native speakers have difficulty distinguishing between [z] and [ʑ]. Therefore, there is a possibility that [z] is pronounced as [ʑ]. In addition, there is a tendency to pronounce [z] as [s]. /shizuka/ and /gozaimasu/ have /z/ in the middle of the word, however, /gozaimasu/ was not articulated [ʑ] in the data (Table 1). However, some introductory Japanese learners pronounce [za] in /gozaimasu/ as [ʑa]. According to Fukuda (2013), the ability of phonological working memory also improved with the acquisition of Japanese. It can be said that when adults learn a second language, their ability to capture the phonological features of the target language, accurately represent it, and utter it as speech improves. /gozaimasu/ may have been improved because it is spoken more frequently than /shizuka/ in Japanese education. However, when the vowel [i] comes before /z/, it is easier to articulate [ʑ] rather than [z]. [i] is a close front unrounded vowel, which is articulated with the tongue closest to the hard palate. [ʑ] is an alveolar-palatal fricative and [z] is an alveolar fricative. The position of the tongue of [i] is similar to [ʑ], therefore, it tends to be articulated [ʑ]. The above is the reason why [z] after [i] is articulated to [ʑ].

Watase (1968) defined [dz] and [z] as separate phonological units, however, not phonologically opposed in Japanese. In other words, [dz] and [z] are not used separately. Therefore, it doesn't matter /shizuka/[ɕidzɯᵝka] is pronounced [ɕizɯᵝka] or [sizɯᵝka]. If there is /z/ at the beginning of the word, it is common for Japanese to pronounce affricate [dz], however, it can also be conveyed by pronouncing [z].

Table 2 indicates the result of the learners when they read the sentences which contain the affricate as below.

Table 2. Learners' phonological process (sentence)

No.	Japanese sentence	Analysis
1	**ぜったい**に、ごうかくします。 /zettai ni, goukakushimasu./ Absolutely, I will pass the exam. [**dze**／ttai¯]	30% correct 10% [tt] less than 1 beat 60% [dze／tta＼i¯] **[dzeʰ] overemphasized**
2	ここは、**しずか**です。 /Koko wa, shizukadesu/ [ɕi＼**dzɯ**ᵝka]	40% [ɕi／], [si／] L-H pitch accent **30% [dz]→[ʤ]** 30% change their pitch accent. [ɕi／dzɯᵝ＼ka]
3	おはよう**ございます**。 /ohayou gozaimasu/ Good morning [go／**dza**ima＼sɯᵝ]	40% Correct 40% [go／dzaimasɯᵝ] **20% [dza]→[dze] or [s]**
4	**どうぞ**、きをつけて。 /doozo, kiotsukete/ /kiwotsukete/ [do＼:**dzo**]	50% correct **30% [dzo]→ [ʤo] learners** pronounced **[do＼: ʤo]** **20% learners pronounced [dzo]→ [so]** 10% made wrong pitch accent
5	**つかれました**から、やすみましょう。 /tsukaremashitakara, yasumimashou/ Let's take a rest because we are tired. [**tsɯ**ᵝ／karema＼ɕita]	**20% [tsɯ]→[tsu] but correct pitch accent** **70% [tsɯ]→[sə]** **10% [tsɯ]→[dzu] error**
6	きょうは、**あつい**ですね。 /kyou wa atsui desune/ It is hot, today. [a／**tsɯ**＼i]	**20% correct** 70% [ɯ]→[u] **10% vocabulary [atsui]→ [t͡ʃui]**
7	にほんの　**せいかつ**は　どうですか。 /nihon no seikatsu wa doo desuka?/ How is your life in Japan? [se／:ka**tsɯ**ᵝ¯]	70% [se／ika＼tsu¯] 20% [se／:ka＼tsu¯] 10% [se＼ika＼tsu¯]

Comparing with Table 1, it can be seen that the correct pronunciation rate of [dz] or [z] that becomes an allophone that comes at the beginning of a word has increased by 20%. For the in-word [dz] or allophone [z], the number of learners who pronounced [ʤ] for /shizuka/[ɕi\dzɯᵝka] decreased 40%. However, the accuracy rate decreased from 20% to 0% due to pitch accent errors. The data in Table 3 indicated that learners' phonological process of [dzɯᵝ] tends to be /jyu/ [ʤu]. Japanese /jyu/ is [d͡ʑɯ], however, both [d͡ʑ] and [ɯ] don't exist in Javanese phonetic. Therefore, learners pronounce [ʤ]. [d͡ʒ] tends to protrude rounder than [d͡ʑ]. The following Javanese vowel /u/ is rounded [u]. Although it is slightly different from /u/ in Japanese [ɯ], [u] is an allophone in Japanese. /gozaimasu/ [go/dzaima\sɯᵝ] also decreased the accuracy rate by 10% when learners read the sentence. There was a phonological process [dze]/[ze] instead of [dza]/[za] when a learner read the sentence. For word endings [dz] or allophones [z], the accuracy rate increased by 10% when learners read

the sentence. However, there was a phonological process [dzo] → [ʤo]. This phonological process was seen in learners who could read the vocabulary correctly. どうぞ、きをつけて /douzo, ki o tsukete/ has a comma between /douzo/ and /ki o tsukete/, therefore there is a short beat between /zo/ and /ki/. If learners take a beat, it is unlikely that /zo/ will be affected by the next word /ki/. If the beat were ignored, there was a tendency to return to easy pronunciation for them due to mother tongue interference. There was a tendency to pronounce Javanese phonetics [ʤ], [s] and [z]. The results show that if learners can distinguish the pronunciation of [z] from [ʤ] and [s], and can pronounce [z] stably, they can pronounce words containing [z] correctly.

Table 3. Phonological process of each learner's [dz] (* [z] is considered correct as allophone)

No.	Learner	Vocabularies /**ze**ttai/ /shi**zu**ka/ /go**za**imasu/ /dou**zo**/	Sentences /**ze**ttai/ /shi**zu**ka/ /go**za**imasu/ /dou**zo**/	Vocabularies /**tsu**karemasu/ /a**tsu**i/ /seika**tsu**/	Sentences /**tsu**karemasu/ /a**tsu**i/ /seika**tsu**/
1	A	correct [ʤu] correct correct	correct [ʤu] [ze] [ʤo]	[dzu] correct correct	[dzu] correct correct
2	B	[se] [ʤu] [sa] correct	[se] correct correct [so]	[sə] correct correct	[sə] correct correct
3	C	correct correct correct correct	correct correct correct correct	correct correct */t/ was weak correct	[sə] correct correct
4	D	correct [ʤu] correct correct	correct correct correct correct	correct correct correct	correct correct correct
5	E	[se] [ʤu] correct correct	correct correct correct correct	correct correct correct	[sə] correct pronounce [tsu], but beat was shorter
6	F	[zeʰ] [ʤu] correct [ʤo]	[zeʰ] [ʤu] correct [ʤo]	[sə] [t͡su] [t͡ʃu]	[sə] [t͡su] correct
7	G	correct correct correct correct	correct correct [dze] correct	[sə] correct correct	[sə] correct correct
8	H	correct [ʤ] correct correct	correct correct correct [ʤ]	[t͡ʃu] correct correct	[sə] correct correct
9	I	correct [ʤ] correct correct	correct [ʤ] correct correct	[t͡ʃu] correct correct	[t͡ʃu] correct correct
10	J	[s] [s] [s]	[s] [s] [s]	[sə] correct correct	[sə] correct correct

[s] [s]

3.1.2 Larner's articulation of [ts]

Looking at the data, learners have difficulty to pronounce if /tsu/ [tsɯ] is at the beginning of the word. Learners tend to pronounce [t], [s], or [t͡ʃ]. [ts] doesn't exist either in Javanese or Indonesian, therefore, they articulate their familiar sound. The closest sounds of [ts] in Javanese are [t], [s], and [t͡ʃ]. Therefore, articulation in learners is affected by mother tongue interference. The data indicates that the learners can pronounce either [tsɯ] or [tsu] if /tsu/ is in the middle of the word and the end of the word. There is a research result that the ability of phonological working memory improves along with the acquisition of Japanese (Fukuda 2013). It can be said that this achievement of /tsu/ in the middle and ending of words was achieved through frequent use during Japanese language learning.

The pronunciation of /tsu/ at the beginning of word such as /tsukaremashita/ [tsɯᵝkaɾemaɕita] seems difficult. Since the pronunciation of the very first letter is unfamiliar, the accuracy rate is not high. 70% of learners articulated [sə] in [ts] and lacked [t]. 10% of learners made voiced sound [dzu]. 20% of learners pronounced [tsu]. Phonological processes include lack of plosives or change to voiced. However, when /tsu/ was in the middle of the vocabulary in the sentence, most of the learners could pronounced the allophone [tsu] or [tsɯ], whereas 10% of the learners had phonological process [tsu] → [t͡ʃu]. When there was /tsu/ at the end of the vocabulary in the sentence, learners could pronounce /tsu/ [tsu] or close to [tsɯ], however, there was an effect on the pitch accent at the end of the word. When all learners shift from /ka/ to /tsu/, the pitch accent changes from H → L. The phonological process of the /tsu/ sound is as described above. Learners who are starters of learning Japanese articulate [sə] and [t͡ʃu] due to mother tongue interference, however, they learn the articulation of [tsɯ] or [tsu] through training at school.

However, there are differences in pronunciation among learners even though they are learning in the same condition. What is the difference between learners who can pronounce and those who cannot? Akagi's (2022) research results shows that being phonological awareness and noticing differences is the key to improving the phonological process. In addition, Akagi (2022) stated that visualization of pronunciation is a clue for awareness. Therefore, phonological process of learners will not be changed if learners are just pronouncing the words within the range of the learner's own mother tongue. In this survey, all learners are in the same Japanese learning background. However, there are differences in pronunciation among learners. It is because differences in "thinking ability" can be seen in the process of improving phonological processes which means awareness and consciousness help learners to improve phonological process and lead to correct pronunciation. Therefore, knowing and being aware of the phonological process is a great force for improving pronunciation.

3.1.3 Japanese Alveolar affricate [ts] [dz] and Javanese Post-alveolar affricate [t͡ʃ][d͡ʒ]

Alveolar consonants are articulated with the tongue against or close to the superior alveolar ridge. Post-alveolar consonants are articulated with the tongue near or touching the back of the alveolar ridge. Articulation of post-alveolar is farther back in the mouth than the alveolar consonants but not as far back as the hard palate. Therefore, difference between alveolar and post-alveolar is the position of tongue. The articulatory position of post-alveolar

is posterior to the alveolar ridge. In another word, the articulation is in the back of the alveolar ridge. Simply put, to pronounce /tsu/, the tip of tongue touch to the back of your upper front teeth. To make /chu/, the tongue is in the middle. Simply put, to pronounce /tsu/, the tip of the tongue touches to the back of the upper front teeth. If the tongue is in the middle, it will sound like "chu". Different tongue positions produce different sounds. The reason why some Javanese native speakers end up with /chu/ when pronouncing /tsu/ is because the tongue is centred. The phonological process [t͡ʃ] [d͡ʒ] is due to the position of the tongue, and since these are present in the Javanese pronunciation, it can also be said to be the mother tongue interference of [ts] and [dz].

3.1.4 Consistency of Pronunciation Seen from Phonological Process

In the phonological process, some learners are coherent in articulation and others are incoherent. A consistent learner may be familiar with the articulation. Among them, there are learners who can pronounce correctly; however, some words have phonological processes. The learner J had consistent, but fundamentally incorrect articulations. Inconsistent learners are considered to be exploring. Learner F had inconsistent articulation of words containing [ts]. Different articulations were found in all three words. Learners B and E were inconsistently pronounced only for the word [dz]. Hara (2003) stated that (1) inconsistent learners can understand the validity of phonological rules, however they are not aware their incorrect articulation, and (2) coherent learners had difficulty recognizing the correctness of phonological rules and self-articulatory errors. After identifying this classification, learners in (1) should be guided to notice errors in articulation, and to correct the phonological rules for learners in (2) before they are made aware of their individual errors.

4. Conclusions

The results of this study show that the phonological processes of affricates of Javanese native speakers are influenced by their mother tongue. It turned out that the affricate [dz] is articulated to [z], [d͡ʒ], [s], and [ts] is articulated to [t], [s], [t͡ʃ]. It is the learner who chooses these articulations. This depends on their hearing and speech abilities. As a result of this observation, we found that learners are able to produce accurate pronunciation through awareness, realization, and daily practice, despite the interference of their mother tongue. In Japanese, [z] is an allophone of [dz], and [u] is an allophone of [ɯ], so even if [dz] is pronounced as [z], [ɯ] is pronounced as [u]. There is no problem in conversation. However, relatively many learners pronounced [tsɯ] as [sə] due to the interference of their mother tongue. Looking at Table 3, it is clear that affricates at the beginning of words are difficult for native speakers of Javanese to pronounce. It has been shown that there are more phonological processes at the beginning of words than at the middle or ending of words. In addition, the consistency of phonological processes of Javanese native speakers was also observed. Observations showed that 60% of learners were consistent in their phonological processes, while 40% were inconsistent and articulated the same sounds differently. The presence or absence of this consistency shows recognizing the correctness of phonological rules and self-articulation. As a result, inconsistent learners can understand the correctness of the phonological rules, but are not aware that their articulation is incorrect. Consistent learners have difficulty in recognizing the correctness of phonological rules and self-articulatory errors. These findings have been clarified by cross-checking with previous studies. The phonological processes of Javanese native speakers are not only caused by

mother tongue interference, but without the accuracy of phonological rules and the awareness of the learners themselves, there will be no improvement.

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