วารสารภาษาและภาษาศาสตร์ ปีที่ 39 ฉบับที่ 1 (มกราคม - มิถุนายน 2564)
JOURNAL OF LANGUAGE AND LINGUISTICS 39, 1 (JANUARY - JUNE 2021)

Recognition of Glottal Stop /ʔ/ as an Allophone of /t/ in English Words by Native Thai Listeners

Somboon Pojprasat
Sunantha Wilaisilp
Faculty of Liberal Arts, Mahidol University
Corresponding author's email: sunantha.wil@mahidol.edu
Received 29 July 2020; revised 10 March 2021; accepted 12 March 2021;
online 21 June 2021

Abstract

Some native speakers of English pronounce /t/ in certain words such as *written, mountain,* and *button* as the glottal stop /ʔ/. That is to say, the latter sound for some native English speakers serves as a variation of the former sound. This practice seems, we assume, unfamiliar to Thai learners of English, to whom sound variation is not often taught in a formal classroom. Thus, we aim to explore to what extent native Thai listeners can recognize the glottal stop /ʔ/ as a variation; to be more precise in this study as an allophone of the phoneme /t/ in English words. Methodologically, the participants listened to 15 English words, all of which contained an intervocalic glottal stop as the /t/ allophone. They were then asked to write the words they heard together with their meanings in Thai orthography in order for us to examine the level of their recognition of the sound in question as well as their matching of the glottal stop to Thai corresponding sounds. Results have shown a fairly low level of the participants' ability to recognize the glottal as an allophone of /t/ in English words, and the most frequent correspondence was sound omission. We make a pedagogical suggestion pertaining to the glottal stop /ʔ/ as an allophone of the phoneme /t/ in the final section of the paper.

Keywords: glottal stop, sound recognition, allophone

วารสารภาษาและภาษาศาสตร์ ปีที่ 39 ฉบับที่ 1 (มกราคม - มิถุนายน 2564)
JOURNAL OF LANGUAGE AND LINGUISTICS 39, 1 (JANUARY - JUNE 2021)

การรู้จำเสียงกักเส้นเสียง /ʔ/ ในฐานะหน่วยเสียงย่อย ของหน่วยเสียง /t/ ในคำภาษาอังกฤษของผู้ฟังชาวไทย

สมบูรณ์ พจน์ประสาท
สุนันทา วิไลศิลป์
คณะศิลปศาสตร์ มหาวิทยาลัยมหิดล
Corresponding author's email: sunantha.wil@mahidol.edu
รับบทความ 29 กรกฎาคม 2563 แก้ไขบทความ 10 มีนาคม 2564 ตอบรับ 12 มีนาคม 2564
ออนไลน์ 21 มิถุนายน 2564

บทคัดย่อ

ผู้พูดที่เป็นเจ้าของภาษาอังกฤษบางคนออกเสียง /t/ ในคำบางคำ เช่น *written, mountain,* และ *button* เป็นเสียงกักเส้นเสียง (glottal stop) กล่าวคือเสียงกักเส้นเสียงเป็นเสียงแปรของเสียง /t/ ซึ่งผู้เรียนชาวไทยอาจไม่คุ้นเคยกับการออกเสียงแปรนี้เนื่องจากไม่ได้รับการสอนในห้องเรียนมากนัก ผู้วิจัยจึงมีวัตถุประสงค์เพื่อศึกษาว่าผู้ฟังชาวไทยสามารถรู้จำเสียงกักเส้นเสียงในฐานะเสียงแปรมากน้อยเพียงใด ซึ่งในการศึกษาครั้งนี้หมายถึงหน่วยเสียงย่อยของเสียง /t/ ในคำภาษาอังกฤษ วิธีการในการทำวิจัยคือ ผู้ร่วมวิจัยฟังคำภาษาอังกฤษที่มีเสียงกักเส้นเสียงในตำแหน่งระหว่างเสียงสระจำนวน 15 คำ จากนั้นจึงเขียนคำที่ได้ยินพร้อมกับความหมายเป็นภาษาไทย ผลการวิจัยแสดงให้เห็นว่าความสามารถในการรู้จำเสียงกักเส้นเสียงในฐานะหน่วยเสียงย่อยของเสียง /t/ ในคำภาษาอังกฤษของผู้ฟังชาวไทยอยู่ในระดับค่อนข้างน้อย และเสียงกักเส้นเสียงในคำทดสอบที่ผู้ฟังชาวไทยเชื่อมโยงมากที่สุดคือการละเสียง (sound omission) ทั้งนี้ผู้วิจัยได้ให้ข้อเสนอแนะเกี่ยวกับการสอนเสียงกักเส้นเสียงในฐานะหน่วยเสียงย่อยของหน่วยเสียง /t/ ไว้ในตอนท้ายของบทความวิจัยนี้

คำสำคัญ เสียงกักเส้นเสียง การรู้จำเสียง หน่วยเสียงย่อย

1. Introduction

Problems may arise when a sound of a word is misperceived. Imagine, for example, you heard the word *rice* as /laɪs/, instead of /raɪs/, which your conversation partner actually uttered. This problem seems to be felt more apparently when the interlocutors speak different languages. They might have different levels of the language being used, different amounts of exposure to the target language, and the degree to which the two languages share linguistic attributes. Indeed, previous research has investigated the similarities and differences between L1 and L2 listeners' speech backgrounds that might have certain impacts on sound recognition (e.g., Best & Hallé, 2010; Best & Strange, 1992; McAllister et al., 2002; Polka, 1992). Findings have been various.

The current study concerned itself with sound recognition of an English phoneme that, we assumed, Thai learners of English find difficult. This situation becomes potentially exasperating when speakers' and listeners' linguistic choices are not the same. That is, the speaker's pronunciation of a certain sound does not match with a sound that the listener is familiar with. The issue lies in the choice that speakers have when conversing with their partner, so it is the listener's task to figure out what sound is produced. As Byram and Hu (2013, p. 764) put it succinctly, "variation is not an optional extra for users of a language; it is an unavoidable central feature". This suggests that a lack of knowledge of sound variation can bring about communication failure.

The glottal stop in English is the focus of this study. Briefly, this sound is represented by the IPA symbol /ʔ/ and can be heard in such words as *assortment* /əˈsɔː(r)ʔmənt/, *eaten* /ˈiːʔən/, and *sweeten* /ˈswiːʔən/ by some native speakers of English, especially Americans, who opt for this sound to alternatively substitute the [t] sound in some cases. The /ʔ/ appears in certain phonological contexts and in certain regions of English-speaking countries. From the sociolinguistic point of view, the use of this sound in speech can indicate social class, prestige, and gender of the speaker, as observed by Eddington and Channer (2010).

As far as Thai learners of English are concerned, little is known about their recognition of the English glottal stop. Despite its existence in the Thai language, albeit in different manners and contexts, the English glottal stop receives little attention in formal teaching as far as our decades of teaching experiences can tell. As English is taught as a foreign language in Thailand, it is rarely used outside the classroom. Therefore, exposure to English language variation of Thai learners is probably even more minimal. An awareness and recognition of the sound in question is even far from clear. The bulk of the research on native Thais' English phonetic abilities has generally paid attention to such common features as consonant and vowel sounds, stress, linking, and intonation (Kanokpermpoon, 2007; Khamkhien, 2010; Narksompong, 2007; Sahatsathatsana, 2017). We think it is both important and timely to carry out a linguistic investigation on this specific sound. The aim is to find out to what extent Thai learners recognize the English glottal stop as an allophone of the phoneme /t/ in the hope that it will probably help minimize Thai learners' difficulties in listening to this sound, and could increase their awareness of sound variation in English.

2. Backgrounds

2.1 Glottal Stop /ʔ/

The glottal stop, one of the most fascinating stop phonemes existing in many languages, is produced by the obstruction of airflow in the glottis before a burst of air is released as for other stops. Its phonation is voiceless and the passage of the airflow is oral. The glottal stop can be recognized as an isolated phoneme in one language or one of phonemic variation in another. For example, while the glottal stop is an allophone in some English dialects such as Cockney, Japanese and Arabic speakers apply this stop as a phoneme that makes a distinction among words.

2.1.1 [ʔ] in English

The glottal stop in English can occur in the initial, medial, or final position as in the expression *uh-oh* /ˈʔʌʔəʊ/, and the words *written* /ˈrɪʔən/ and *cat* /kʰæʔ(t)/ in some English dialects. Nevertheless, the glottal stop sound can be omitted in the initial position in English as in *uh-oh*, thus the phonetic transcription of this expression being identical to /ˈʌəʊ/ (*MacMillan dictionary*, 2007, p. 1619). In addition, the English glottal stop can appear as an allophone of the voiceless alveolar stop /t/ in these following environments (Fromkin et al., 2003, p. 285). First, when an intervocalic /t/ is preceded by a stressed vowel and is followed by an unstressed vowel, the /t/ sound is substituted by the glottal one as in *mountain* /ˈmaʊnʔən/ or *written* /ˈrɪʔən/. Second, the glottal stop replaces the /t/ sound in certain words such as *network* and *outbreak*, in which the /t/ is in the final position followed by another consonant sound. Last, in the following phrase *right at*, the glottal stop replaces the final consonant /t/ of the word *right* and functions as a linking sound with the following vowel. This substitution of the glottal /ʔ/ sounds more common in American English pronunciation than in British Received Pronunciation, where the alveolar /t/ is conserved most of the time.

Figure 1

The waveform of /ʔ/ in the English word "button"

(From *"Consonant sound glottal 'T' /ʔ/ as in "button" – American English pronunciation* [Video]," by Sound American, 2017, http://www.youtube. com/ watch?v=Vja83KLQXZs.)

2.1.2 /ʔ/ in Thai

There is a schism in thinking as to whether the glottal stop is categorized as a phoneme in the Thai phonological system. It is, however, far from debatable that the sound in question exists in abundance in Thai. Indeed, it occurs in the initial, medial, and final positions of words, for example, /ʔaː/ 'uncle', /ʔɪːk/ 'more', /kraʔæm/ 'cough', /saʔɯk/ 'hiccup', /kapɪʔ/ 'shrimp paste', and /teʔ/ 'kick'. The orthographic form <*อ*> is used to indicate a glottal stop sound both in the initial and medial positions. The aforementioned words are written out in Thai letters as <*อา, อีก, กระแอม,* and *สะอึก*>, respectively. Accordingly, such appearance might be the main reason why some linguists consider this sound as a phoneme (Changjai, 2015). On the contrary, those who remove this sound from the Thai system argue that it functions merely as "a buoy for a vowel to attach to" (Uppakitsilpasan, 1988, as cited in Kanchanawan, 2015). That is to say, Thai words beginning with a vowel sound will automatically insert /ʔ/ just to facilitate pronunciation. Therefore, most Thai people are likely to pronounce English words beginning with a vowel sound such as *in, on,* and *at* as /ʔɪn/, /ʔɔːn/, and /ʔæt/, respectively. In addition, the occurrence of the glottal stop in the final position of Thai words is predictable in the manner that it happens only with words ending in a short vowel. With the facts stated above, it will be more interesting to see how Thai listeners perceive the glottal stop, for they are more or less familiar with this sound even though English and Thai apply it in different aspects; that is, the clearest distinction is that it is an allophone in the former while it is not in the latter.

2.2 L2 Speech Perception

Humans are born with the ability to recognize and categorize any sounds they hear, but no matter how much inborn ability we have in hearing, some unfamiliar speech sounds even in a familiar language can sometimes disrupt our understanding. Oftentimes when non-native listeners hear an unfamiliar sound, they may recognize that particular L2 sound in various ways depending on the level of similarity between their mother tongue and the target language.

Talking about L2 speech perception, two classic theories are the Perceptual Assimilation Model (PAM) proposed by Best (1993, 1994, 1995) and Speech Learning Model (SLM) proposed by Flege (1995, 2002).

PAM tests non-native listeners' ability to categorize non-native sounds into those of their mother tongues. Methodologically, PAM focuses on pairwise phonological contrasts by matching a sound in a foreign language to another in their language (Best et al., 2001).

Similar to PAM, SLM investigates perceived phonetic similarities and differences between L1 and L2 but differs from PAM in that, first, it tests individual sounds, and second, it applies to both perception and production of a target sound (Flege, 1995). SLM hypothesizes a number of factors that influence L2 learners' performance. Notable factors include the critical period of L2 acquisition, age of L2 learning, and amounts and kind of input. It is difficult to learn to obtain a native-like pronunciation after puberty (i.e., after 12 years old); the sooner L2 learners are exposed to the target language the better they would master it; and if L2 learners are given adequate and sufficient input, they can possibly perceive L2 sounds more accurately.

The current study was based on the SLM framework on the grounds that the individual sound was tested (the glottal stop as an allophone of /t/ in English words), and that input was believed to affect participants' perception.

3. Research Questions

This study attempts to respond to the following research questions:

1) To what extent do native Thai listeners recognize the glottal stop in English words?

2) To what corresponding sounds in Thai do the participants match the glottal stop in English words?

4. Methodology

4.1 Participants

A group of 17 undergraduate students from a university and a group of 13 working people whose level of education was bachelor's degree or over participated in the study. Of all the participants, there were 8 males and 22 females, aged between 18 and 40 years old. Both groups were selected to represent Thai learners with no formal instruction of speech perception of the English glottal stop: the first group was drawn from all the students enrolled in an English summer course, and the second group from twenty percent of all the staff members in a workplace (13 out of 62 people). They were all native Thai listeners who had at least six years of formal English language learning at school and university levels.

4.2 Stimuli

Fifteen English words were used as stimuli in this experiment. All of them were actual words that are in common use. They were drawn from an online video demonstrating American English pronunciation. The narrator of this video was an American male, who read 30 English words in isolation with clear pronunciation. However, only 15 words were selected for this perception test based on their frequency of usage in everyday conversation. Fourteen words contained two syllables, while the other one contained three-syllables. The glottal stop in each word appeared in the intervocalic position where the preceding vowel was stressed. All the words ended with the nasal /**n**/, except one that ended with the cluster /**nt**/ (See Appendix A for a list of the test words).

4.3 Data Collection

Thirty participants were asked to listen to the stimulus set as listening practice in a quiet room with well-equipped facilities. Each participant was also given a questionnaire asking about personal information including gender, age, education, and occupation. In the experimental part, the participants were instructed to listen to each English word carefully and write down the word they heard in Thai orthography together with its Thai meaning (See Appendix

B for a sample of the test words). Each word was played only once and was not visually displayed on screen. The interval pause between words was 7 to 10 seconds. All participants were asked to listen to all 30 words, but were required to answer only 15 words as selected.

After the initial analysis of the data, a small interview session was conducted with individual participants to elicit their background knowledge of the /ʔ/ in English, including whether they were familiar with this sound and whether they received any formal instruction on it.

4.4 Data Treatment

4.4.1 Data Analysis

After the test had been administered, we adopted the following procedures to analyze the data.

1) Exploring the participants' transcriptions in Thai orthography to see whether or not they could recognize the glottal stop as an allophone of /t/ in each word (in this study, the Thai letter <อ>, which corresponds to the English glottal sound, was used as a measurement of accurate perception of the glottal stop in English test words)

2) Identifying the corresponding sounds that were matched to the glottal stop in each word. This was done by examining the Thai letters that participants wrote.

4.4.2 Data Presentation

Raw data on the recognition of the glottal stop of all the tokens by the native Thai listeners was converted into frequencies and percentages presented in table format. As for the phonological contexts of glottal stops, explanations were given to illustrate sound correspondence of the English glottal stops to the Thai phonemes recognized by the participants.

5. Findings

5.1 Recognition of Glottal Stop as Allophone of /t/

Table 1 shows recognition accuracy, together with inaccuracy, of the glottal stop as an allophone of /t/ in each of the 15 test words by 30 participants. Note that 22 out of 450 tokens were left unanswered, amounting

to a total of 428 words being analyzed. The findings revealed that participants' overall performance in recognizing the glottal stop as an allophone of /t/ correctly was very low (35 out of 428 = 8.18%). To be more specific, the highest accuracy score was only 5 (16.67%) belonging to one word which is *important*, and the lowest score was 1 (3.33%) belonging to nearly half of the test words which are *certain, cotton, curtain, forgotten, fountain,* and *sweeten.* We were quite surprised that very few participants correctly perceived the glottal stop as an allophone of /t/ despite the fact that all of the test words were found to be in the list of the most frequently used vocabulary in everyday conversation. This might reflect their acquisition of English words in an incomplete manner; that is, the participants paid less attention to how the words are pronounced, including their variation, than to what they mean.

Table 1

Recognition Accuracy and Inaccuracy of the Glottal Stop as an Allophone of /t/ in Each Word (n=30)

Word	Frequency of Accuracy (Percentage)	Frequency of Inaccuracy (Percentage)
brighten	4 (13.33)	26 (86.67)
certain	1 (3.33)	29 (96.67)
cotton	1 (3.33)	29 (96.67)
curtain	1 (3.33)	29 (96.67)
eaten	2 (6.67)	28 (93.33)
forgotten	1 (3.33)	29 (96.67)
fountain	1 (3.33)	29 (96.67)
frighten	3 (10.00)	27 (90.00)
important	5 (16.67)	25 (83.33)
kitten	3 (10.00)	27 (90.00)
Latin	4 (13.33)	26 (86.67)
mountain	3 (10.00)	27 (90.00)
satin	2 (6.67)	28 (93.33)
sweeten	1 (3.33)	29 (96.67)
written	3 (10.0)	27 (90.00)

5.2 Glottal Stop and Corresponding sounds in Thai

Table 2 shows that the most frequent sound that corresponded to the glottal stop was an omitted sound (52.34%) as in *eaten* and *satin*, heard as /ɪn/ and /sæt/, and inferred from their transcriptions, respectively. This result may have derived from either their failure to perceive the target sound or their association with an existing word in their lexicon. The second most frequently corresponding sounds included [t^h m ʔ b d] , which were all in the stop class, suggesting that some participants had the ability to identify the manner of the glottal stop even though they failed to pinpoint the actual place of articulation. Extra sound was another sound correspondence which the participants perceived (3.04%), such as *fountain* and *Latin*, heard as /ˈfæməli/ and /ɪˈlevən/, respectively. This result indicated to a large extent that the participants associated the test sounds with existing words in their lexicon, implying they had made some effort in making sense of what they heard. The other corresponding sounds included [w k^h p n l r tʃ k f], which were shown to vary in terms of place and manner of articulation, as well as voicing. Note that 22 tokens were left unanswered, amounting to a total of 428 words being analyzed.

Table 2

Correspondence of the Glottal Stop to Thai Sounds

Sound Correspondence	Thai Letter	Frequency	Percentage
omission	Ø	224	52.34
[t^h]	<ท>	46	10.75
[m]	<ม>	36	8.41
[ʔ]	<อ>	35	8.18
[b]	<บ>	15	3.50
[d]	<ด>	14	3.27
extra sound	various	13	3.04
[w]	<ว>	12	2.80
[k^h]	<ค>	8	1.87
[p]	<ป>	8	1.87
[n]	<น>	6	1.40
[l]	<ล>	4	0.93
[r]	<ร>	3	0.70
[tʃ]	<ช>	2	0.47
[k]	<ก>	1	0.23
[f]	<ฟ>	1	0.23
Total		428	100.00

6. Conclusion and Discussion

The findings have revealed a fairly low level of recognition accuracy of the glottal stop as an allophone of /t/ in English words among native Thai listeners', which suggests a lack of deep knowledge of the sound in question. This finding supports the SLM hypothesis that language inputs have an impact on L2 learners' speech perception—the majority of the participants reported no formal instruction about the glottal stop as an allophone of /t/. The variety of the corresponding sounds also supports the said suggestion in ways that the participants did not understand the phonetic and/or phonological properties of the test sound /ʔ/, which is a voiceless stop. Even though the

majority of the corresponding sounds are in the stop class, which suggested that the participants recognized the manner of articulation of the test sound, they failed to realize its place and voicing. The corresponding sounds such as [f tʃ w n l r] revealed a failure to recognize the manner of /ʔ/, and /t b d k p m/ the place of articulation and the voicing of the sound in question. As far as the phonological systems of Thai and English are concerned, this failure is particularly interesting because even though the glottal stop sound exists in Thai, it seems that the native Thai listeners still could not recognize this sound in English probably due to the different phonetic realization and phonological contexts in which it appears. As mentioned earlier, while the English glottal stop happens mostly when it functions as an allophone (Fromkin et al., 2003; Isac & Reiss, 2008; Jakielski & Gildersleeve-Neumann, 2018), the Thai counterpart appears as a non-allophone.

Last but not least, we would like to end this paper with a few remarks that will possibly shed more light on this specific topic. First, we found that meaning seemed to play a bigger role in the students' recognition. Sound omission and mismatched sounds were applied to correspond to the actual sounds. For example, they mismatched *satin* as *sad* and *forgotten* as *family*. Second, the mismatch may derive mainly from a vacuum of formal teaching of this sound variation in Thai classroom. We then suggest a more comprehensive pronunciation lesson in which variations in English sounds should be taught at school. In response to the /ʔ/ sound in particular, Thai teachers of English are advised to, first, provide their students with knowledge of its phonetic characteristics and notably its role as an allophone of /t/ in English words. Then teachers should give learners ample opportunities to listen to the sound in a number of words spoken by English speakers of different backgrounds—accent being one of them. In fact, teachers should give them a comparative listening practice in which <t> appearing in words is pronounced differently (i.e., either as /t/ or /ʔ/ or any other sound). At this stage, authentic

materials such as English songs, speeches, and movies should be used in order for students to realize the presence of the taught sound in real, common situations. Last, students are advised to pronounce the glottal stop sound in different phonological environments, particularly when it is an allophone of /t/ in English words. If possible, recording their own voice is recommended, and their pronunciation should be assessed either by their teacher, their peers, themselves or any combination of these.

Finally, we suggest further research could be conducted on the recognition of the English glottal stop which appears in different positions and/or all possible phonological contexts. Researchers may also consider focusing on the production of this sound by learners in order that more promising results may be obtained thus shedding more light on this linguistic phenomenon among Thai learners of English as a foreign language. In turn, we hope that this should increase Thai learners' communicative performance in some respects.

References

Best, C. T. (1993). Emergence of language-specific constraints in perception of non-native speech contrasts: A window on early phonological *development.* In B. de Boysson-Bardies, S. de Schonen, P. Jusczyk, P. MacNeilage, & J. Morton (Eds.), *Developmental neurorecognition: Speech and face processing in the first year of life* (pp. 289-304). Kluwer Academic.

Best, C. T. (1994). Learning to perceive the sound pattern of English. In C. Rovee-Collier & L. Lipsitt (Eds.), *Advances in infancy research* (Vol. 9, pp. 217-304). Ablex.

Best, C. T. (1995). A direct realist perspective on cross-language speech perception. In W. Strange (Ed.), *Speech perception and linguistic Experience: Theoretical and methodological issues in cross-language research* (pp. 171-204). York Press.

Best, C. T., & Hallé, P. A. (2010). Perception of initial obstruent voicing is influenced by gestural organization. *Journal of Phonetics, 38*(1), 109-126.

Best, C. T., & Strange, W. (1992). Effects of phonological and phonetic factors on cross-language perception of approximants. *Journal of Phonetics, 20*(3), 305-330.

Best, C. T., McRoberts, G. W., & Goodell, E. (2001). Discrimination of non-native consonant contrasts varying in perceptual assimilation to the listener's native phonological system. *The Journal of the Acoustical Society of America, 109*(2), 775-794.

Byram, M., & Hu, A. (Eds.). (2013). *Routledge encyclopedia of language teaching and learning* (2nd ed.). Routledge.

Changjai, N. (2015). *Evolution of the Thai language.* Ramkhamhaeng University Press.

Eddington, D., & Channer, C. (2010). American English has go? a lo? of glottal stops: Social diffusion and linguistic motivation. *American Speech, 85*(3), 338-351.

Flege, J. E. (1995). Second language speech learning: Theory, findings, and problems. In W. Strange (Ed.), *Speech perception and linguistic experience: Issues in cross-language research* (pp. 233-277). York Press.

Flege, J. E. (2002). Interactions between the natives and second-language phonetic systems. In P. Burmeister, T. Piske, & A. Rohde (Eds.), *An integrated view of language development: Papers in honour of Henning Wode* (pp. 217-244). Wissenschaftlicher.

Fromkin, V., Rodman, R., & Hyams, N. (2003). *An introduction to language* (7th ed.). Thomson/Heinle.

Isac, D., & Reiss, C. (2008). I-language: An introduction to linguistics as cognitive science. Oxford University Press.

Jakielski, K. J., & Gildersleeve-Neumann, C. (2018). *Phonetic science for clinical practice: A transcription and application workbook.* Plural Publishing.

Kanchanawan, N. (2015). *Analysis of Thai structure* (7th ed.). Ramkhamhaeng University Press.

Kanokpermpoon, M. (2007). Thai and English consonantal sounds: A problem or a potential for EFL learning?. *The ABAC Journal, 27*(1), 57-66.

Khamkhien, A. (2010). Thai learner's English pronunciation competence: Lesson learned from word stress assignment. *Journal of Language Teaching and Research, 1*(6), 757-764.

MacMillan dictionary (2nd ed.). (2007). MacMillan Publishers.

McAllister, R., Flege, J. E., & Piske, T. (2002). The influence by native speakers of Spanish, English, and Estonian. *Journal of Phonetics, 30*(2), 229-258.

Narksompong, J. (2007). *A study of Thai phonological features that cause pronunciation problems for Thai people* [Unpublished master's thesis]. Thammasat University.

Polka, L. (1992). Characterizing the influence of native language experience on adult speech perception. *Perception & Psychophysics, 52*(1), 37-52.

Sahatsathatsana, S. (2017). Pronunciation problems of Thai students learning English phonetics: A case study at Kalasin University. *Journal of Education Maharakham University, 11*(4), 67-84.

Sound American. (2017, December 4). *Consonant sound glottal 'T' /ʔ/ as in "button" – American English pronunciation* [Video]. http://www.youtube.com/watch?v=Vja83KLQXZs

Appendix A Test Words

1) brighten
2) certain
3) cotton
4) curtain
5) eaten
6) forgotten
7) fountain
8) frighten
9) important
10) kitten
11) Latin
12) mountain
13) satin
14) sweeten
15) written

Appendix B Recognition of Glottal Stop /ʔ/ as a Allophone of /t/ in English Words by Native Thai Listeners

Part I: Personal Information

1.1 Gender_____

1.2 Age_____

1.3 Educational Level_____

1.4 Major of Study _____

1.5 Occupation _____

Part II: You will hear 25 English words from the computer program. Write only the selected words you hear in Thai together with their Thai meanings.

Example cat แคท แมว

Word	Sound (in Thai)	Meaning (in Thai)
1.	No answer needed	No answer needed
2.	No answer needed	No answer needed
3.	No answer needed	No answer needed
4.	No answer needed	No answer needed
5.	No answer needed	No answer needed
6.		
7.		
8.		
9.		
10.		
11.	No answer needed	No answer needed
12.	No answer needed	No answer needed
13.		

Word	Sound (in Thai)	Meaning (in Thai)
14.		
15.		
16.	No answer needed	No answer needed
17.	No answer needed	No answer needed
18.		
19.		
20.		
21.	No answer needed	No answer needed
22.	No answer needed	No answer needed
23.		
24.	No answer needed	No answer needed
25.	No answer needed	No answer needed
26.	No answer needed	No answer needed
27.		
28.	No answer needed	No answer needed
29.		
30.		