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指導教員 アレン 玉井 光江 教授

日本人早期英語学習者の英語音声処理システムと明示的音声指導を通じた
意識変容についての研究

A Study of the English Speech Processing System in Young Japanese EFL
learners and Changes in Their Awareness Through Explicit Sound
Instruction

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河合 裕美

**A STUDY OF THE ENGLISH SPEECH PROCESSING SYSTEM
IN YOUNG JAPANESE EFL LEARNERS AND CHANGES
IN THEIR AWARENESS THROUGH EXPLICIT SOUND INSTRUCTION**

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by Hiromi KAWAI

BA (Sophia University), MA (Dokkyo University)

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ABSTRACT

A STUDY OF THE ENGLISH SPEECH PROCESSING SYSTEM IN YOUNG JAPANESE EFL LEARNERS AND CHANGES IN THEIR AWARENESS THROUGH EXPLICIT SOUND INSTRUCTION

By Hiromi Kawai

Keywords: English segments (phonemes), perception, production, explicit instruction

In response to a social demand to cultivate Japanese with English ability, the Japanese Ministry of Education, Culture, Sports, Science and Technology (abbreviated as MEXT) has launched a serious attempt to reform English education and has introduced a new course titled “Foreign Language Activities.” It is a mandatory course for students in the 5th and 6th grades of all public elementary schools in Japan. One of the primary purposes of this course is to familiarize learners with the sounds and rhythms of English (MEXT, 2008). Recently, MEXT (2014) announced “English Education Reform Plan corresponding to Globalization” in which “Foreign Language Activities” will become a formal subject for the 5th and 6th graders, and the course will be introduced to the 3rd and 4th graders in 2020 with an eye to the times with Tokyo Olympic and Paralympic Games. There will be more English lessons in the upper grades of elementary schools to develop their basic communication skills including not only listening and speaking but also reading and writing. Although a number of research and studies have suggested how sounds and rhythms of English should be taught to elementary school students along with the new reform, little research has been conducted to investigate how young Japanese learners perceive and produce English

sounds and rhythms. Therefore, it is the author's interest in this thesis to investigate how learners at pre-puberty age process L2 sounds at the initial stage of learning in a formal school setting.

A mixed method design was used. A quantitative and a qualitative studies were used to complement each other in order to verify the nature of sound processing system of young learners in a foreign language setting. In the first study 104 students in Grade 5 of a public elementary school in Tokyo participated. Their ability to perceive and produce English phonemes (segments) was measured. The data was analyzed based on the model for L1 children's speech processing system proposed by Stackhouse and Wells (1997). The results showed that (1) the participants were better at perceiving a phoneme than producing a phoneme, (2) they had difficulty in auditory discrimination of paired consonants when one of them does not exist in the Japanese inventory, (3) they had difficulty in both perceiving and producing English vowels, and (4) their L1 loan word knowledge had an influence on their ability to perceive and produce L2 sounds. The second study reports on how the author taught sounds explicitly to the same participants in the first study and how they reacted to the instruction that was designed from the findings in the quantitative study. Students' reflection notes clearly showed changes in the participants' awareness and attitudes.

These two studies indicate EFL older children's nature of perceptive and productive abilities of English sounds and the benefits of an explicit instruction of the English sound system. The author believes that this study clarifies the importance of developing the basic sound processing system which subsequently affects the development of spoken and written English.

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INTRODUCTION

For beginner learners, especially those children learning a new language, it is essential to encounter the new language with its abundant sounds in a spoken form. I have often noticed in the EFL classroom that some children seem to acquire L2 English sounds quickly, and, as a result, their English pronunciation is much better than other children, while for other children the acquisition of English sounds proves to be difficult and their pronunciation does not really improve. This observation contributed to my interest in this investigation. As yet, there seems to be no established investigation of the nature of EFL young learners' processing system of English sounds. As a language teacher, hoping that young students will be able to express their own thoughts with fluent language skills in the future, I have conducted this dissertation study.

As compared to English education to young learners in foreign countries, the implementation of the formal English education on a primary level in Japan seems slow and unpermeative, and has not yet been taken firm hold. The importance of teaching English to young learners has been finally recognized in the present *Course of Study*. The Ministry of Education, Culture, Sports, Science and Technology (MEXT, hereafter) introduced a new course named "Foreign Language Activities (abbreviated as FLA hereafter)" in 2011, in which students in the upper grades of public elementary schools learn simple English conversations, words, and letters. MEXT (2014) announced that the current FLA will be taught to pupils in the third and fourth grades, and pupils in the fifth and sixth grades will be taught English as a regular English classes from the year 2020. Thus, the more concrete contents will be necessary, particularly related to how English sounds should be taught to the upper graders.

One of the primary objectives of this course is to get students "to become familiar

with the sounds and rhythms of the foreign language, to learn its differences from the Japanese language, and to be aware of the interesting aspects of language and its richness” (MEXT, 2008). There is, however, no particular method to teach English sounds in this course has been recommended by MEXT. At present, most of the municipal boards of education assign elementary school teachers to be in charge of teaching English as the main teacher (T1) and to work with an assistant language teacher (T2) (abbreviated as ALT hereafter). These elementary school teachers, however, do not have much experience in teaching English. In addition, many of them have not been trained to teach English to children (Butler-Goto, 2005). In particular, elementary school teachers do not have much knowledge of English speech sounds or methods of teaching English pronunciation. Furthermore, Japanese children in the 5th and 6th grades have much less exposure to English than EFL children in other East Asian countries, such as Korea, China, and Taiwan (Butler-Goto, 2005; MEXT, 2015). Japanese children generally do not have a chance to speak English outside of school. How can these students develop their sound systems in this impoverished learning environment? What are the characteristics of their English sound system, if any? How can we measure these characteristics?

This dissertation is an attempt to answer these questions using data not from laboratory conditions but from real classrooms, reflecting the real voices of learners in order to find a pedagogical solution to the teaching of L2 sounds at the elementary school level in an EFL setting. A mixed method design was used. Both a quantitative and a qualitative study were used to complement each other, in order to verify the nature of the sound processing system in young learners.

In the quantitative study, after the literature review of English sounds on segmental, the differences between English and Japanese sound system, and

cross-linguistic views on children's segmental development, the speech processing model proposed by Stackhouse and Wells (1997) is introduced. Based on the research questions, the researcher reports on her study which was conducted with 104 students in Grade 5 of a public elementary school in Tokyo, when she measured the students' ability to perceive and produce English segments. The data was analyzed using the model proposed by Stackhouse and Wells.

Based on the findings of the quantitative study, the qualitative study was designed. It reports on a study that examined how the participants responded to explicit instruction of English phonemes and how they changed their awareness and attitudes towards the English sound system. The data were gathered from the students' reflection notes.

General discussion summarizes the findings in both quantitative and qualitative studies and discusses several issues revealed in this study, and conclusion and implications follow. In the final chapter, limitations, pedagogical implications, and suggestions for future studies are stated, which leads to the conclusion of the study for English education in an EFL setting targeting L2 older children around pre-puberty age.

Chapter I

THE QUANTITATIVE STUDY

1. 1 Literature Review

This study investigates the nature of the English sound processing system of older Japanese children in an EFL setting. The model proposed by Stackhouse and Wells (1997) for L1 English children is employed as the principal theory to measure their English sound perceptive and productive abilities. The author acknowledges that human speech consists of both segmental and suprasegmental aspects, and as Major (2001) claimed, if L2 learners want to master L2 native-like speech, they must master both the segmental and suprasegmental aspects of the L2 sound system. This study, however, focuses only on how L2 older children perceive and produce English sounds on the segmental level.

In this chapter, the segmental features of the two languages, English and Japanese, are described first, and the two languages are compared from the phonetic and phonological points of view. In the quantitative study described in this chapter, the segmental features of General American English (GA) are outlined and are taken as the standard criterion of judgment for the measurements developed in the study. Since the study treats developmental ages, the children's articulatory developmental stages in both languages are taken into consideration.

Second, the model of speech processing system for L1 English children proposed by Stackhouse and Wells (1997) is introduced from a psycholinguistic perspective along with related studies in order to lead the research questions for the quantitative study.

1.1.1 Segments

A segment¹ phonetically refers to a distinct speech sound or an individual phone in a flow of speech which lacks any meaning in itself. A unit of segments composes a syllable or a word that contains one prominent part which is a *vowel* and may contain several *consonants* preceding or following the vowel (Ashby & Maidment, 2005; Sato & Sato, 1997). The structure of a syllable or a word is shown as a string of vowels (V for vowel, hereafter) and consonants (C for consonant, hereafter). Each segment is written in the form of International Phonetic Alphabet abbreviated as IPA. When a segment is written encased in two slashes (/ /), it usually represents the underlying form of a specific language (e.g., /kæt/). A phonetic symbol is universal, is not specific to one language, and is encased in two brackets [] that normally stands for concrete speech sounds as they are pronounced (Davenport & Hannahs, 2010). In this study, the features of English articulation, vowels, and consonants are represented in phonemic symbols (/ /), and the substantial outputs produced by the participants are represented in phonetic symbols ([]).

¹. Although this study investigates the nature of EFL older children's ability of perceiving and producing English *segments*, it should be noted that a term *phoneme* appears in the following sections. In the framework of structural linguistics, *phonemes* represent "the abstract phonological units underlying surface sounds of a language" (Davenport & Hannah, 2010) used in phonemic analysis which studies the systematic organizations and patterns of sound in languages. Claiming the abandonment of phonemic analysis, Chomsky and Halle (1968/1991) developed generative phonology which attempts to account for *segments* from the minimal elements of distinctive features with the introduction of the concept of underlying phonological representations that are mapped onto the surface form. In the generative phonological analysis, a segment can be specified in the matrix of valued features represented on a binary scale of plus (+) or minus (-). However, *phonemes* are also used in this study conventionally as a single sound unit of a language in the psycholinguistics and literacy investigating children's speech and literacy development, which is described in 1.1.5.

Vowels are voiced speech sounds that open the vocal tract, and are classified according to the height of the tongue, front-back position of the tongue, lip rounding, and the muscular tension of the mouth. These are the features of vowel quality (Ladefoged, 2006; Sato & Sato, 1997; Yavaş, 2006). Consonants are articulated by constriction or closure at some point in the vocal tract. They are classified in a combination of a place of articulation, a manner of articulation, and a phonation type (Sato & Sato, 1997; Yavaş, 2006). There are voiced consonants and voiceless consonants.

1.1.1.1 American English vowels

There are roughly 15 different vowels in GA English. GA English vowels contain monophthongs: /i/, /ɪ/, /e/, /ɛ/, /æ/, /ʌ/, /ə/, /ɑ/, /ɔ/, /ʊ/, and /u/, and diphthongs: /eɪ/, /ou/, /aɪ/, /aʊ/, and /ɔɪ/. The three vowels: /e/, /a/, and /o/ in Figure 1 are normally used as the beginning point of diphthongs. Thus, /e/ is normally used as the first vowel of a diphthong /eɪ/. In order to compare with /ɛ/ and a Japanese vowel /e/, the position of /e/ is shown in Figure 1. A classification of North American English vowels is shown with features of tongue movements and lip positions (Celce-Murcia, Brinton, & Goodwin, 1996; Ladefoged, 2005, 2006; Ohtaka, 1998; Sato & Sato, 2003; T. Vance, 2008; Yavaş, 2006). In addition, English has a reduced vowel called *schwa* /ə/ that is likely to occur in the stream of the speech. Schwa /ə/ is the mid-central position close to stressed vowel /ʌ/ (Celce-Murcia, Brinton, & Goodwin, 1996).

Vowels are described by the tongue position which is classified as front, central, and back, and the height of the tongue position as high, mid, and low. American English vowels can be classified on the front-back dimension as follows including the first elements of diphthongs which are parenthesized:

Front: /i/, /ɪ/, (/e/), /ɛ/, /æ/

Central: /ʌ/, /ə/, (/a/)

Back: /ɑ/, /ɔ/, (/o/), /ʊ/, /u/

Classification of the height dimension is as follows:

High: /i/, /ɪ/, /u/, /ʊ/

Mid: (/e/), /ɛ/, /ə/, /ɔ/, (/o/)

Low: /æ/, (/a/), /ʌ/, /ɑ/ (Ohtaka, 1998; Sato & Sato, 2003; Yavaş, 2006)

The vowel sounds are shown in the vowel quadrilateral in Figure 1 which represents the height and back-and-front position of the tongue including the beginning points of diphthongs. The figure 1 shows an approximate vowel quality of standard American English (Ladefoged, 2006).

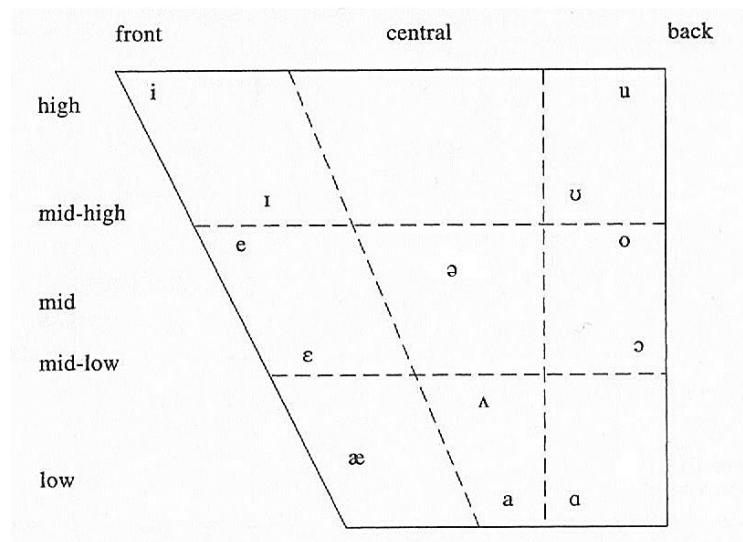


Figure 1. American English vowels (Revised from Ladefoged, 2006, p. 44)

Note. This cardinal chart includes the beginning points of diphthongs: /e/, /a/, and /o/.

Ladefoged (2006) explains that a diphthong forms a single syllable but includes a change from one vowel quality to another. This feature of English diphthongs may

cause Japanese learners of English to have difficulty in articulating English vowels (Ohtaka, 1998). This phenomenon is described in 1.1.3.

In addition to tongue position, English vowels can be divided into either *tense* or *lax*. Ladefoged (2006) shows the distribution of tense and lax vowels in stressed syllables (p. 96) in which /i, e, a, ɔ, u, ai, au, ɔɪ/ are classified as tense, and /ɪ, ε, æ, ʊ, ʌ/ are as lax. Ladefoged (2006) explains that tense vowels are allowed both in closed syllables and in open syllables, while lax vowels are allowed only in closed syllables. Jakobson, Fant, and Halle (1963) described the difference between tense and lax by giving an example of tense segments in comparison with the corresponding lax segments. For example, [i] in *beat*, a closed syllable, and in *bee*, an open syllable, is longer in duration than [ɪ] in *bit*, a closed syllable. (Ladefoged, 2006). A tense [e] (used as [eɪ]) is longer than a lax [ε], and a tense [u] is longer than [ʊ] (Jakobson, Fant, & Halle, 1963; Ladefoged, 2006; See also Table 2). As for the degree of rounding of the lips, rounded vowels are /ɔ, ou, ʊ, u/, and unrounded vowels are /i, ɪ, e, eɪ, ε, æ, a, ʌ, ə/.

Produced speech sounds can differ in pitch, in loudness, in duration, and in quality. In terms of acoustical measurement of produced vowels, the resonances of the vocal tract called *formants*, which are measured in hertz, have several prominent bands of frequency or energy in a spectrogram (Kent & Read, 2001; Ladefoged, 2005, 2006). Fant (1960) defined formants as “the spectral peaks of the sound spectrum.” Ladefoged (2006) explains that the air in the vocal tract vibrates in more than one way due to the complex shape of the vocal tract and a vowel sound which contains a number of different pitches simultaneously. Among the pitches there are various overtone pitches that are distinguished in quality from other vowels. Among the formant frequencies, the three formants, which are Formant 1, the lowest formant (F1 hereafter), Formant 2, the second lowest formant (F2 hereafter), and Formant 3, the third formant (F3 hereafter),

decide the quality of each vowel (Kent & Read, 2001; Ladefoged, 2006). These formant frequencies are the highest in children, decrease with age, and are the lowest in adult men due to the inverse link to the length of the vocal folds (Hillenbrand, Getty, Clark, & Wheeler, 1995; Peterson & Barney, 1952). According to Busby and Plant (1995), low vowels in F1 values and all vowels in F2 for female children, within the same age group, are higher than for male children. This gender difference among children of the same age seems to attribute to the difference in the pharyngeal length (Bennett, 1981). F1 normally represents the height of the vowel. The high vowels have the low values in F1 and the low vowels have high values in F1. F2 represents the front/back distinction, and front vowels have higher formant values than back vowels. Fant (1960) mentioned that F1 values would change in jaw opening size, and F2 values would relate to the amount of tongue constriction and increase the area of front cavity. Ladefoged (2006) suggested that the correlation between the value of F2 and front/back distinction is not as strong as the correlation between the value of F1 and the vowel height. The values of F2 and F3 are related to the degree of lip rounding (Ashby & Maidment, 2005; Kent & Read, 2001; Ladefoged, 2006). According to Ladefoged (2006), the frequencies of F1 on the vertical axis and F2 on the horizontal axis arranged in accordance with the *Bark scale*, in which perceptually equal intervals of pitch are represented as equal distances along the scale, are inversely related to the traditional vowel parameter, as shown such as Figure 1.

Peterson and Barney (1952) investigated the vowel quality of 33 men, 28 women, and 15 children who speak GA English. Claiming that individual variabilities and regional diversities within standard American English since 1950s, Hillenbrand, Getty, Clark, and Wheeler (1995) replicated and extended the study conducted by Peterson and Barney (1952). Hillenbrand *et al.* investigated the acoustic characteristics of vowel

quality of 45 adult males, 48 adult females, and 46 children aged between 10 to 12 years old, who spoke L1 American English. The participants produced the vowels in /hVd/, in which 12 vowels were measured acoustically. Table 1 shows the F1 and F2 values produced by the participants.

Table 1

The Mean Values of Formant Frequencies (Hz) Produced by the Participants in Hillenbrand et al. 's Study (1995, p. 3103)

		/i/	/ɪ/	/e/	/ɛ/	/æ/	/ɑ/	/ɔ/	/o/	/ʊ/	/ʌ/	/ə/
F1	M	342	427	476	580	588	768	652	497	469	378	474
	W	437	483	536	731	669	936	781	555	519	459	523
	C	452	511	564	749	717	1002	803	597	568	494	586
F2	M	2322	2034	2089	1799	1952	1333	997	910	1122	997	1200
	W	2761	2365	2530	2058	2349	1551	1136	1035	1225	1105	1426
	C	3081	2552	2656	2267	2501	1688	1210	1137	1490	1345	1719

Notes. M: males, W: females, C: children.

It is clear that both mean values of F1 and F2 produced by the children were the highest among the three groups, females were the second highest, and males were the lowest. The mean F1 values of the vowels for the group of children were between around 400 and 1000, and those of F2 were between around 1000 and 3000.

Lee, Potamianos, and Narayanan (1999) compared ranges of F1 and F2 values of children between the ages of 10 and 12 years old and male adults in the three studies: Peterson and Barney (1952), Hillenbrand *et al.* (1995) and their own study (1999) shown in Figure 2. Lee *et al.* (1999) pointed out the tendency shared by the three studies that the area of ellipses for children in the F1-F2 plots representing each vowel was much larger than that of adult males. This indicates that the observed children seemed to

have been anatomically in the developmental process, so the variance of each vowel is greater than that of adult males. In addition, some vowel areas overlapped each other among the areas in children more conspicuously than those of adult males, particularly among /æ/ and /ɑ/, and /ɑ/ and /ɔ/. This suggests that these vowels are close in tongue position and may be difficult even for L1 older children to articulate. Although it is clear that the three suggested vowels (/æ/, /ɑ/, and /ɔ/) would be more difficult for Japanese learners of English to discriminate one from the other than L1 English children, it is the researcher's great interest in the degrees of discriminatory ability that a child L2 learner has at the initial stage of learning. It should also be taken into consideration that the vowel quality is influenced by the adjacent consonants as Ladefoged (2006) points out.

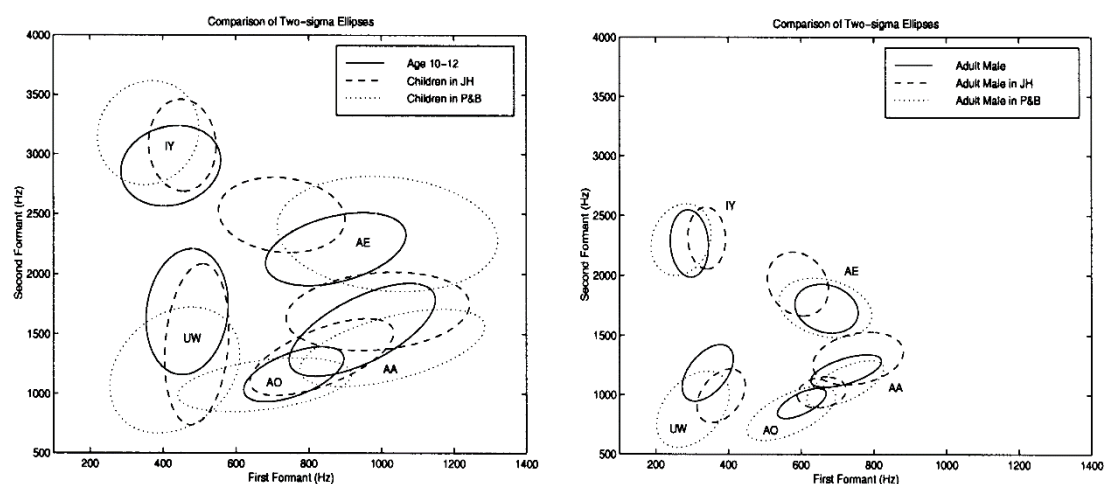


Figure 2. Comparison of formant ellipses (F1 and F2 values) between children at age between 10 and 12 years old (the left chart), and adult males (the right chart) in the three studies (solid line: Lee *et al.*, 1999; thick dotted line: Hillenbrand *et al.*, 1995; and light dotted line: Peterson & Barney, 1952). The vowels are represented /IY/ as /i/, /AE/ as /æ/, /AA/ as /ɑ/, /AO/ as /ɔ/, and /UW/ as /u/. (Lee, Potamianos, & Narayanan, 1999, p. 1464).

Hillenbrand *et al.* (1995) also measured the mean duration of each vowel as shown in Table 2. As can be seen in the table, tense vowels as well as diphthongs have longer durations. Yavaş (2006) mentions that duration is also an important parameter influencing the vowel quality although it is not a distinctive feature. Ladefoged (2006) points out that the precedent vowel duration tends to be longer before a voiced stop consonant comes at coda position than a voiceless stop consonant. For example, Ladefoged (2006) showed the duration of [æ] in *mad* is longer than that in *mat* (p.59). This rule also can be applied to fricative consonants.

Table 2

The Mean Values of Vowel Durations Produced by the Participants in Hillenbrand et al.'s Study (1995, p. 3103)

		/i/	/ɪ/	/e/	/ɛ/	/æ/	/ɑ/	/ɔ/	/o/	/ʊ/	/ʉ/	/ʌ/	/ə/
Duration	M	243	192	267	189	278	267	283	265	192	237	188	263
	W	306	237	320	254	332	323	353	326	249	303	226	321
	C	297	248	314	235	322	311	319	310	247	278	234	307

Notes. M: males, W: females, C: children.

According to Yavaş (2006), it is exceptional that the lax vowel /æ/ would have a longer duration than some of the tense vowels. This durational value decides the difference between /ɛ/ and /æ/, since these two vowels are very close in F1 and F2 values. Although duration is not a construct of the vowel quality, Klatt (1976) claimed that listeners in his study tended to discriminate one vowel from other similar vowels by duration of the vowels, for example, distinction between [æ] and [ɛ]. Klatt's study suggested that the difference between [æ] and [ɛ] is decided by the durations rather than vowel quality, which may be a perceptual key to distinguish these two similar vowels.

The fact that [æ] is a lax vowel seems astonishing to Japanese learners of English. This is because Japanese learners intentionally need to move their tongue in the appropriate position and move their cheek muscles sideways when articulating [æ], which does not occur in articulating Japanese sounds. These facts indicate that both perception and production of the two vowels are difficult for L2 learners of English whose L1 does not have these distinctive vowels.

1.1.1.2 American English consonants

English consonants are articulated in a combination of places in the vocal tract and manners which show the degree and the kind of obstruction in the vocal tract (Yavaş, 2006). There are voiced consonants and voiceless consonants. When the vocal cords are open, voiceless sounds are produced with the airflows passing through the glottis. When the vocal cords are closed, voiced sounds are produced with the airflows that make the glottis vibrate (Ladefoged, 2005).

According to Ladefoged (2005) and Yavaş (2006), English consonants are produced in the following places in the vocal organs:

1. *Bilabial* represents a position where the two lips come together. English bilabials are /p, b, m/.
2. *Labiodental* represents a constriction between the lower lip and the upper teeth. English labiodentals are /f, v/.
3. *Interdental* represents the position of placing the tip or blade of the tongue between the upper and lower front teeth. English interdentals are /θ, ð/.
4. *Alveolar* sounds are produced when the tongue tip or blade goes against the alveolar ridge. /t, d, s, z, n, l/ are English alveolar sounds.

5. *Palato-alveolar* sounds /ʃ, ʒ, tʃ, dʒ/ are produced when the blade of the tongue moves towards the back of the alveolar ridge.

6. *Retroflex* represents the American English sound /ɻ/, which is produced by curling the tip of tongue up and back towards the back of the alveolar ridge. This retroflex sound and the palate-alveolar sounds are constricted at the back of the alveolar ridge. These two sounds are different. Palato-alveolar uses the tip of the tongue, and retroflex uses the blade of the tongue. Yavaş (2006) noted that many American English speakers have ‘bunched’ r-sound by raising the blade of the tongue with the tip down. Ladefoged (2006) describes that it is the norm that North American English speakers produce *rhotic* in which /r/ can occur after a vowel and within a syllable. In this study, an *r* sound at the syllable initial position is represented as /ɻ/, and an ending *r* at the word final position as /r/.

7. *Palatal* is the /j/ sound. This sound is produced when the front of the tongue articulates against the hard palate.

8. *Velar* sounds are /k, g, ŋ/. These sounds use the back of the tongue articulating against the soft palate.

9. *Glottal* sounds are /h, ʔ/. These sounds are produced at the glottis.

10. The *Labio-velar* /w/ is the consonant that has two places of articulation. The lips are rounded while the back of the tongue is raised toward the velum.

American English consonants are produced in different manners in combination with places of articulation. Appendix A1 shows the place and the manner of American English consonants:

1. *Stop (plosive)* sounds are bilabials /b, p/, alveolars /d, t/, and velars /g, k/.

These sounds are produced with a complete closure of articulators to block the air, and then abruptly released by letting the air rush out. The pairs in each place are either voiced or voiceless. A glottal /ʔ/ is also a stop sound.

2. *Fricative* sounds are labio-dental /v, f/, inter-dental /ð, θ/, alveolar /z, s/, and palate-alveolar /ʒ, ʃ/. These pairs in each place are either voiced or voiceless. A voiceless glottal fricative /h/ is also a fricative sound. These sounds are produced by constricting the vocal tract, so that a noisy airstream is formed.

3. *Affricates* are the sounds produced when a quick release of the closure like stop sounds is followed by a homorganic fricative. In English, affricate sounds are /tʃ, dʒ/ which are both articulated in the place of palato-alveolar.

4. *Nasal* sounds are made by blocking the sound from coming out of the mouth while allowing it to come out through the nose. They are bilabial /m/, alveolar /n/, and velar /ŋ/. The two nasals, /m/ and /n/ can be any position in a word or syllable, but /ŋ/ occurs only in syllable-final position. English nasals except for [ŋ] can be syllabic as well as liquid sounds.

5. *Approximants* are consonants that open the vocal tract. Thus, the sonority of these sounds are the second to vowels. Approximants consist of liquids and glides. Liquid sounds are /l, ɹ (or transcribed broadly as r)/, and glides are /j, w/. Liquid sounds can be syllabic as well as nasals. A consonant cluster includes one of the approximant consonants with a stop sound or a fricative sound such as *pr-*, *pl-*, *bl-*, *br-*, *tw-*, *dw-*, *sl-*, *fr-* (Ladefoged, 2005, 2006; Yavaş, 2006). Velarization of /l/ occurs in syllable final, marked as [ɫ] which is called “dark l.” Ladefoged (2006) explains that the pronunciation of American English /l/ is mostly velarized except /l/ at the syllable initial position and between high front vowels.

Kent and Read (2001) and Ladefoged (2006) state that the measurement of the consonants is more difficult than that of vowels due to the wide variety of consonant features and qualities, so frequency ranges vary according to the features of the consonant sounds. In addition to analysis of the waveforms and spectrogram, *voice onset time* (Abbreviated as VOT hereafter) is frequently employed to measure stop consonants and is often used with cross-linguistic comparisons. VOT is the interval between the release of a stop sound and the start of the successive voicing sound. The interval between a voiceless stop and the following vowel is longer than the interval between a voiced stop and the following vowel (Ladefoged, 2005, 2006). In terms of the coda position of a syllable in English, the duration of voiceless consonants are longer than that of the corresponding voiced consonants after the same vowel (Ladefoged, 2006).

1.1.2 Sonority of English sounds

As this study investigates Japanese older children's receptive ability of English sounds, the sonority of English sounds is a concern in this study. The sonority of English segments is the degree of opening of the vocal tract when articulating a sound. From the greatest degree of the sonority, vowels comes first, glides (/w, j/) and liquids (/r, l/) second, nasals (/m, n, ŋ/) third, fricatives (/f, v, θ, ð, s, z, ʃ, ʒ/) fourth, and the stop sounds (/p, b, t, d, k, g/) last (Ladefoged, 2006; Sugito, 1996; Yavaş, 2006). Hogg and McCully (1987) showed a more precise 10-point scale of sonority. On their scale low vowels /ɑ, æ/ are given 10 points, mid vowels /e, o/ 9, high vowels /i, u/ and glides 8, flaps /r/ 7, laterals /l/ 6, nasals /m, n, ŋ/ 5, voiced fricatives /v, ð, z/ 4, voiceless fricatives /f, θ, s/ 3, voiced stops /b, d, g/ 2, and voiceless stops /p, t, k/ 1 point.

It is questionable, however, whether L2 children's auditory discriminability of

English segments can apply to the sonority of English sounds as stated above. This question arose from the tendency of Japanese learners of English to have difficulty in producing accurately those English vowels that do not exist in the Japanese inventory, although English vowels have high sonority. Thus, the issues of the degrees of the sonority and the auditory discriminability of individual sounds which are in the same sonority level are considerably different.

1.1.3 The differences between the English and Japanese sound system

Comparing phonological features of English and Japanese, Takebayashi (1996) identified four major differences about consonants, vowels, syllable structure, and prosodic factors. The segmental parts and syllable structure that are related to this study will be introduced here. Although the syllable structure is related to suprasegmental aspects, this factor cannot be ignored when comparing the two languages on the segmental level.

On the segmental level, there are more vowels and consonants in English than in Japanese. As a result, there is a tendency for Japanese learners of English to substitute Japanese sounds for English sounds. English vowel monophthongs are /i, ɪ, e, ε, æ, ʌ, ə, ɑ, ɔ, ʊ, u/. In addition, English has diphthongs and triphthongs. On the other hand, Japanese only has the five vowels /a, i, u, e, o/ (Takebayashi, 1996). According to Ladefoged (2006), a Japanese high back vowel /ɯ/ is not as lip rounded as /u/ in other languages, and a Japanese /e/ is between the American vowel /e/ and /ɛ/.

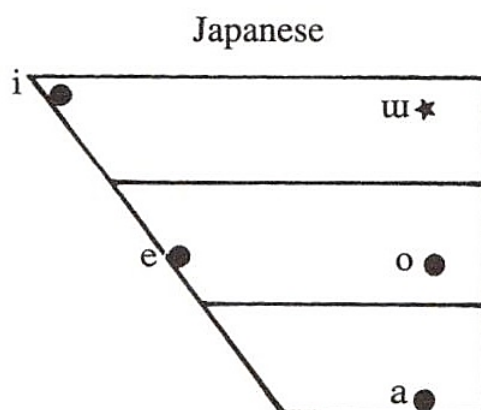


Figure 3. Cardinal vowel chart of Japanese (Ladefoged, 2006, p.221).

The GA version of the Cardinal vowel chart is shown in Figure 1. The Japanese version is shown in Figure 3 (Ladefoged, 2006, p.221). The five black spots including a star shaped spot showing /u/ in the figure identify the vowel spaces of Japanese. Judging from the number of English vowels and tongue positions of English vowels, it would be expected that Japanese learners of English would have great difficulty in articulating English vowels accurately. From Figure 3, only /i/ seems to be a similar sound in the two languages. The English vowels /æ, ə, ʌ, ɑ/ are frequently pronounced as /a/ (ア) by Japanese speakers. The two cardinal vowel charts suggest that it is necessary for Japanese learners to learn to move their front-back and high-low muscles if they wish to articulate English vowels that are distinguishable from one another. Ohtaka (1998) suggests that some parts of English vowels are positioned so close to each other that Japanese learners tend to fail in both auditorily discriminating and producing them, such as the pair /æ/ and /ε/, and /ɪ/ and /ε/, and thus they should be taught in pairs to distinguish them from each other as well as substituted sounds both in vowels and consonants.

There are also differences between the consonants of the two languages on the

segmental level. Regarding stop consonants, English has a similar set of stop sounds as Japanese. However, voiceless /p, t, k/ are aspirated in English when these sounds are placed at the initial position of a word or a syllable but Japanese voiceless plosives are not. Tsujimura (1996) comments that a piece of paper placed in front of an English speaker moves when the speaker pronounces /pɪn/.

As for fricatives, there are no labio-dental /f, v/ and interdental fricatives /θ, ð/ in Japanese. Thus, Japanese learners have difficulty in producing those sounds, and often substitute them with Japanese fricative sounds. For example, /v/ is often pronounced /b/, and /θ/ is often pronounced /s/ in the case where English words are used as Japanese loan words (Mutsukawa, 2009). The fricative sounds that are similar across the two languages are /s, z/ and /h/. The Japanese fricative /ɕ/ is quite similar but different from the English /ʃ/ sound in the rounding of the lips according to Tsujimura (1996). English /f/ and /h/ are likely substituted by the Japanese /ɸ/ and /ç/ that do not exist in English. Ohtaka (1998) explains that Japanese learners of English are influenced by the Japanese *ha* line [ha, çi, ɸu, he, ho] when pronouncing /f/ and /h/. Ohtaka also points out the tendency of Japanese L2 learners to pronounce [ʃ] for English [s] and [ʒ] for [z] due to their L1 *sa* line and *za* line so that teachers should teach them that their tongue tip should go against the alveolar ridge and the tongue should not move towards the back of the alveolar ridge.

The approximant sounds (liquids and glides) are probably the most difficult of all the English consonants for Japanese learners to distinguish auditorily and to articulate. Ohtaka (1998) says that this difficulty in both discriminating and articulating [l] and [ɾ] is due to the fact that the Japanese consonant /ɾ/ is a “flap” sound (Tsujimura, 1996) that is neither English [l] nor [ɾ]. This means that both [l] and [ɾ] sounds are heard as the same sounds by Japanese learners. Another difficulty is the ending sounds in words that

contain *-er* and *-or*, that is an American English segment /ə/ called *hooked schwa*. This sound is actually a set of [ə + r] (Ohtaka, 1998). Glides /j/ and /w/ also seem to be difficult for Japanese as they find it difficult to distinguish between /j/ and /i/, and /w/ and /u/ or /u/. These approximant consonants are phonetically very close to vowel sounds (Ladefoged, 2006).

Concerning the segmental differences between English and Japanese described above, Makino (1977) summarized the problematic English sounds for Japanese learners of English when perceiving them as follows:

Vowels		Consonants	
English	/a/ → /a/ Japanese	English	/f/ → /f, h/, [ɸu] Japanese
	/ʌ/ → /a/		/v/ → /b/
	/ə/ → /a/		/θ/ → /s/ [ʃi]
	/ɔ/ → /o/		/ð/ → /zi/ [dʒi]
			/s/ → /s/ [ʃi]
			/z/ → [dz] [dʒi]
			/j/ → [i]
			/h/ → [ɸu] [çi]

(Makino, 1977, p. 109 and 115)

Makino (1977) suggested that learners' productive ability of English sounds is dependent on their perceptive ability. Both Makino (1977) and Ohtaka (1998) suggest that those English segments described above should be taught in pairs so that Japanese learners can notice the difference between the two sounds contrastively. For example, although learners know how to pronounce *bed* and *bad* respectively, the difference between /ɛ/ and /æ/ should be taught in a pair so that the learners can notice the more specific difference between the two vowels. Ohtaka (1998) shows the pairs to be taught in the following pairs of vowels, such as [i]/[ɪ], [ɪ]/[ɛ], [ɛ]/[æ], [æ]/[ʌ], [ʌ]/[ɑ], and

[ɑ]/[æ], and pairs of consonants, such as [θ]/[s], [ʃ]/[s], [θ]/[z], [z]/[ð], [f]/[h], [v]/[b], and [l]/[ɹ]. This way of teaching in pairs so that Japanese learners of English can notice the difference of paired-segments suggests the importance of explicit instruction.

Another difference between English and Japanese lies in syllable structures. Japanese is an open syllable language. Kubozono (1995) reported that more than 90% of Japanese words are open syllable words. In contrast, English is a closed syllable language. Its basic syllable structure is CVC. Dauer (1983) pointed out that 40% of English spontaneous speech is composed of open syllable words, and Ogden (1968) said that only 15% of the “850 Basic English words²” were open syllable words.

In addition, Japanese is a mora-timed language: A *mora* is a unit of timing. The duration of each mora is roughly the same length of time (Ladefoged, 2006). A Japanese short syllable can contain a structure of a short V and a CV which are both counted as one mora. For example, /e/ meaning a *picture* containing a short vowel, and /ha/ meaning a *tooth* or a *leaf* containing a consonant and a short vowel, are both counted as one mora. A syllable-final nasal represented as N (hatsu-on in Japanese) and a syllable-final obstruent represented as Q known as *geminate* (soku-on in Japanese) are also counted as one mora (T. Vance, 2008). For example, *nippon* meaning “Japan” includes a geminate and a syllable-final nasal, and is pronounced /niQpoN/ which is counted as four morae. This indicates that there is a certain duration of time in articulating a geminate between the first and the third morae. A Japanese vowel cluster word, such as *ai* meaning love is produced in approximately equal length and counted as two morae (Kubozono, 1998; Nema, 1996; Ohtaka, 1998) while an English

² Ogden developed Basic English and released it as a book in 1930. He selected 850 words most frequently used among 25,000 words from the Oxford Pocket English Dictionary.

diphthong [aɪ] is normally counted as one single syllable. The feature of Japanese morae seems to cause problems for Japanese learners of English. Ohtaka (1998) points out that the tongue movement when pronouncing English diphthongs is terminated in a higher position with the second vowel pronounced weakly and short, which is fundamentally different from Japanese vowel clusters.

Furthermore, constraints on the number of consonants in a syllable structure differ between the two languages. Some English syllables do not have any consonants, some allow one consonant, and some have a plural number of consonants around the nucleus vowel allowed up to three in the onset and four consonants at maximum in the coda. When either the onset or the coda allows more than two consonants, it is called a *consonant cluster* (Kubozono, 1998; Yavaş 2006). This structural difference in syllables between English and Japanese appears in Japanese loan words. Sugito (1996) pointed out that when English words are used in Japanese loan words, monosyllabic words are treated as having a greater number of morae. For example, the English words *strike* [stɹaɪk] and *straight* [stɹeɪt] are one-syllable words. However, when Japanese speakers pronounce them in Japanese, they put a vowel after each consonant, as [su.to.raɪ.ku] and [su.to.re:to.] (p. 47). This phenomenon is known as *vowel epenthesis* (Kubozono, 1998; Major, 2001; Nema, 2005; T. Vance, 2008). As a result, these two words are counted as 5 morae in 4 syllables, where two diphthongs [aɪ] in *strike* and [eɪ] in *straight* are counted as two morae. Sugito (1996) explained that the basic structure of Japanese morae is the same as a single letter of Japanese syllabary, and this feature makes Japanese learners of English split a single heavy syllable into two or more morae (1996, p. 53). Japanese learners often produce two morae in the case of English long vowels, diphthongs, coda nasals, and geminates. However, it becomes a serious matter for Japanese learners of English when the Japanese basic rhythmic timing in which

Japanese learners split single heavy syllable into two morae occurs successively. This successive rhythmic timing is likely to cause the collapse of English rhythm.

Consequently, this phenomenon of L1 transfer has a serious effect on the articulation of English sounds.

1.1.4 Cross-linguistic views on children's segmental development

In the previous section, the linguistic differences between English and Japanese that contribute to L2 Japanese learners' difficulty in acquiring native-like English pronunciation were described from the phonetic aspects of segments and the syllable structure. In addition to these difficulties caused by cross-linguistic differences, there are difficulties that occur universally (despite the language) in children's perception and production of linguistic sounds. This section first pinpoints the development of the segmental perception and production respectively during infancy from universal points of view, and then describes segmental acquisition of L1 English children and L1 Japanese children.

1.1.4.1 Development of segmental perception

It seems that human perceptive ability of speech sounds begins prior to birth (Fifer & Moon, 1989). Kuhl (2004) developed *the universal language timeline* which shows the typical development of infants in perceptive and productive abilities of speech sounds during their first year of life. Regarding the development of segments according to the timeline, neonates can discriminate phonetic contrasts of all languages, and infants can perceive language-specific vowels around six months old and produce language-specific speech sounds around 10 months old (Kuhl, 2004). This also mentions that infants' initial universal ability diminishes while L1 language-specificity

on both perception and production develops. For example, English L1 infants at the age of 12 months old had difficulty in discriminating between segments that were not used in English (Best & McRoberts, 2003; Werker & Tees, 1984). Werker and Tees (1984) investigated infants' accuracy of discriminating segments in an L2. They found that the discriminative ability of infants at younger age (between 6 and 8 months old) was superior to those of an older age (between 10 and 12 months old). The accuracy of discriminating non-native speech contrasts declined from 95% to 20%. Another example was /ɹ-l/ contrast between Japanese and American infants. While both infants during 6-8 months of age could discriminate the two segments, American infants' performance improved significantly whereas Japanese infants' performance declined by 10-12 months old (Kuhl, Stevens, Hayashi, Deguchi, Kiritani, & Iverson, 2006). This accords with Kuhl's timeline (2004) that perceptive ability of consonants in foreign languages declines around 11 months of age, while at the same time perceptive ability of L1 consonants rises.

In terms of perceiving vowels, Trehub (1973) found that 4 to 17-week-old infants were able to discriminate between [u] and [i] and between [i] and [a]. Experiments of vowel contrasts conducted by Kuhl (1977, 1979) revealed that the discrimination between /a/ and /ɔ/ is more difficult for six-month-old infants than between /a/ and /i/. Kuhl (1977, 1979) surmised that the distance between /a/ and /ɔ/ is closer in tongue position than between /a/ and /i/, which made the discrimination task more difficult for the infants.

Numerous investigations have been carried out to examine infants' auditory discrimination of L1 segments by conducting CVC minimal pair type tests (Barton, 1976a, 1976b; Edwards, 1974; Eilers & Ollers, 1976), as sound perception ability precedes production ability (Kuhl, 2004). Barton (1976a) conducted a minimal pair test

to an L1 English children between the ages of 27 months and 35 months in order to measure consonant discriminatory ability. Barton corroborated the generalization that if children can perceive the difference between the segments they can produce the sounds of the target segments. This conclusion was criticized, however, for the method in which the target segments were likely among the first acquired by the participants, and the words including the target segments were named by the participants as to establish the criterion of the stimuli (Ingram, 1989). Nevertheless, Barton's study mentioned that perception study should consider children's articulatory abilities.

1.1.4.2 Development of segmental production

Regarding children's production of linguistic sounds, Jakobson (1941/68) attempted to establish *universal order of acquisition* in which a universal course of development should be based on a finite set of binary *Distinctive Features* underlying all possible phonemes of the world's languages. According to this theory, an infant's first babbling utterance [ba] contains /b/, a bilabial voiced stop consonant which goes along with vowel /a/ which is lowest and central position of tongue. Jakobson (1968) claimed that the openness of the low vowel [a] is the most unmarked vowel universally from the following three rationales:

1. [a] appears the most frequently in all languages of the world.
2. [a] is likely the first sound that children acquire.
3. [a] is the last sound that patients suffering from aphasia are likely to lose.

Johnson and Reimers (2010) summarized Jakobson's claim of children's phonological development in the following order:

- a. Vowels are acquired before consonants; [a] is the first vowel.
- b. Single consonants are acquired before multiple consonants (clusters); generally the first consonant is labial ('front' consonants are acquired before 'back' consonants).
- c. Consonant-vowel contrast is the first to be acquired.
- d. The distinction between nasal and oral; generally [m] vs [p].
- e. The distinction between labial and dental sounds are generally [p, m] and [t, n].
- f. The first vocalic opposition is low vs high; [a] vs [i].
- g. The expansion of the vocalic system into three vowels by splitting the high vowel into front and back to form the fundamental vowel triangle /a, i, u/ or adding a more central degree of opening to form the linear vowel system /a, e, i/.
- h. The pair /o-u/ cannot precede the pair /e-i/.
- i. Secondary vowels³ are acquired later than primary vowels (in other words, front rounded after both front spread and back rounded and so on).
- j. The acquisition of stops; velar stops are acquired shortly after dentals.
- k. The acquisition of fricatives (since no language has fricatives without stops); if the child has only one fricative is it /s/.
- l. Acquisition of affricatives
- m. Acquisition of liquids and glides

³. According to Ladefoged (2006), there are eight primary vowels /i, e, ε, a, ɑ, ɔ, o, u/, and another eight vowels called secondary vowels, which are /y, ø, œ, æ, ɒ, ʌ, ɣ, ʊ/. These secondary vowels are more lip-rounded. For example, /y/ is defined as a vowel with the same tongue position as /i/, but with more rounded lips.

- n. Acquisition of obstruent liquids
- o. Nasal vowels are acquired after the remaining vowels.
- p. The distinction between nasal and oral vowels
- q. The distinction between pulmonic and non-pulmonic airstream mechanism⁴.

(Johnson & Reimers, 2010, p. 53)

Jakobson's theory was developed from speech production based upon published data of acquisition in 15 languages (Ingram, 1989). The most remarkable feature of Jakobson's theory is laws of irreversible solidarity. For example, Jakobson found that all languages had front consonants but not all had back consonants. This means that the presence of the back consonants implies the existence of the front consonants, and that children will acquire unmarked features before more marked ones. While there have been some cross-linguistic studies to support Jakobson's theory, other studies have indicated that his theory had some problems. For example, although Jakobson predicted that the early acquired vowels are /i, e, a, o, u/, Kent and Miolo (1995) found that they are /ɪ, ʊ, a, o, ʌ/. In terms of consonants, while Jakobson predicted that /l/ is one of the consonants to be acquired last, French children between 12 and 15 months old seem to be able to produce lateral sounds (Vihman, 1993; Vihman & Boysson-Bardies, 1994). Ferguson and Farwell (1975) pointed out that Jakobson's theory did not concern individual differences and variability across children learning the same or different languages in the world.

⁴. Pulmonic airstream mechanism is the lung air movement with the respiratory muscles. Ladefoged (2006) explains that most human sounds are produced with pulmonic airstream mechanism.

1.1.4.3 Comparison studies between perception and production of segments

As research on infants' perception and production of segments became respectively thorough, some studies seeking the relationship between perception and production emerged. Edwards (1974) compared between perception and production of the consonant contrasts for children between the ages of 20 and 47 months. Edwards found that segmental perception is patterned in children's linguistic development, perception of a certain segment comes before production, the acquisition of segments is uniform, and fricative contrasts, such as /s-z/ and /θ-ð/ pairs, were more difficult to discriminate than plosives and approximants. Eilers and Oller (1976) investigated the relationship between perception and production of segments in order to find any cause of the speech errors produced by children. They conducted a minimal pair test to the children between the ages of 13 months and 26 months. The result of the tests was categorized into the three levels: easy, moderate, and difficult. It was interesting to note that most of the participants had both perception and production of the difficult pair, *fish* and *thish* evaluated as wrong. On the other hand, perception of an easy pair, *car-gar*, was 12 out of 14 participant were evaluated as correct while two out of 14 was evaluated as wrong. However, another easy pair, *pig-tig*, had a contrary result that perception was worse than production. This phenomenon suggested that the causes of children's speech errors in the acquisitional process could be complicated.

These sections above described the universal tendency of infants' development in perception and production up to the age when they acquire their first 50 words. The next two sections describe children's acquisition of L1 segments.

1.1.4.4 L1 children's acquisition of English sounds

Around its one-year-old birthday, an infant starts the onset of the first word. By the age of 18 months, infants explosively increase their repertoire of words from three to 50; babbling with several syllables with intricate intonation patterns. According to Lenneberg (1967), infants' biological development such as growth of the facial skeleton and muscles as well as their body motoric functions and exposure to the opportunity of hearing linguistic stimuli accord with their explosive vocabulary growth. Between the ages of 2 and 3 years old, infants' utterances include multisyllabic vocabulary in a sentence. It is noticeable, however, that the onset of their words are often truncated at this age (Lust, 2006), with deletion of the consonant cluster (Pater & Barlow, 2003), and vowel epenthesis to the consonant cluster (e.g. [bured] for /bred/, Pater & Barlow, 2003) all likely to occur. Lust (2006) suggested that this *deformation* of adult target words reflects a universal process of L1 acquisition.

According to Templin (1957), developing infants between the ages of 3 and 4 years old greatly improve their articulation, until seven years old for female infants and eight years old for male infants (Johnson & Moeller, 1967). Hallahan and Kauffman (1982) defined *articulation* and *resonance* that are accompanied with articulation as follows:

Articulation refers to the movements that the vocal tract makes during production of speech sounds; resonance has to do with the quality of the sound imparted by the size, shape, and texture of the organs in the vocal tract.

Articulation and resonance are closely linked processes because as the pharynx, tongue, lips, and other parts of the vocal tract are moved to articulate sounds, the size and shape of the vocal tract, and hence its resonance characteristics,

also change (Hallaha & Kauffman, 1982, p. 212).

Strange (1986) claims that children's L1 perception system is reconstructed to be suitable to the innate language specific segments by the age of 4 or 5 years old, and L1 sound patterns seem to be consolidated to be the same as L1 adult perception ability (Keduka, 2006; Ohtsuka, 2005). In terms of L1 productive sounds, the American Speech and Hearing Association's *Articulation developmental chart* (Appendix A2) shows that all the L1 segments except /l, s, r, v, z, tʃ, ʃ/ are acquired around the age of 4 or 5 years old (American Speech-Language-Hearing Association, 1972). The articulatory establishment of L1 English (General American English) was studied by Templin (1957). Up to the present, her study is still regarded as the most important normative data of L1 English children's acquisition of segments (Ingram, 1989). Templin tested 480 children between the ages of 3 and 8 years old. Table 3 shows percentages of correct production of fricatives by children between the ages of 3 and 5 years old from Templin's study (1957).

Table 3

The Correct Percentages of Articulated Fricatives in Children at the Age 3-5 Years Old from Templin's Study (1957) (Cited from Ingram, 1989, p. 364)

Age	/f/	/θ/	/s/	/ʃ/	/v/	/ð/	/z/	/ʒ/	/tʃ/	/dʒ/
3;0	84	26	64	44	31	20	34	15	47	35
3;5	88	32	78	63	39	23	55	23	61	41
4;0	92	49	76	71	51	42	58	33	72	69
4;5	97	59	77	84	54	47	66	38	83	72
5;0	91	63	78	82	62	56	64	84	84	81

Her investigation included both perception and production tests, such as, articulation, vocabulary, sentence development, and speech sound discrimination. The younger participants, between the ages of 3 and 5 years old, were asked to imitate the words that the test implementer pronounced, and the older participants read the words or repeated them. For the speech sounds discrimination test, each participant heard a pair of nonsense syllables and were asked to decide if they were the same or different. A consonant sound was considered acquired when 75% of the participant children in an age group produced the sound correctly. Each sound was also observed in the position of a word: initial, medial, and final position.

The results of Templin's study showed that all the twelve vowels, nasals /m, n, ŋ/, voiceless stops /p, t, k/, glides /w, h/, fricatives /f, s/, and voiced stops /b, d, g/ except final position were acquired by the age of 3 years old, and voiced stops in final position, palatal fricatives and affricatives /ʃ, tʃ, dʒ/, liquids /l, r/, in initial and medial position /v, z/ were acquired by four years old (Ingram, 1989). It is clear that consonants in the fricative class are acquired later than other consonants.

The L1 English children's articulation development chart in Appendix A2 shows that the acquisition of the fricatives /s, z, v, θ, ð, ʒ/ are extended to the age of 8 years old (American Speech- Language-Hearing Association; Sander, 1972; Templin, 1957; Wellman, Case, Mengert, & Bradbury, 1931). Since Templin (1957), numerous investigations have been carried out to examine infants' auditory discrimination of L1 segments by conducting CVC minimal pair type tests as described in the previous section (Barton, 1976a, 1976b; Edwards, 1974; Eilers & Ollers, 1976). This articulatory acquisitional process of L1 English children implies that the articulatory difficulty for developing children is universal on account of both the infants' motoric development and vocalization.

Grunwell (1987) developed a profile of phonological development and phonotactic structures development across seven chronological stages of ages including parentheses that indicate processes likely to be optional based on the findings of studies of children's speech, as shown in Appendix A3. Grunwell's profile agrees with Barlow and Gierut's study (1999) that normally children commonly commit errors in the L1 acquisitional process. Grunwell (1987) accounts for error phenomena in the patterns of articulatory development that are likely to occur at a certain period of child life but later disappear. Taking the example of *Clusters*, some L1 English children can realize clusters by three years old, and most children by four years old. On the other hand, cluster reduction is likely to occur in some children between two and 3;6 years old. The following errors are shown in *Chronology of Phonological Processes* (Grunwell, 1987, p. 229). These errors are considered to be either temporal or caused by speech impairment. Grunwell accounts for the following processes as affecting structural simplifications:

Weak syllable deletion: the tendency of simplifying the structure of multisyllabic words by omitting one or more syllables (e.g. banana [ˈnənə]) (p. 212).

Final consonant deletion: consonants in word-final position are often omitted (e.g. juice [dʊ], ball [bɔ]) (p. 213).

Reduplication: the repetition of the first syllable, which is also stressed syllable. This is frequently seen at the stage of the emergence of the 'first words' (e.g. pudding [pʊpʊ]) (p. 214).

Consonant harmony: this is also called *assimilation* of one consonant to another across a vowel (e.g. dog [gɒg]) affecting both place and manner (pp.

215-216).

Cluster reduction: the deletion of one or more consonants from a target cluster (e.g. plate [pɛt], brick [bɪk]) (pp. 217- 221).

Epenthesis: a vowel is inserted between the consonant clusters (e.g. bread [bʊɛd]) (pp. 220-221).

Grunwell also summarized the following phenomena as processes affecting systematic simplifications that are frequently seen in normally developing children:

Fronting: the sound that is supposed to be articulated as velar is realized as alveolar. For example, a child wants to say ‘key,’ but it is pronounced ‘tea.’ Thus, /k, g, ŋ/ are realized as [t, d, n]. In normally developing children, velar consonants are established around by 3;3 (p. 221).

Stopping: fricatives and affricates sounds tend to be realized as plosive sounds (e.g. face [pɛt]). This phenomenon generally begins to disappear by 2;6-3;0. This is, however, not a temporal phenomenon, but rather is likely to go through developmental phases until the establishment of fricatives and affricates around 4;6 (pp. 221-223).

Gliding: replacing consonants with approximants at the beginning of speech development (e.g. /f/ ➡ [w], /s/ ➡ [l, j] (pp. 223-225).

Context-sensitive voicing: a voiceless sound is replaced by a voiced sound (e.g. /p, t, k/ ➡ [b, d, g]). This voicing is likely to remain until about 3;0 (pp. 225-226).

Grunwell mentioned that the phenomena described above frequently co-occur in

the realization of the target words. It is questionable whether these kinds of errors occur in L1 Japanese children as well from a typological point of view.

1.1.4.5 Japanese children's L1 speech sound development

Some studies have investigated that L1 Japanese children's acquisitional process based on the specific linguistic features of L1 segments. As described in the previous section, Kuhl, Stevens, Hayashi, Deguchi, Kiritani, and Iverson (2006) conducted an experiment to determine the critical period of American and Japanese infants' perception of native and non-native patterns of the American English /ɹ-l/ contrast. The result indicated that infants' phonetic properties of non-native language unit was that 10-12 months, the possible period of non-native perception. While Japanese infants are in the L1 acquisitional process, Ota (1998) suggested that a similar phenomenon of *deformation* of adult target words that Lust (2006) had suggested for L1 English infants is likely to occur in L1 Japanese infants. Ota studied *truncation* where a Japanese infant (age of 2;1-2;4) produced [do:ʃa] instead of the adult form /dʒido:ʃa/⁵ (meaning a *car*). It was presumed that the onset sound /dʒ/ was still hard to articulate, and the first weak mora /dʒi/ was hard to perceive so that the child could not produce the sound.

Combining this with the description of L1 English infants' deformation of adult target words in the previous section, it can be concluded that these phenomena occur in both L1 English and L1 Japanese infants between two and four years old owing to children's universal tendency of speech errors. It is probable that this is due to their

⁵. This written form /dʒido:ʃa/ is as it was in Ota's study (1998). For *Jidousha* meaning a car in Japanese, Tsujimura (1996) and T. Vance (2008) describe that Japanese romanized *ji* is represented as /jʒ/ in IPA symbols.

undeveloped motor skills and physiological functions in the articulation system, as well as immature perceptibility. These studies also suggest that perception comes earlier than production. This phenomenon among Japanese infants, however, seems to be attributed not only to the Japanese mora but also Japanese heavy syllable with a light syllable (HL). In the word *jidousha*, the stressed syllable is *dou*, so the first syllable may not be heard by the infants. It can be said that the truncation by Japanese infants is not only a problem of Japanese mora, but also the suprasegmental feature of Japanese.

Regarding Japanese children's developmental process of Japanese articulation, Ohtsuka (2005) points out that approximately 90% of Japanese children around Grade 1 (between six and seven years old) are likely to have an established articulation system, and the fricative sounds are found to be the latest sounds to be acquired. "Fricatives are the latest" is likely the same for L1 English children. Nasals and stop sounds are acquired in relatively early age, and fricatives /s, ʃ/, affricates /ts/ /dz/, and flapping sound /ɾ/ are acquired later around the age of 6 or 7 years old when Japanese children enter elementary school. Appendix A4 shows three studies of Japanese children's articulation development (Nakanishi, Ohwada, & Fujita, 1972; Noda, Iwamura, Naito, & Asukai, 1969; Takagi & Yasuda, 1967). Takami, Kitamura, Kato, Tanaka, and Yamamoto (2009) compared these studies and pointed out that there was considerable variation of individual differences in the first appearance and the acquisition period of segments among the three studies. In addition, they pointed out that these studies were conducted more than three decades ago, and the methods of data collection were possibly very different from each other. Thus, Takami *et al.* (2009) investigated the developmental process of articulation and speech errors among nursery school children between the ages of 3;9 and 6;7 years old. They found that (1) Japanese children acquire almost all of the Japanese speech sounds by the age of 4 or 5 years old, (2) Japanese

children tend to acquire vowels, nasals, and bilabial plosives much earlier than other segments, and [s], [ʃ], [dz], [ts], and [r] sounds tend to be acquired much later than other sounds, (3) undeveloped sounds, such as [k] and [g], occasionally remained undeveloped, and (4) lateral articulation may appear later than the age of 4 or 5 years old. They reported that the errors that Japanese children tended to make at the age of 5 or 6 years old were: [ki]→[tʃi], [gi]→[dʒi], and [ke]→[tʃe], all of which were phenomena of *fronting*. This is a similar phenomenon to L1 English children's articulation errors that Barlow and Gierut (1999) had pointed out. Takami *et al.* (2009) suggested that while the velar stops [k] and [g] are normally acquired between the ages of 2 and 4 years old, there are some children who have difficulties in articulating [k] and [g] even at the age of 5 years old, and their articulation of these error sounds may not naturally be cured.

Ichihashi, Okano, Kondo, Nakahara, Iinuma, and Tamura (2008) conducted frequency analysis on the continuation vowels and the VCV syllable words in Japanese children between the ages of 3 and 8 years old. The vowel quality was analyzed in a spectrographic display. As mentioned in the previous section, vowel quality is decided by formant frequencies: Formant 1 (F1) is related to the height of tongue, and Formant 2 (F2) is related to front/back of the tongue. Ichihashi *et al.* (2008) found that there was no significant difference between the F2 values of the 3-year-old group and the group of the 8-year-old children. This implies that the front-back tongue movement has not been acquired among the observed ages. Ichihashi *et al.* surmised that this was due to the tendency of Japanese children of these ages to move their tongue up and down more frequently when articulating vowels but front-back movement is still immature. This result raises a question as to whether or not Japanese children of pre-puberty age still have the same tongue movement as those of younger children which may influence their

English pronunciation. This motoric developmental features in Japanese articulation produced by Japanese children may have association with the articulation of L2 English sounds.

In summary, while infants are able to discriminate language-specific contrasts not used in their native language, the ability to perceive such contrasts declines at around the age of 10 months, when they begin to produce their native language. Most children, however, do not have full phonological proficiency until about school age. Some cross-linguistic studies indicate that children fail to produce certain sounds and may produce errors before they acquire L1 adult-like words. Certain sounds (e.g., /ʃ/, /θ/, and /s/) are difficult to make for even L1 English children. In the process of L1 children's articulatory development, children make errors that are divided into patterns that children of any language commit in the children's L1 acquisition system.

1.1.5 The model for L2 segmental development for young children

From this section, it should be noted that the term *phoneme*, which is referenced conventionally in psycholinguistics and language teaching, is frequently used instead of *segment* throughout this study. It is used to represent a single sound unit of a language for children to acquire. Vihman (1996) explains the usage of *phoneme* by describing an interdisciplinary connection between phonology and the study of children's literacy. Liberman, Shankweiler, Fischer, and Carter (1974) found that children had difficulty in identifying individual segments as compared with syllables, which was assumed to cause negative influence in children's reading ability. Since then, a number of studies have investigated the relationship between children's awareness of speech sound and literacy development. Those studies have investigated *phonemic awareness* and *phonological awareness* in both L1 and L2 children as well as in both normally

developing children and children with reading or speech difficulties.

1.1.5.1 The Model of Stackhouse and Wells

Stackhouse and Wells (1997) introduced the *speech processing system* which is the psycholinguistic framework composed of three components: *input channel*, *output channel*, and *lexical representation* between these two channels as shown in Figure 4. According to Stackhouse and Wells, speech processing system is defined as “all the skills included in understanding and producing speech, including peripheral skills such as articulatory ability and hearing” (p. 8).

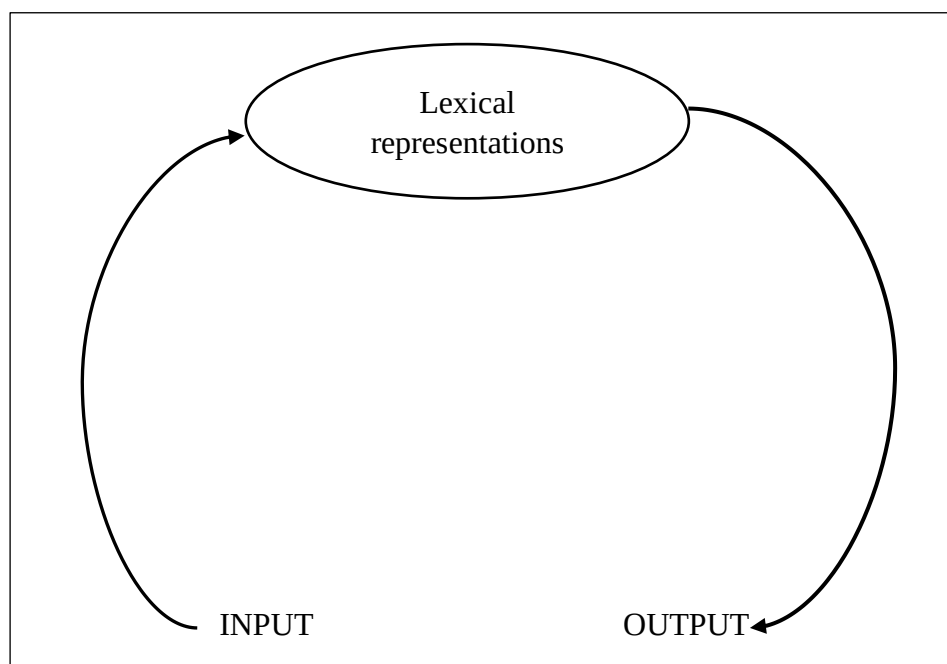


Figure 4. Input/output dimensions of the speech processing system (Stackhouse & Wells, 1997, p. 88).

This model examines how a child receives information from spoken or written language, remembers and stores it within the lexical representations and how the child selects and produces spoken or written words. According to Stackhouse and Wells

(1997), and Stackhouse, Vance, Pascoe, and Wells (2007), a lexical representation is composed of semantic representation, phonological representation, motor representation, grammatical representation, orthographic information, and motor programs.

Semantic information is about the meaning of a word. In the example of *cat*, the word means an animal that can be a pet, has soft fur, and says mew. It is also associated with an image of catching mice. Phonological representation is information about the sound of the word: *Cat* is pronounced [kæt], but not [bæt]. Grammatical information is about how the word is appropriately used in a sentence, and how plural forms are produced. Orthographic information is about how the word looks in written form and how to read the word. Motor programs represent the articulation system of tongue, lips, soft palate, and vocal folds. Even though a child can perceive the word adequately, it is possible that the motor program is deficient and the child cannot pronounce the word. These components are measured by perception and production tests.

1.1.5.2 The Model of Stackhouse and Wells and its related theories

Baker, Croot, McLeod, and Paul (2001) and Vihman (1996) mention that Smith (1973) first described the process, including children's underlying representation, that Stackhouse and Wells (1997) describe as lexical representation. In Smith's model, the input from adult speech is stored in the child's underlying representation. The stored information is modified online through a phonological rule to realize the representation form as output. His model, however, was criticized in that a child's perception form is not always adult-like and does not correspond to variable pronunciation. For instance, Smith's model cannot explain why a child pronounces the same segment differently in different words (Bernhardt & Stemberger, 1998).

Extending Smith's one-lexicon model, Menn and Matthei (1992) proposed that

children have two lexicons for their underlying representations. One is the input lexicon that represents word recognition, and the other is the output lexicon that represents word production. This proposal can account for the underlying representation that exists in both adult-like and non-adult-like forms. In Menn and Matthei's two-lexicon model, the adult-like perceptual representation in the input lexicon is modified offline through phonological rules and stored in an output lexicon that is associated with production rules and follows the final output forms (Baker *et al.*, 2001). Hewlett's model (1990) focused more on production parts, and proposed two possible processing routes for a child's word production: A child can access an auditory-perceptual feature-based representation and an articulatory-based representation. This model has been found to be useful in detecting problems of children with speech difficulties. William and Chiat (1993) employed this model to assess children with a suspected delay in their phonology and children with disordered phonology by conducting speech production tests, such as naming, sentence repetition, non-word repetition, and real word repetition. The results showed that the children with delayed phonology did significantly much better than the children with disordered phonology. Their study implied the necessity of finding specific diagnosis and a specific intervention for the child.

1.1.5.3 The speech processing profile sheet

Stackhouse and Wells (1997) have suggested that there is a difference between *articulatory (phonetic) difficulty* and *phonological difficulty*: while the former means that a child has difficulty in producing sounds, the latter means that the child has difficulty using the sound appropriately to carry the meaning of the word. Thus, a child with articulatory difficulty cannot produce the sounds (totally or partially), but a child with phonological difficulty may say "I want to go to the tea," instead of "to the sea"

and the same child may choose the right picture of the sea among from pictures of tea and sea. In order to grapple with this complicated speech processing system and to clearly identify where a child's problem is, Stackhouse and Wells developed their speech processing check sheet based on their theory (Figure 5).

INPUT	OUTPUT
F. Is the child aware of the internal structure of phonological representations?	G. Can the child access accurate motor programs?
E. Are the child's phonological representations accurate?	H. Can the child manipulate phonological units?
D. Can the child discriminate between real words?	I. Can the child articulate real words accurately?
C. Does the child have language-specific representations of word structure?	J. Can the child articulate speech without reference to lexical representations?
B. Can the child discriminate speech sounds without reference to lexical representations?	
A. Does the child have adequate auditory perception?	K. Does the child have adequate sound production skills?
L. Does the child reject his/her own erroneous forms?	

Figure 5. The speech processing profile sheet (Stackhouse & Wells, 1997, p. 98; Stackhouse, Vance, Pascoe, & Wells, 2007, p. 9).

In accordance with this profile sheet, researchers and educators provide tests to students to identify their problems. The following are examples including the ones used in the Input (perception) channel for this study:

- (i) A non-word perception test derived from real words is employed to observe whether a child can discriminate one sound from another without access to lexical representation (corresponds to level B in the profile sheet). For example, a child is

asked whether /kɛt/ and /kæt/ are the same or different.

(ii) The same/different type of auditory discrimination test asks a child to choose the right auditory input between /kæt/ and /bæt/ to represent a picture of a cat (corresponds to level D in the profile sheet).

(iii) Listening test asks a child to choose the right picture of a word he/she hears (corresponds to level E in the profile sheet).

(iv) An *odd-man-out* listening test measures whether a child is aware of the internal structure of phonological representations without reference to lexical representations (corresponds to level F in the profile sheet).

In the Output (production) channel, the tests are the following examples:

(i) A naming test asks a child to say a word corresponding to a picture (corresponds to level G in the profile sheet).

(ii) A word-in-sentence test asks a child to repeat model sentences (corresponds to level I in the profile sheet). This test is to assess the child's production of the target word in connected speech. This performance is compared with a naming task where the word is produced in isolation.

(iii) A non-word production test asks a child to repeat the model non-words derived from real words (corresponds to level J in the profile sheet) in order to assess how accurately a child can produce English segments without reference to lexical representation.

These Input (perception) tests and Output (production) tests are conducted with L1 English children. Stackhouse and Wells (1997), and Stackhouse, Vance, Pascoe, and

Wells (2007) describe how an L1 child is tested to find out exactly where the child's processing skills are breaking down, and to observe how the breakdown affects the child's speech, and lexical and literacy development. Stackhouse and Wells (1997) also explain that the child's spoken language skills predict his/her future literacy outcome, because both his/her spoken and written language are developed dichotomously from the bottom of the child speech processing system which deals with linguistic sounds. It should be noted that L2 children at the novice level cannot be tested with the same methods as L1 children in production tests due to their L2 lexical representation. Thus, production tests administered to L2 Japanese children in this study were repetition tests, which will be described in the next section.

1.1.5.4 The Model application to EFL normally developing children

Finally, the adequacy of using this model in this study will be explained since it is usually used for investigating children with speech difficulty and language impairment in their first language. Frith (1985) emphasized that errors of children with linguistic difficulty cannot be distinguished from those of normally developing children. For instance, children with dyslexia "are not disordered or fundamentally different from normally developing children, but in certain aspects of their development they have not moved on to the next phase in the way that studies of normally-developing children lead us to expect" (Stackhouse *et al.*, 2007, p. 188). Based on the notion of sound errors that possibly occur in any child, Stackhouse and Wells (1997) initiated their first study of 100 normally developing children between the ages of 3 and 7 years old in order to construct the framework of this speech processing system (M. Vance, 1995; M. Vance, Stackhouse, & Wells, 1994, 1995, 2005). Cassidy (1994), Darili (1994), Dollagan, Biber, and Campbell (1995), and Treiman (1993) also conducted their studies with normally

developing children in order to verify the model proposed by Stackhouse and Wells (1997).

Stackhouse and Wells (1997) state that “L1 children’s speech processing model can also be applied to the early development of language skills in young normally-developing monolingual children, and the language skills of multilingual speaking children with or without speech and language difficulties” (pp. 94-95). Stackhouse *et al.* (2007) affirm that this psycholinguistic approach is also applicable to children learning a new language in order to investigate their separate language storage. Some of the tasks in this model observe whether the child has language-specific representations of word structure. For example, in an auditory discrimination task conducted by Darili (1994) and Dry (1997), children were asked to do a task to recognize the phonological and phonotactic structure of the language they were learning, and to distinguish real words from non-words that follow the same phonological principles. Although this psycholinguistic framework proposed by Stackhouse and Wells (1997) has been published in German, French, and Portuguese, there seems to be no L2 version of the whole framework as yet.

1.2 Research Questions

This study investigates the following research questions:

RQ1: Can Japanese EFL children perceive English sounds accurately?

RQ2: What affects their understanding of English sounds?

RQ3: Can they produce English sounds accurately?

RQ4: What affects their production of English sounds?

RQ5: How are their receptive and productive abilities of English sounds related?

The quantitative study outlined in this chapter investigates the nature of older Japanese children's sound processing system in foreign language acquisition by examining their ability to perceive and produce English sounds. The study is designed to investigate the five research questions (RQs) proposed above. RQ 1 and RQ 2 concerning participants' perceptive ability of English sounds are examined through four perception tests. RQ 3 and RQ 4 concerning their productive ability of English sounds are examined through three oral repetition tests. Research questions RQ1 to RQ4 are basically investigated through item facility (IF) analysis. RQ 5 investigates the relationship between the participants' perceptive ability and productive ability of English sounds through correlation analysis and structural equation modeling analysis.

1.3 Method

Since "Foreign Language Activities (Gaikokugo Katsudou)," hereafter referred to as FLA, became mandatory in 2011 for Japanese students in the fifth and sixth grades based on a revision of the courses of study by MEXT (Ministry of Education, Culture, Sports, Science and Technology Japan), the learning environment for young EFL Japanese learners has been gradually changing. According to MEXT, the overall objective of FLA in public elementary schools is "to form the foundation of pupils' communication abilities through foreign languages while developing the understanding of languages and cultures through various experiences, fostering a positive attitude toward communication, and familiarizing pupils with the sounds and basic expressions of foreign languages" (MEXT, 2008). The class hours for FLA are 35 hours a year (1 class hour is 45 minutes) in both Grade 5 and Grade 6. With reference to the content of FLA, MEXT describes the importance of teaching linguistic aspects of English so that learners "become familiar with the sounds and rhythms of the foreign language, ... learn

its differences from the Japanese language, and ...be aware of the interesting aspects of language and its richness” (MEXT, 2008). The implementation of this education reform was left up to each individual municipality, and they were told to introduce this reform in their own way, establish their own concrete curriculum, and put appropriate teachers in charge of English education. Many of these municipalities, however, experienced difficulties. For example, many education boards had no option but to make homeroom teachers, who were not trained as language teachers, responsible for Grade 5 and Grade 6 English classes, due to the limitation of the municipal budget for hiring teachers specialized in teaching English to young learners. Many municipal education boards spent a large proportion of their budget commissioning ALT (Assistant Language Teacher) agencies to send native English speakers or native-like speakers as ALTs to schools in their districts. When this happened, a FLA class would usually be team-taught by a homeroom teacher and an ALT. This, however, caused problems since often the relationship between the homeroom teacher and the ALT was not ideal due to the shortage of time available for discussion about the class, and language barriers. Homeroom teachers are often not confident in teaching English due to their low level of English proficiency. Furthermore, ALTs are not certified teachers, and so they often do not have adequate knowledge of how to teach young learners. In addition, the lack of a concrete curriculum in FLA has often been discussed. Many public elementary schools employ two volumes of the English sub-textbook “Hi, friends!” authorized by MEXT. These textbooks contain nine units in volume one and eight in volume two covering young learners’ basic vocabulary and easy expressions, and they are based on a communicative approach. Although the textbooks introduce the English alphabet, both upper and lower case, sound-letter associations and phonemic awareness are not taught in these textbooks.

1.3.1 Participants and research site

The education board of the district in Tokyo where the researcher conducted this thesis study had begun their own English education program in public elementary schools before the implementation of English education reform by MEXT. The English program in elementary schools is part of the district's integrated education policy in elementary and junior high schools that began in 2003 when the district was permitted by MEXT to implement its regional core project aimed at enhancing English education and schools with special curriculum. The district published its own original textbooks for Grades 5 and Grade 6 and introduced a communicative approach in elementary schools in which pupils were taught topic-based vocabulary and easy conversation, such as that used in restaurants, shopping, and giving directions.

The elementary school where the researcher taught had introduced an English program in all grades before the board of education in the district launched its integrated education policy. The school principal employed a Japanese teacher from the community who was specialized in teaching English to young learners. She was responsible for the pupils in Grades 1 to Grade 3, teaching basic phonics, songs, chants, and storytelling. Students in Grades 4 to Grade 6 were team-taught by ALTs and homeroom teachers through a communicative approach based on the textbooks authorized by the education board in the district. There are approximately 20 classes (one class is 45 minutes) a year in Grade 1 and Grade 2, 25 classes in Grade 3 and Grade 4, and 35 classes in Grade 5 and Grade 6.

Due to the limitation of teaching hours set by the district education board, the researcher was allowed to have 17 classes a year each to teach English to Grade 5 and Grade 6 students, which is half of the required 35 classes a year for FLA. The rest of the hours were team-taught by the homeroom teachers in each grade and the ALTs.

104 students in Grade 5 (Mean age: 11;0) from this public elementary school participated in this study. These participants started English lessons when they were in the first grade. From Grade 1 to Grade 3, they were taught English by the Japanese teacher mentioned above, and in Grade 4, they were team-taught by their homeroom teachers and the ALTs. The students in Grade 5 were taught by the researcher herself, based on a story-based curriculum, in which basic sound-letter association, alphabet knowledge, vocabulary, and lines of expression in the story were taught. When all the perception and production tests were administered in October 2014, the fifth graders had been taught English by the researcher seven classes since April 2014. None of the participants had a history of speech disorder or a hearing problem.

1.3.2 Instruments

In order to investigate the participants' perceptive and productive abilities of English sounds, four perception tests and three production tests were developed corresponding to *The Speech Processing Profile Sheet* developed by Stackhouse and Wells (1997) as shown in Figure 5 in the Literature Review (p. 41). Appendix B1 shows all of the tests. Figure 6 shows the instruments of the speech processing model, taking consideration of the time limitations of conducting tests at research site. Instruments were designed in accordance with the Stackhouse and Wells (1997) speech processing profile sheet.

Stackhouse and Wells (1997) introduce six different levels from Level A to Level F on perceptive ability in input channel which examines whether a child hears the sound appropriately to carry the meaning of the word, and six different levels from Level G to Level L on productive ability in output channel which examines whether the child has any difficulties of producing the sound.

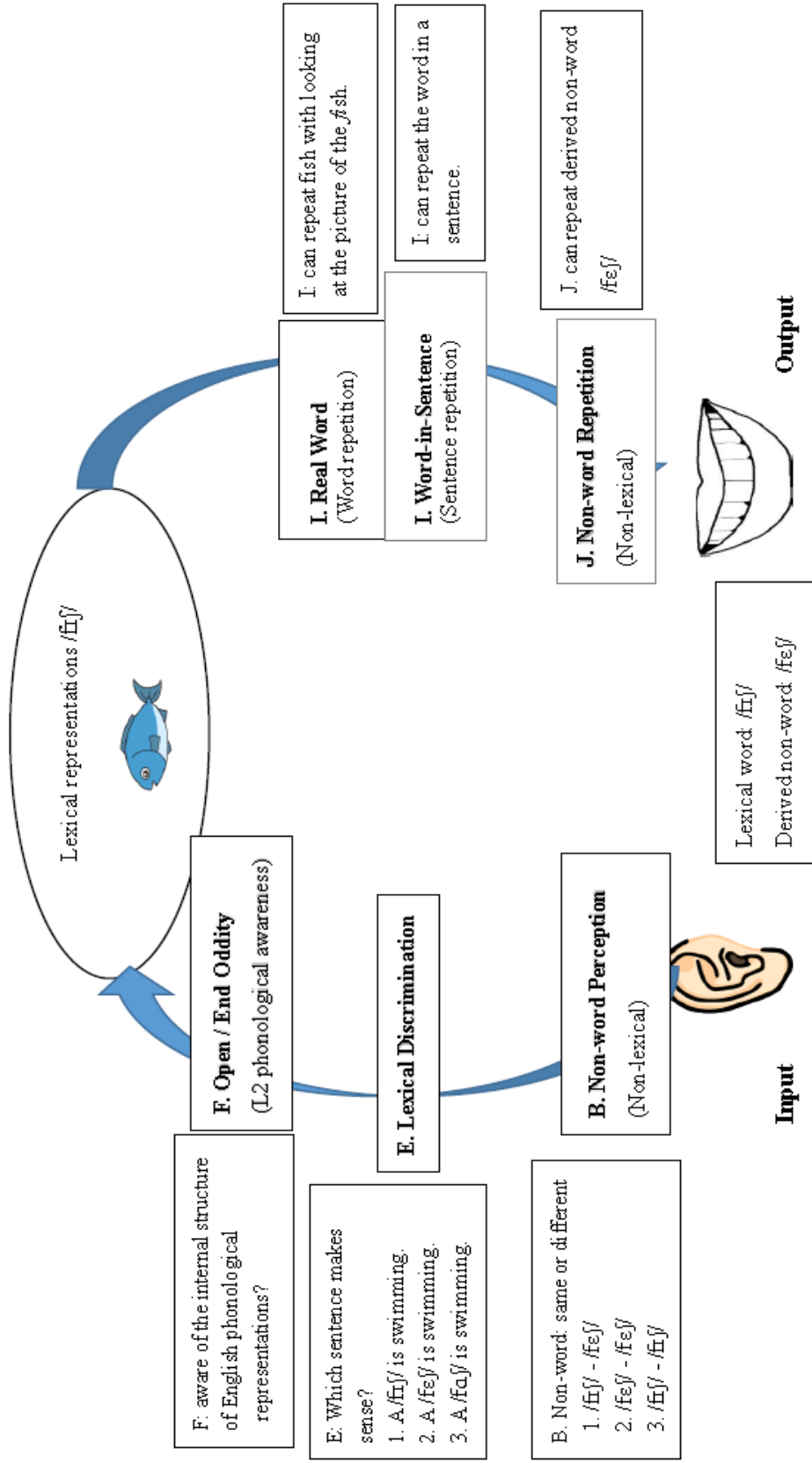


Figure 6. Instruments in this study revised from the speech processing model proposed by Stackhouse & Wells (1997).

In this model, the input spoken language is processed through lexical representation to the output channel. All of these levels basically investigate a child's processing system of speech sounds on the segmental level. In consideration of the limitation of time and place in an EFL setting but not in the laboratory-based research, feasible instruments were fully considered when applying this model to L2 Japanese older children. Thus, Level B, Level E, and Level F were chosen among the input levels, and Level I, and Level J were chosen among the output levels.

In Level B, the ability of non-word perception is examined to see whether the participants could discriminate speech sounds without reference to lexical representation. In Level E, an ability of lexical discrimination is examined to see whether the participants could respond to the sound of the right real word to match the meaning of a picture. This level is checked on the assumption that the participants know the words in the test item. Thus, the *Auditory Word Meaning Test* was administered as well as conducting the test on Level E. In Level F, the task examines whether or not the participants are aware of the internal structure of English phonological representations. Level I examines the participants' accurate motor programs of L2 sounds on single word level and on a sentence level in reference to lexical representation. On this level, the repetition tests of single words and sentences use the same vocabulary. Level J examines whether the participants can articulate the speech sounds without reference to lexical representation. The results of perception and production tests are compared on the non-word level and the real word level. All the tests in the employed levels are described in the following sections. All of the tests conducted are shown in Appendix B1. Each test is described in the following sections. It should be noted that an *r* sound at the syllable initial position is represented as /ɹ/, and an ending *r* at the word final position as /r/ in all of the tests as mentioned in the previous studies (1.1.1.2, p. 14).

1.3.2.1 Perception tests

In order to investigate the participants' receptive ability of English sounds, the Non-word Perception Test (a), the Lexical Discrimination Test (b), the Open Oddity Test (c), and the End Oddity Test (d) were designed. All of these tests were auditory discrimination tests conducted in the participants' classrooms using a CD player.

1.3.2.1.1 The Non-word Perception Test (a)

This test corresponds to Level B: Can a child discriminate speech sounds without reference to lexical representation? On this level, eight one-syllable non-words derived from real words were chosen from Nathan, Stackhouse, Goulandris, and Snowling (2004), and M. Vance, Stackhouse, and Wells's study (2005) shown in Table 4. The real words were selected from the vocabulary of L1 English three-year-old children (Stackhouse & Wells, 1997; M. Vance, 1995; M. Vance *et al.*, 2005). Among the chosen words, *sponge* and *train* were also tested as real words in reference to lexical representation. The five one-syllable non-words were the same as in the test on Level J in a production test. The target non-words were derived from real words in such a way that the vowels of the one-syllable real words were replaced by vowels of a similar length. M. Vance *et al.* (2005) used the phonetic features listed in Table 4 in discriminating two sounds. They are cluster reduction, place in coda position, voicing in onset position, manner in coda position, and nucleus vowel change. Basically a one-syllable non-word item had three patterns.

Table 4

Items for the Non-word Perception Test (a)

Item	derived from	A	B	answer	feature
a01	plate	/pəʊt/	/pəʊt/	○	cluster reduction
a02	van	/zɪn/	/zɪm/	×	place in coda
a03	snake	/saɪk/	/snaɪk/	×	cluster reduction
a04	train	/tɔɪn/	/tɪɔɪn/	×	cluster reduction
a05	fish	/fɛʃ/	/fɛʃ/	○	voicing in onset
a06	brush	/bɹɪs/	/bɹɪʃ/	×	place in coda
a07	sponge	/spændʒ/	/spændz/	×	place in coda
a08	glove	/glɛb/	/glɛb/	○	manner in coda
a09	plate	/pəʊt/	/pləʊt/	×	cluster reduction
a10	van	/vɪn/	/zɪn/	×	place in onset
a11	snake	/naɪk/	/snaɪk/	×	cluster reduction
a12	train	/tɪɔɪn/	/ɪɔɪn/	×	cluster reduction
a13	fish	/vɛʃ/	/fɛʃ/	×	voicing in onset
a14	brush	/bɹɪs/	/bɹɪθ/	×	place in coda
a15	sponge	/spændʒ/	/spændʒ/	○	place in coda
a16	glove	/glɛb/	/glɛv/	×	manner in coda
a17	plate	/ləʊt/	/pləʊt/	×	cluster reduction
a18	van	/vɪn/	/vɛn/	×	vowel
a19	snake	/snaɪk/	/snaɪk/	○	cluster reduction
a20	train	/tɔɪn/	/tɔɪn/	○	cluster reduction
a21	fish	/fɪʃ/	/fɛʃ/	×	vowel
a22	brush	/bɹɪʃ/	/bɹɪʃ/	○	place in coda
a23	sponge	/spændʒ/	/spænʒ/	×	place in coda
a24	glove	/glɛv/	/glɛv/	○	manner in coda

Concerning the test method, it was fully considered which type of test was more appropriate for the participants, an ABX task or the same-different task. In an ABX task, first, a child hears two test items A and B. Then, the child hears another test item X, and is asked which item is the same as X, A or B (Stackhouse & Wells, 1997). Since, the

Japanese participants were novice level L2 learners and had never taken a non-word discrimination test before, and since Schissel (1980) suggested that children's short-term memory skills (Gathercole & Baddeley, 1993; Gathercole & Adams, 1994) may affect their test performance, it was decided to employ the same-different type in this study. The participant children were asked to listen to a pair of non-words and to decide if both items in the pair were the same or different. They were told to draw a circle on the answer sheet if the words were the same, and put an X if they were different.

1.3.2.1.2 The Lexical Discrimination Test (b)

This test corresponds to Level E: Are the child's phonological representations accurate? At this level, for example, an L1 child is asked to choose the right auditory input between /kæt/ and /bæt/ to represent a picture of a cat.

As described in the previous section, the *Auditory Word Meaning Test* was administered first to assess whether the participants were lexically familiar with the target vocabulary employed in this study before the test was administered. It should be noted that the Auditory Word Meaning Test and the Lexical Discrimination Test (b) were conducted one year after six other tests were conducted. This means that the Lexical Discrimination Test (b) was administered while the participants were given explicit English sound instruction in the 2015 academic year. Thus, this test was statistically treated independently as a variable to be measured at time two. Table 5 shows the target words.

Table 5

Items for the Lexical Discrimination Test (b)

Item	target word	Auditory-choices	Item	target word	Auditory-choices
example	dogs	1. /dɛgz/ 2. /dɔgz/ 3. /dɪgz/	b13	computer	1. /kɪmpetər/ 2. /kæmpjutər/ 3. /kæmpoutər/
b01	sing	1. /sɪŋ/ 2. /sɛŋ/ 3. /suŋ/	b14	sandwich	1. /sɪndwɪʃ/ 2. /sendwɒtʃ/ 3. /sændwɪtʃ/
b02	bus	1. /bɛs/ 2. /bɪs/ 3. /bʌs/	b15	kangaroo	1. /kɛŋɡɹaɪ/ 2. /kæŋɡə.ru/ 3. /kɪŋɡɹeɪ/
b03	house	1. /hɔɪs/ 2. /haɪs/ 3. /haʊs/	b16	knife	1. /naɪf/ 2. /nouf/ 3. /neɪf/
b04	flower	1. /flaʊər/ 2. /flou.ɪ/ 3. /flaɪe/	b17	sponge	1. /spɛndʒ/ 2. /spɪndʒ/ 3. /spʌndʒ/
b05	map	1. /mɛp/ 2. /mæp/ 3. /mɪp/	b18	kitchen	1. /kɪtʃən/ 2. /kæɪtʃɪn/ 3. /ketʃun/
b06	dress	1. /dɹɛs/ 2. /dɹæs/ 3. /dɹɪs/	b19	train	1. /tɹɔɪn/ 2. /tɹaɪn/ 3. /tɹɛm/
b07	skirt	1. /skɔrt/ 2. /skout/ 3. /skart/	b20	money	1. /mɛnd/ 2. /mɪne/ 3. /mʌni/
b08	hand	1. /hʌnd/ 2. /hɪnd/ 3. /hænd/	b21	leaf	1. /lɪf/ 2. /leɪf/ 3. /luf/
b09	car	1. /kɑr/ 2. /ki/ 3. /kaʊ/	b22	fish	1. /fɛʃ/ 2. /fɪʃ/ 3. /fɑʃ/
b10	hamburger	1. /hɛmbɪɡər/ 2. /hæmburgər/ 3. /hɪmbougər/	b23	glove	1. /ɡlɪv/ 2. /ɡlʌv/ 3. /ɡlev/
b11	toilet	1. /taʊlɛt/ 2. /tɔʊlɛt/ 3. /tɔɪlɪt/	b24	brush	1. /brʊʃ/ 2. /brɪʃ/ 3. /brʌʃ/
b12	duck	1. /dʌk/ 2. /dɛk/ 3. /dɪk/	b25	run	1. /ɹɛn/ 2. /ɹʌn/ 3. /ɹɪn/

All of the items had more than .80 in IF values (item facility, IF demonstrates the

correct percentage of the given questions) in the Auditory Meaning Test and the words that Allen-Tamai (2009) had investigated for their familiarity. These is described in the end of this section. In this test, the nucleus vowel of a syllable in a target word was substituted with a similar vowel about the same length (M. Vance, 1995). The participants were then asked to listen to three English sentences read by an L1 model speaker (the Model hereafter) and to choose the appropriate number that represented the meaning of the sentence written in Japanese. For example, the participants read the Japanese sentence “Anata wa inu ga suki desuka? (Do you like dogs?) ” on a test paper and listened to three English sentences read by the Model, “1. Do you like /dægz/?, 2. Do you like /dɒgz/?, and 3. Do you like /dɪgz/?” The target word in a Japanese sentence was underlined. This test consisted of 25 question items. Appendix B2 shows test items used in the Lexical Discrimination Test (b).

1.3.2.1.3 The Open Oddity Test (c) and the End Oddity Test (d)

The Open Oddity Test (c) and the End Oddity Test (d) were conducted in the form of *odd-man-out* listening tests without reference to lexical representations. These tests correspond to level F and address the question of whether or not the child is aware of the internal structure of the phonological representations. These tests were originally developed by Kirtley, Bryant, MacLean, and Bradley (1989) for L1 young children to detect the structure of CVC in different conditions. Allen-Tamai (2000, 2006a, 2006b, 2009) revised the original version in order to investigate young Japanese EFL children’s English phonological awareness. In her revised tests, the knowledge of not only the consonant onset or coda of a CVC word but also the successive vowel that is a part of the rime were detected. For example, the participant children were asked to detect *hop* as a non-rhymed word from a set of *lip*, *hop*, *tip*. Allen-Tamai intended to observe

whether L2 Japanese children were able to detect that *lip* and *tip* share the same rime /ɪp/ but *hop* has a different rime /ap/, and thus, the vowel /a/ should be detected in order to examine their L1 influence.

In the present study, the Open Oddity Test (c) and the End Oddity Test (d) were employed as a measure of Japanese children's auditory discriminatory ability of the opening and ending segment and vowel of CVC words. Thus, the participants were asked to choose the word which did not match the other two words. Table 6 shows all the items in the Open Oddity Test (c).

The Open Oddity Test (c) consists of three parts containing eight items each with the following conditions. Condition 1: the successive vowels are all different, and the onset consonant of an odd word is different from other two words. Condition 2: the onset consonants are the same, but the vowel of an odd word is different from other two words. Condition 3: the vowels are all the same but the onset consonant of an odd word is different from other two words.

Table 6
Items for the Open Oddity Test (c)

<u>Condition 3</u>			<u>Condition 1</u>			<u>Condition 2</u>		
Items	same	different	Items	same	different	Items	same	different
eg.	/sɪŋ/	/sɪt/	eg.	/fɪʃ/	/faks/	eg.	/bʌg/	/bʌs/
c01	/dɛf/	/dɛk/	c09	/kæn/	/kɑp/	c17	/læp/	/læm/
c02	/læm/	/læp/	c10	/lɑt/	/læp/	c18	/pɛm/	/pɛt/
c03	/kɑp/	/kaf/	c11	/dɑl/	/dɛf/	c19	/kɑt/	/kɑp/
c04	/pɛm/	/pɛt/	c12	/kɑf/	/kæp/	c20	/dɛk/	/dɛn/
c05	/fɪt/	/fɪn/	c13	/lɑm/	/læd/	c21	/fɪt/	/fɪn/
c06	/sɪt/	/sɪn/	c14	/pɪm/	/pɛt/	c22	/sɪt/	/sɪn/
c07	/lɑt/	/lɑm/	c15	/hæm/	/fɪt/	c23	/dɔt/	/dɔg/
c08	/dɑl/	/dɑg/	c16	/sæŋg/	/sɪt/	c24	/kæt/	/kæn/

Concerning the sonority of Japanese L2 learners of English segments (Sugitou, 1996) and the target segments used in production tests, two question items in each condition were revised. Item 05, 15, and 21 were added to differentiate between the onset consonants /f/ and /h/, Item 06, 16 to differentiate between /s/ and /ʃ/, and Item 22 to differentiate between the nucleus vowels /ɪ/ and /i/, which Japanese learners of English often seem to substitute for one another (Sugito, 1996).

Table 7 shows items in the End Oddity Test (d). The End Oddity Test (d) also consists of three parts containing 24 items with the following conditions. Condition 1: the vowels are different, but the coda consonant of an odd word is different from other two words. Condition 2: the coda consonants are all the same, but the precedent vowel of an odd word is different from other two words. Condition 3: the vowels are all the same, but the coda consonant of an odd word is different from other two words.

Table 7

Items for the End Oddity Test (d)

Condition 3			Condition 1			Condition 2		
Items	same	different	Items	same	different	Items	same	different
eg.	/fʌn/	/sʌn/	eg.	/dʌg/	/bæg/	eg.	/sʌn/	/rʌn/
d01	/hɪd/	/kɪd/	d09	/tʌp/	/wɪp/	d17	/lɪp/	/tɪp/
d02	/ɪʌk/	/sʌk/	d10	/wɪk/	/sʌk/	d18	/sʌk/	/nʌk/
d03	/lɪd/	/bɪd/	d11	/hɪd/	/sɪd/	d19	/ɪeɪ/	/teɪ/
d04	/ɪeɪ/	/neɪ/	d12	/teɪ/	/houɪ/	d20	/lɪd/	/sɪd/
d05	/bouɪ/	/houɪ/	d13	/nʌk/	/lɪk/	d21	/houɪ/	/bouɪ/
d06	/tʌp/	/mʌp/	d14	/pæθ/	/smɪθ/	d22	/pet/	/net/
d07	/pet/	/net/	d15	/teɪp/	/kæp/	d23	/tʌp/	/pʌp/
d08	/tɪθ/	/ɪɪθ/	d16	/mæt/	/nat/	d24	/tɪθ/	/ɪɪθ/

As with the Open Oddity Test (c), one question item in each condition was revised. Item 08 and Item 14 were developed to differentiate the coda consonant between /θ/ and /s/, and Item 24 was designed to differentiate between the nucleus /i/ and /ɪ/ with same coda /θ/. Item 07 and Item 16 were to differentiate between coda /t/ and /d/, and Item 22 was to differentiate between the nucleus /ε/ and /ɪ/ with the same coda /t/. Item 06 and Item 15 were to differentiate between coda /b/ and /p/, and Item 23 was to differentiate between the nucleus /ɑ/ and /æ/ with the same coda /p/.

1.3.2.2 Production tests

In order to investigate the participants' production ability of English sounds, the Real Word Repetition Test (e), the Word-in-Sentence Repetition Test (f), and the Non-word Repetition Test (g) were designed. All three tests were conducted individually in quiet rooms at the research site. As the participants in this study were novice learners of English in EFL surroundings where their exposure to English is much more limited than ESL children, all the production tests were designed as sound repetition tests that included non-words, real words, and real words in sentences. According to Stackhouse, Vance, Pascoe, and Wells (2007), these tests are able to show the nature of a child's speech production difficulties and to specify a particular speech processing deficit. For example, they conducted a picture naming test to investigate a child's lexical and speech difficulties. It should be noted, however, in the L2 context of this study the tests were all repetition tests in which the participants repeated a word or a sentence with both real words and non-words. While these production tests were being implemented, the participants watched the computer screen carefully and were told to repeat words or the sentence that the Model on the screen pronounced, imitating his mouth movement.

1.3.2.2.1 The Real Word Repetition Test (e)

This test corresponds to Level I: Can a child articulate real words accurately? In this test, the participants were asked to repeat the word that the Model pronounced. This test was designed to investigate the participants' productive capability of English sounds using real words that they know by repeating after the Model. Since this repetition task was being applied to Japanese EFL children at novice level of English, and not L1 English children (Stackhouse *et al.*, 2007), the researcher had to consider that the English words used with L1 children may not be familiar to L2 children. Thus, as mentioned in perception tests, the Auditory Word Meaning Test was conducted with the participants to verify that the 15 words employed in the Real Word Repetition Test (e) and the Word-in-Sentence Repetition Test (f) were known to the Japanese participants. The Auditory Word Meaning Test which will be described in the end of this section, demonstrated IF value of the words ranging .82 to 1.00. Moreover, it was also taken into consideration that the real words employed in this repetition test should be different from the derived words in the Non-word Repetition Test (g) in order to prevent priming effects, as these three tests were conducted on the same day due to the time limitation imposed by the school authority. Thus, the Real Word Repetition Test (e) was conducted first, the Non-word Repetition Test (g) second, and the Word-in-Sentence Test (f) third. Concerning the number of syllables that the participants at the novice level of English can possibly pronounce, 15 words ranging from three to nine segments within one to three syllables were employed from M. Vance, Stackhouse, and Wells (1995), and M. Vance, Stackhouse, and Wells (2005) both in the Real Word Repetition Test (e) and the Word-in-Sentence Repetition Test (f).

Table 8 shows the words used in the Real Word Repetition Test (e) and the Word-in-Sentence Repetition Test (g). Appendix B3a shows the test items for the Real

Word Repetition Test (e).

Table 8

Words Used in the Real Word Repetition Test (e) and the Word-in-Sentence Repetition Test (f)

the number of syllables	words (Test e)		the number of segments	sentence (Test f)
1	sponge	/spʌndʒ/	5	The <u>sponge</u> is soft.
	duck	/dʌk/	3	Look at the yellow <u>duck</u> .
	leaf	/lif/	3	A <u>leaf</u> is green and yellow.
	knife	/naɪf/	3	The <u>knife</u> is in the kitchen.
	train	/tɹeɪn/	4	The <u>train</u> is very fast.
2	sandwich	/sændwɪtʃ/	7	I want to eat some <u>sandwich</u> .
	money	/mʌni/	4	I need some <u>money</u> .
	kitchen	/kɪtʃən/	5	The knife is in the <u>kitchen</u> .
	flower ⁶	/flaʊər/	5	Water the <u>flowers</u> .
	toilet	/tɔɪlɪt/	5	I'm in the <u>toilet</u> .
3	hospital	/haspɪtəl/	7	The doctor is in the <u>hospital</u> .
	umbrella	/ʌmbɹelə/	7	Take your <u>umbrella</u> .
	kangaroo	/kæŋgə.ru/	7	Kick the <u>kangaroo</u> .
	computer ⁶	/kəmputər/	9	Use your <u>computer</u> .
	hamburger ⁶	/hæmbərgər/	9	This is a tasty <u>hamburger</u> .
Total segments			83	

Note. A diphthong was counted as one vowel (V).

1.3.2.2.2 The Word-in-Sentence Repetition Test (f)

This test corresponds to Level I: Can a child articulate real words accurately when in a sentence? In this test, the participants were asked to repeat the sentence that the Model read. This test assesses the participants' production ability of segments in the

⁶ As this study employed American General English pronunciation, the ending -er of these three words is represented as /ə/ in IPA. Nevertheless, /ə/ sound is normally expressed in /ər/ in English dictionaries and Japanese learners of English are not familiar with the IPA symbol /ə/, the ending -er. Thus, /ə/ is counted as two segments in this study.

target word in connected speech. The purpose of the Word-in-Sentence Repetition Test (f) is to clarify whether the participants possess articulatory accuracy of English segments singly in the sentence with reference to lexical representation. This test is compared with the Real Word Repetition Test (e) in which each target word is produced independently. Thus, the same 15 real words were used in these tests.

In this test, the length of the sentences ranged from four to nine syllables as shown in Table 8 so that the participants could repeat after the Model, using the sentences or chunks whose meaning was comprehensible to the participants. The sentence was read by the Model with a picture held up by his face while the participants repeated each sentence. The total number of segments in this test was 83. This number was tested because it was predicted that the participants' articulation of a segment might differ with its position in a word. For example, a consonant /f/ was used as the onset in *flower*, and as the coda in *leaf*. A vowel /ʌ/ was used in a one-syllable word, *duck*, the first syllable in *money*, and in *umbrella* as the onset position. Appendix B3b shows the test items.

1.3.2.2.3 The Non-word Repetition Test (g)

This test, which involved asking the participants to repeat the non-words that the Model pronounced, corresponds to Level J: Can a child articulate speech without reference to lexical representation? Stackhouse, M. Vance, Pascoe, and Wells (2007) explain that this level specifically pinpoints speech-processing difficulty. They comment that “within the psycholinguistic framework, this task is considered to be particularly taxing for motor programming skills, since the child assembles a new motor program for speech production quickly. This requires holding the target non-word in a temporary store long enough to reflect on its components and plan the articulatory output”

(Stackhouse *et al.*, 2007, p. 117). Table 9 shows the items in the Non-word Repetition Test (g).

As shown in Table 9, 15 non-words ranging in length from three to seven segments within one to three syllables (five one-syllable, five two-syllable, and five three-syllable non-words, thus, 30 syllables in total) were chosen from Vance, Stackhouse, and Wells (2005), and Nathan, Stackhouse, Goulandris, and Snowling's study (2004). The five one-syllable non-words were the same as in the Non-word Perception Test (a) in order to compare perception and production performance among the participants without reference to lexical representation. The total number of segments assessed was 77. As mentioned already in the assessment of the segments in the Real Word Repetition Test (e) and the Word-in-Sentence Repetition Test (g), it was also taken into consideration here that articulation of a segment may be influenced by the different position in a word structure. Thus, this number of segments were deployed in this test. Appendix B3c shows the test items.

Table 9

Items for the Non-word Repetition Test (g)

One-syllable	Two-syllable	Three-syllable
/pləʊt/	/spéidi/	/bætəfləʊ/
CCVC (4)	CCVCV (5)	CVCVCCV (7)
/vɪm/	/tɹékti/	/spʌgítə/
CVC (3)	CCVCCV (6)	CCVCVCV (7)
/fɛʃ/	/dʒʌlə/	/pɪdʒómɪz/
CVC (3)	CVCV (4)	CVCVCVC (7)
/b.ɪʃ/	/slópə/	/pɛɪʃt/
CCVC (4)	CCVCV (5)	CVCVCVC (7)
/glɛv/	/gétə/	/æɪɪfɒnt/
CCVC (4)	CVCV (4)	VCVCVCC (7)

Note. () shows the number of segments. A diphthong was counted as one vowel (V).

1.3.2.3 The Auditory Word Meaning Test

As this study investigates the nature of Japanese children's perceptive and productive ability of English as a second language and whether these abilities can fit into the model for L1 English children proposed by Stackhouse and Wells (1997), it was necessary to consider whether the variables in the model can be used to measure the basic ability of English of L2 older children in an EFL setting. In the framework of Stackhouse and Well's model, the words employed were real words and non-words derived from real words based on L1 children's lexical representation. Thus, it was important to verify whether the words employed in this study were adequate for the participants. Due to the fact that the participants were beginner level learners, the auditory word meaning test seemed appropriate to measure their receptive vocabulary knowledge of English.

The Auditory Word meaning Test used words ranging from one to three syllables that were taken from the studies for L1 children by Cassidy (1994), M. Vance, Stackhouse, and Wells (1995), and M. Vance, Stackhouse, and Wells (2005). This test was given to the participants to confirm that they were familiar with the target words.

Table 10 shows the result of item facility indices (abbreviated as IF hereafter, and explained in 1.4.2) to demonstrate the correct percentage of the given questions. In this test, the researcher pronounced each English word twice, and the participants circled the appropriate Japanese word that represented the same meaning. The reliability *Cronbach α* (alpha) was .90. This test was conducted two weeks before the Lexical Discrimination Test (b) was conducted, when the participants were being instructed by the researcher during the second term of Grade 6 in 2015 academic year. The target words that had an IF value of more than .80, and the high-familiarity English words among L2 children investigated by Allen-Tamai (2009) were employed in this study. The words from

Allen-Tamai's investigation were: *map* (IF = .77), *hand* (IF = .92), *dress* (IF = .97), *bus* (IF = 1.00), *house* (IF = 1.00), and *run* (IF = .83). If the IF value was below .80, a non-word was derived from the word and used as a non-word in the tests. For example, Item 14 *van* had an IF value of .75. This word was, therefore, used as *vin* in the non-word tests that do not refer to lexical representation. It should be noted that *map* was employed in the Lexical Discrimination Test (b) although its IF was slightly lower than .80. Appendix B4 shows the test items.

Table 10

The result of the Auditory Word Meaning Test (N = 103)

Item	Word	IF	Item	Word	IF
1	fish	1.00	16	spider	1.00
2	elephant	.98	17	knife	1.00
3	spaghetti	1.00	18	guitar	1.00
4	hamburger	1.00	19	brush	.99
5	glove	.99	20	train	.88
6	plate	.80	21	butterfly	.92
7	toilet	1.00	22	slippers	1.00
8	flower	1.00	23	umbrella	.97
9	duck	.94	24	tractor	.98
10	computer	1.00	25	sponge	1.00
11	hospital	.82	26	jelly	1.00
12	sandwich	1.00	27	kitchen	1.00
13	kangaroo	1.00	28	money	1.00
14	van	.75	29	leaf	.91
15	pajamas	1.00			

1.3.3 Procedure

Before data collection, the researcher had some discussion with the school principal and the homeroom teachers, and they understood the purpose of the study and agreed to the consent forms that were delivered to all the parents of the participant children. The letter of consent form with the aim of the researcher's study was sent to the participants' parents, and none of them disapproved of their children participating in this study. The letter of consent form is shown in Appendix B5.

1.3.3.1 Data collection

A male native speaker of General American English (GA) who was a university TESOL teacher participated in recording of both the perception and production tests as the model speaker (the Model). All the test materials were recorded in a university CALL studio on ROLAND R-05 recorder ver. 1.03 WAV-24bit. The sampling rate of the model pronunciation recording and data collection from the participants was 48.0 kHz. While recording the test materials for the production tests, the Model was video-recorded with his face and mouth zoomed up so that the participants could watch his mouth and listen to his pronunciation simultaneously, and then repeat each word as best they could. In order to prevent priming effects, the perception tests were conducted at two to three weeks intervals from the production tests.

The perception tests were conducted in the classrooms of Grade 5 during the second term of the 2014 elementary school year (from September to November). The Auditory Word Meaning Test and the Lexical Discrimination Test (b) were conducted the following year when the participants were in Grade 6 in 2015. The production tests were conducted in the quiet rooms of the elementary school on the first week of October, 2014. Due to the limitation of hours to use the rooms for recording permitted by the

school authority, ten undergraduate students in the course of teaching English to young learners and in English teacher training courses were trained in advance as test implementers by the researcher and were responsible for manipulating the computers and recording the participants' sound production. In order to allay the participants' nervousness, the test implementers were trained to handle children in a kind and friendly manner. The participants were individually called to the rooms and took the production tests. It took each participant approximately 20 minutes to perform the production tests.

Production tests were conducted with the participants individually wearing a headset connected to the computer screen. The participants were told to watch the mouth of the Model very carefully on the computer screen and to try and repeat as accurately as possible immediately after the model. In production tests, the Real Word Repetition Test (e) was conducted first, the Non-word Repetition Test (g) second, and the Word-in-Sentence Repetition Test (f) followed. As these tests were conducted on the same day, the disposition of the test items was rearranged, and the Word-in-Sentence Repetition Test (f) was conducted after the Non-word Repetition Test (g) in order to prevent a priming effect. All the production data were recorded on ROLAND R-05 recorder ver. 1.03 WAV-24bit.

When collecting production data, the participants were asked whether they were taking English lessons after school or had any other learning experiences of English, and whether they were taking any music lessons after school. This demographic information, as well as their birthday, was taken into consideration when analyzing the result. Appendix B6 shows the demographic information card distributed to the participants.

1.3.3.2 Data analysis

After the data collection, all the test items were marked on a binary scale: 1 as correct and 0 as wrong, and were statistically analyzed. The recorded performances were judged by two raters as Judge A and Judge B. Judge A was the researcher herself who was specialized in phonetics and phonology, and Judge B was a senior-year undergraduate student majoring in English and teaching English to young learners and who was trained to rate the participants' production of English sounds. The production tests were rated based on the articulatory accuracy of a single segment on a binary scale (correct or wrong = 1/0), judging whether the participants' production was the same or different from the Model's. Statistical analyses were performed using IBM SPSS Advanced Statistics Version 23 (IBM, 2015) and IBM AMOS Graphics Version 23 (IBM, 2014).

1.4. Results

1.4.1 Test results

In order to answer the research questions, four tests were used to measure the participants' perceptive ability of English sounds, and three tests to measure their productive ability. As described in the previous section, the productive tests were judged by the two raters on binary scales.

Before investigating answers to the research questions, the reliabilities of the perception tests were computed. The interrater reliabilities of the production tests were computed by *Pearson correlation coefficient* which can estimate a valid interrater reliability in case of two raters (Landers, 2015). Table 11 shows reliability of the tests.

Normally tests conducted in a classroom are reliable when the value of reliability is more than .70. Thus, the Non-word Perception test (a) and the Non-word Repetition

(g) unfortunately test failed to be reliable, while the rest of tests filled the requirement.

Table 11

Reliability of the Four Perception Tests and the Three Production Tests

	Tests	Reliability	<i>N</i>
Perception	The Non-word Perception (a)	.65	104
	The Lexical Discrimination (b)	.70	101
	The Open Oddity (c)	.74	104
	The End Oddity (d)	.73	104
Production (interrater reliability)	The Real Word Repetition (e)	.89	104
	The Word-in-Sentence (f)	.74	102
	The Non-word Repetition (g)	.66	104

Note. *N* is the total number of the participants who took the test.

1.4.2 Item analysis

As the main purpose of this study is to clarify the nature of Japanese children's perceptive and productive ability of English as a second language, it was necessary to observe the participants' difficulty on each item rather than the mean value of the tests. Thus, all the test items were analyzed to calculate item facility (IF) indices to demonstrate the correct percentage of the given questions. In each test, IF scores were calculated, and then, high and low IF values were analyzed.

1.4.2.1 The Non-word Perception Test (a)

There were 24 items in the Non-word Perception Test (a) in which the participants were asked if two non-words were the same or different. All the items are shown in Table 4 in the previous section. Table 12 shows the result of IF scores.

Table 12

IF Scores in the Non-word Perception Test (a) (N = 104)

Item	IF	Item	IF	Item	IF
a01	.93	a09	.92	a17	.81
a02	.65	a10	.97	a18	.95
a03	.99	a11	1.00	a19	.97
a04	.84	a12	.98	a20	.99
a05	.99	a13	.67	a21	.94
a06	.99	a14	.85	a22	.96
a07	.76	a15	.97	a23	.38
a08	.95	a16	.43	a24	.92

The items with the five highest IF values and those with the five lowest values are listed in Table 13. High IF was valued between .99 and 1.00 and low IF was valued between .38 and .76. Among the high items, Item 11 and Item 03 were derived from the same real word *snake*, and both items were used to observe cluster reduction. Item 05 and Item 20 were the same pattern, and Item 11 was the different pattern of onset cluster reduction. Item 06 was the different pattern to distinguish between /s/ and /ʃ/.

Among the low items, Item 02 was to distinguish between /n/ and /m/ in coda position, Item 16 to distinguish between /b/ and /v/ in coda position, and Item 07 and Item 23 to distinguish between /dʒ/ and /z/, and /dʒ/ and /ʒ/ in coda position.

Although Item 07 and Item 23 were both ranked in the low group, the difference in IF

values between the two items was high. Item 13 was to distinguish between /v/ and /f/ in onset position. Item 23 were the lowest IF.

Table 13

The Items with High and Low IF Values in the Non-word Perception Test (a)

<u>High</u>			<u>Low</u>		
Item No	Items	IF	Item No	Items	IF
a11	/naɪk/ /snaɪk/	1.00	a07	/spændʒ/ /spændz/	.76
a03	/saɪk/ /snaɪk/	.99	a13	/vɛʃ/ /fɛʃ/	.67
a05	/fɛʃ/ /fɛʃ/	.99	a02	/zɪm/ /zɪm/	.65
a06	/bɪs/ /bɪʃ/	.99	a16	/glɛb/ /glɛv/	.43
a20	/tɔɪm/ /tɔɪm/	.99	a23	/spændʒ/ /spændʒ/	.38

It can be concluded from the Non-word Perception Test (a) that the auditory distinction of the similar consonants in coda position, such as between /n/ and /m/, /ʒ/ and /dʒ/, /b/ and /v/ seemed difficult. This test will be compared with the result of the Non-word Repetition Test (g) in Discussion following this section.

1.4.2.2 The Lexical Discrimination Test (b)

This test measures phonological representation by asking the participants to choose the auditory input that correctly represents the meaning of the word. All the test items are shown in Table 5 in the previous section. All the target words were highly familiar words that more than 80% of the Japanese participants knew before the test. The result of item analysis is shown in Table 14.

In this Lexical Discrimination Test (b), Item 10 gained an IF score of 1.00. This means that all the participants were able to choose “hamburger” from among

/hɛmbɪgəɪ/, /hæmbʊgəɪ/, /hɪmbouɡəɪ/. Twenty-one items gained an IF score of more than .70, and four items had below .70.

Table 14

IF Scores in the Lexical Discrimination Test (b) (N = 101)

Item	IF	Item	IF	Item	IF
b01	.84	b10	1.00	b19	.90
b02	.58	b11	.82	b20	.98
b03	.98	b12	.27	b21	.82
b04	.98	b13	.96	b22	.91
b05	.50	b14	.92	b23	.82
b06	.45	b15	.98	b24	.88
b07	.78	b16	.98	b25	.70
b08	.71	b17	.92		
b09	.92	b18	.95		

Next, the items with the six highest IF values and those with the six lowest values are listed. Table 15 shows that the high items ranked from the first to sixth that gained more than .98. Thirteen items out of 25 items gained more than .90. The high items were *hamburger*, *house*, *flower*, *kangaroo*, *knife*, and *money*. Six low IF words dropped below .71. They were *hand*, *run*, *bus*, *map*, *dress*, and *duck*. While all the high IF words were loanwords ranging from one to three syllables, all the low IF words were one-syllable words. Despite gaining .94 in the Auditory Word Meaning Test, *duck* gained the lowest IF value of .27.

The result of the Lexical Discrimination Test (b) suggests that the participants' knowledge of English vocabulary seemed to be influenced by loanwords and that the nucleus vowels in one-syllable English words seemed to be hard to distinguish for the Japanese participants.

Table 15

The Items with High and Low IF Values in the Lexical Discrimination Test (b)

	Item No.	Vocabulary	IPA	IF	Familiarity
High	b10	hamburger	/hæmburgər/	1.00	1.00
	b03	house	/haʊs/	.98	1.00
	b04	flower	/flaʊər/	.98	1.00
	b15	kangaroo	/kæŋgəru/	.98	1.00
	b16	knife	/naɪf/	.98	1.00
	b20	money	/mʌni/	.98	1.00
Low	b08	hand	/hænd/	.71	.92
	b25	run	/ɹʌn/	.70	.83
	b02	bus	/bʌs/	.58	.98
	b05	map	/mæp/	.50	.77
	b06	dress	/dɹɛs/	.45	.97
	b12	duck	/dʌk/	.27	.94

1.4.2.3 Open Oddity Test (c)

There were 24 items in the Open Oddity Test. All the test items are shown in Table 6 in the previous section. Table 16 shows the IF scores.

Table 16

IF Scores in the Open Oddity Test (c) (N = 104)

Item	IF	Item	IF	Item	IF
c01	.96	c09	.88	c17	.19
c02	.89	c10	.96	c18	.62
c03	.89	c11	.92	c19	.79
c04	.87	c12	.86	c20	.63
c05	.68	c13	.88	c21	.57
c06	.85	c14	.92	c22	.39
c07	.85	c15	.59	c23	.89
c08	.95	c16	.81	c24	.79

Next, the items with the five highest IF values and those with the five lowest values were listed in Table 17. The high IF items were valued between .92 and .96. Regarding the test conditions described in the previous section, Item 10, Item 11, and Item 14 were from Condition 1 in which the onset consonants and the successive nucleus vowel are different from other two words, and Item 01 and Item 08 were from Condition 3 in which the successive nucleus vowels are the same but the onset consonant is different from the other two words. No item ranked as a high item from Condition 2 in which the onset consonants are the same but the successive nucleus vowel is different from the other two words.

Table 17

The Items with High and Low IF Values in the Open Oddity Test (c)

<u>High</u>			<u>Low</u>		
Item No.	Items	IF	Item No.	Items	IF
c01	/dɛf/ /pɛn//dɛk/	.96	c18	/pɛt//pɛm//pɛɪ/	.62
c10	/laɪt/ /læp/ /dɛk/	.96	c15	/hæm/ /fɪt//hɒp/	.59
c08	/kat/ /dal/ /dag/	.95	c21	/fɪt/ /fɪn//fæn/	.57
c11	/dal/ /kɑp//dɛf/	.92	c22	/sɪt/ /sɪŋ//sɪn/	.39
c14	/pɪn/ /pɛt//dag/	.92	c17	/læp//læm//laɪf/	.19

The low IF values ranged between .19 and .62. Item 15 was from Condition 1, Item 17, Item 18, Item 21, and Item 22 were from Condition 2. It is interesting that these four items of Condition 2 were to measure the discriminatory ability of the successive vowels between monophthongs and diphthongs. Item 15, and Item 21 asked the participants to distinguish between /f/ and /h/ in the onset position across the three different conditions. No matter which vowel follows the onset consonant, the IF values

of the three items were ranked lower in discriminating between /f/ and /h/. Item 22 which had an IF of .39 asked the participants to distinguish between a short vowel /ɪ/ and a long vowel /i/. The lowest Item 17 which was .19 in IF value was much lower than the other low items. This result will be discussed more in the next section.

It can be concluded from the Open Oddity Test (c) that the onset consonants with successive vowels which are all the same, or, all different seemed to be auditorily distinguishable. The participants, however, found it difficult to distinguish the difference of the same onset consonants along with the successive vowels between the monophthongs and diphthongs, and between the long and short vowels. It was also difficult for the participants to discriminate between consonants which Japanese learners tend to perceive as similar sounds, such as /f/ and /h/.

1.4.2.4 The End Oddity Test (d)

There were 24 items in the End Oddity Test (d). All the test items are shown in Table 7 in the previous section. Table 18 shows the IF scores. The highest IF was Item 03 which was .95, and the lowest IF was Item 23 which was .37.

The items with the six highest IF values and those with the five lowest values are listed in Table 19. The high IF values were between .89 and .95, and the low IF values were between .37 and .67.

Regarding the test conditions described in the previous section, Item 13 and 16 which ranked as high items were from Condition 1 in which the precedent vowel and the coda consonant are different from the other two words. The other high items 01, 02, 03, and 04 were from Condition 3 in which the vowels are all the same, but the coda consonant is different from the other two words.

Table 18

IF Scores in the End Oddity Test (d) (N = 104)

Item	IF	Item	IF	Item	IF
d01	.91	d09	.71	d17	.54
d02	.93	d10	.79	d18	.70
d03	.95	d11	.88	d19	.88
d04	.92	d12	.76	d20	.61
d05	.88	d13	.89	d21	.77
d06	.74	d14	.69	d22	.58
d07	.83	d15	.67	d23	.37
d08	.88	d16	.89	d24	.82

Table 19

The Items with High and Low IF Values in the End Oddity Test (d)

<u>High</u>			<u>Low</u>		
Item No.	Items	IF	Item No.	Items	IF
d03	/lid/ /bid/ /wik/	.95	d15	/terp/ /kæp/ /mab/	.67
d02	/ɪak/ /map/ /sak/	.93	d20	/lid/ /kɪd/ /sid/	.61
d04	/ɜrɪ/ /pem/ /nerɪ/	.92	d22	/pet/ /sɪt/ /nɛt/	.58
d01	/lɪp/ /hɪd/ /kɪd/	.91	d17	/lɪp/ /hæp/ /tɪp/	.54
d13	/nak/ /lik/ /kɪd/	.89	d23	/tap/ /mæp/ /pap/	.37
d16	/mæt/ /nat/ /sed/	.89			

Regarding the low IF items, Item 15 was from Condition 1, and Items 17, 20, 22, and 23 were from Condition 2 in which the coda consonants are all the same but the precedent vowel of the odd word is different from the other two words. Item 15 asked the participants to distinguish between /p/ and /b/. The other low IF values were from items which asked participants to distinguish the precedent vowels of the coda consonants. Items 20 asked participants to distinguish between the long /i/ and the short

/ɪ/. Item 17 asked the participants to distinguish between /ɪ/ and /ɑ/, and Item 22 to distinguish between /ɛ/ and /ɪ/. The lowest Item 23 asked participants to distinguish between /ɑ/ and /æ/, both of which are substituted as /a/ (ア) in Japanese.

It can be concluded from the End Oddity Test (d) that if the preceding vowels are all the same, or, the preceding vowels are all different, the ending coda seems to be auditorily distinguishable. It was, however, difficult when the coda consonants were contrastive sounds, such as /s/ and /θ/, or when the coda consonants were all the same but with the two ambiguous precedent vowels. This phenomena will be discussed in the next section.

1.4.2.5 The Real Word Repetition Test (e)

The Real Word Repetition Test (e) and the Word-in-Sentence Repetition Test (f) were conducted to measure the participants' productive ability of English segments by way of repeating the target word or the sentence containing the target word. These tests and the Non-word Repetition Test (g) were evaluated by two raters (Judge A and Judge B). Interrater reliability was .89 in the Real Word Repetition Test (e). The assessment by Judge A is shown as results in the tables. In this test there were 83 items among 15 English words ranging from one to three-syllables. Table 20 shows their IF values. The assessment by Judge B is shown in Appendix B7.

The highest IF values were Items 20, 23, 42, 44, 45, 49, 57, 59, 60, 61, and 62 all of which had IF score of .99, and the lowest IF value was Item 74 which was .13. Item 74 (ending segment /t/ in *toilet*) was, however, excluded from the analysis as this segment articulated by the Model was acoustically observed on the computer software but hard to catch the sound on the aural level. Thus, Item 54 had the lowest IF which was .16.

Table 20

IF Scores in the Real Word Repetition Test (e) (N = 103)

Item	Target	IF	Item	Target	IF	Item	Target	IF
e01	s	.96	e29	b	.98	e57	k	.99
e02	p	.98	e30	ɪ	.72	e58	ə	.73
e03	ʌ	.80	e31	e	.87	e59	m	.99
e04	n	.98	e32	l	.71	e60	p	.99
e05	dʒ	.83	e33	ə	.77	e61	j	.99
e06	s	.98	e34	l	.93	e62	u	.99
e07	æ	.45	e35	i	.98	e63	t	.96
e08	n	.97	e36	f	.94	e64	ə	.39
e09	d	.82	e37	k	.98	e65	r	.37
e10	w	.69	e38	ɪ	.98	e66	t	.98
e11	ɪ	.93	e39	tʃ	.89	e67	ɪ	.86
e12	tʃ	.85	e40	ə	.84	e68	eɪ	.82
e13	h	.98	e41	n	.92	e69	n	.86
e14	ɑ	.85	e42	k	.99	e70	t	.98
e15	s	.95	e43	æ	.46	e71	ɔɪ	.84
e16	p	.97	e44	ŋ	.99	e72	l	.62
e17	ɪ	.95	e45	g	.99	e73	ɪ	.39
e18	t	.93	e46	ə	.98	e74	t	.13
e19	ʔ	.89	e47	ɪ	.78	e75	h	.98
e20	d	.99	e48	u	.98	e76	æ	.46
e21	ʌ	.77	e49	n	.99	e77	m	.98
e22	k	.95	e50	aɪ	.98	e78	b	.98
e23	m	.99	e51	f	.91	e79	ə	.43
e24	ʌ	.94	e52	f	.93	e80	r	.41
e25	n	.98	e53	l	.80	e81	g	.96
e26	ɪ	.67	e54	au	.16	e82	ə	.40
e27	ʌ	.94	e55	ə	.23	e83	r	.38
e28	m	.97	e56	r	.21			

Next, the items with the 11 highest IF values and those with the 11 lowest values are listed in Table 21.

Table 21

The Items with High and Low IF Values in the Real Word Repetition Test (e)

Item No.	<u>High</u>				Item No.	<u>Low</u>			
	Items	target	position	IF		Items	target	position	IF
e20	duck	d	1	.99	e07	sandwich	æ	2	.45
e23	money	m	1	.99	e79	hamburger	ə	5	.43
e42	kangaroo	k	1	.99	e80	hamburger	r	6	.41
e44	kangaroo	ŋ	3	.99	e82	hamburger	ə	8	.40
e45	kangaroo	g	4	.99	e64	computer	ə	8	.39
e49	knife	n	1	.99	e73	toilet	ɪ	4	.39
e57	computer	k	1	.99	e83	hamburger	r	9	.38
e59	computer	m	3	.99	e65	computer	r	9	.37
e60	computer	p	4	.99	e55	flower	ə	4	.23
e61	computer	j	5	.99	e56	flower	r	5	.21
e62	computer	u	6	.99	e54	flower	au	3	.16

The high IF values were .99, and the low IF values were between .16 and .45. The column *Position* in Table 21 represents the number in the sequence of the target segment in a word. For example, /d/ ranked as high is the first segment of *duck*. Thus, the position is “1.”

Among the items with high IF values, five segments (Item 20, 23, 42, 49, and 57) were the onset consonants, and two segments were the initial consonants of the second syllable of the words (Item 45 and 60). Among the four other segments, two of them (Item 44 and 59) were the last consonants of the multiple syllable words, and the other

two were one approximant /j/ and one long vowel /u/.

All items with low IF values were either vowels or approximants: They were /æ/ in *sandwich*, coda /ər/ in *hamburger*, *computer*, and *flower*, /ɪ/ in *toilet*, and /au/ in *flower*. These English words are known as loan words among the participants.

1.4.2.6 The Word-in-Sentence Repetition Test (f)

There were also 83 segments in the Word-in-Sentence Repetition Test (f). As interrater reliability was .74 in this test, which was acceptable, the assessment by Judge A is shown as results in the following tables. The assessment by Judge B is shown in Appendix B7.

Table 22 shows IF scores in the Word-in-Sentence Repetition Test (f). The highest IF were Items 05, 10, and 13, which were .65, and the lowest IF was Item 45 which was .04. In this test, as in the Real Word Repetition Test (e), Item 09 (ending segment /t/ in *toilet*) was excluded from the analysis although the segment was at an acoustically hearing level this time. IF values in the Word-in-Sentence Repetition Test (f) were much lower than the IF values in the Real Word Repetition Test (e).

It was assumed, that it was difficult for the participants who were novice level learners to repeat English sentences ranging from four to nine syllables after the Model, and that the memory bias might have hindered the participants from completing the task at a satisfactory level.

Table 22

IF Scores in the Word-in-Sentence Repetition Test (f) (N = 102)

Item	Target	IF	Item	Target	IF	Item	Target	IF
f01	t	.54	f29	au	.26	f57	ɪ	.46
f02	ɪ	.20	f30	ə	.37	f58	ʌ	.45
f03	eɪ	.31	f31	r	.50	f59	m	.54
f04	n	.59	f32	k	.63	f60	b	.49
f05	t	.65	f33	ə	.11	f61	ɪ	.14
f06	oɪ	.47	f34	m	.59	f62	e	.55
f07	l	.47	f35	p	.62	f63	l	.45
f08	ɪ	.13	f36	j	.55	f64	ə	.34
f09	t	.32	f37	u	.58	f65	s	.63
f10	h	.65	f38	t	.59	f66	p	.59
f11	æ	.12	f39	ə	.22	f67	ʌ	.21
f12	m	.59	f40	r	.57	f68	n	.61
f13	b	.65	f41	l	.42	f69	dʒ	.54
f14	ə	.24	f42	i	.45	f70	s	.63
f15	r	.54	f43	f	.36	f71	æ	.05
f16	g	.64	f44	k	.64	f72	n	.63
f17	ə	.30	f45	æ	.04	f73	d	.56
f18	r	.60	f46	ŋ	.56	f74	w	.26
f19	n	.62	f47	g	.63	f75	ɪ	.57
f20	aɪ	.60	f48	ə	.28	f76	tʃ	.54
f21	f	.47	f49	ɪ	.22	f77	h	.53
f22	k	.62	f50	u	.64	f78	ɑ	.28
f23	ɪ	.56	f51	d	.53	f79	s	.51
f24	tʃ	.47	f52	ʌ	.39	f80	p	.52
f25	ə	.19	f53	k	.48	f81	ɪ	.51
f26	n	.53	f54	m	.55	f82	t	.43
f27	f	.58	f55	ʌ	.51	f83	ɫ	.33
f28	l	.55	f56	n	.56			

The high and low IF values were compared with the Word-in-Sentence Repetition Test (f). *Position* column in Table 23 represents the sequence of the target segment in a word. Eleven items with high IF values and those with low IF values are shown in Table 23.

Table 23

The Items with High and Low IF Values in the Word-in-Sentence Repetition Test (f)

<u>High</u>					<u>Low</u>				
Item No.	Items	target	position	IF	Item No.	Items	target	position	IF
f05	toilet	t	1	.65	f39	computer	ə	8	.22
f10	hamburger	h	1	.65	f49	kangaroo	ɪ	6	.22
f13	hamburger	b	4	.65	f67	sponge	ʌ	3	.21
f16	hamburger	g	7	.64	f02	train	ɪ	2	.20
f44	kangaroo	k	1	.64	f25	kitchen	ə	4	.19
f50	kangaroo	u	7	.64	f61	umbrella	ɪ	4	.14
f32	computer	k	1	.63	f08	toilet	ɪ	4	.13
f72	sandwich	n	3	.63	f11	hamburger	æ	2	.12
f47	kangaroo	g	4	.63	f33	computer	ə	2	.11
f65	sponge	s	1	.63	f71	sandwich	æ	2	.05
f70	sandwich	s	1	.63	f45	kangaroo	æ	2	.04

Among the high IF items, 10 items were consonants and one item was a vowel. Six of the consonants were in the initial position (Item 05, 10, 44, 32, 65, and 70), and three of the consonants were the first sound of the second syllable (Item 13, 47) and the third syllable (Item 16). Item 72 was the successive consonant of the nucleus vowel.

As for the 11 items with low IF values, they were /ɪ/ in *toilet*, /ʌ/ in *sponge*, /æ/ in *sandwich*, *kangaroo*, and *hamburger*, schwa /ə/ in *computer* and *kitchen*, /ɪ/ in *kangaroo*,

train, and *umbrella*. All of these English words are used as loanwords in Japanese. The number of vowels was eight, and the number of consonants was three.

Combining the results of the Word-in-Sentence Repetition Test (f) with the Real Word Repetition Test (e), it can be seen that (1) segments in word level were likely to be produced more correctly than in sentence level, (2) consonants were more often ranked in the high IF group, and vowels in the low IF group, (3) vowels in the low IF group were mostly the stressed vowels in loanwords, and (4) The variance in IF values was wide.

It is also noteworthy that vowel epenthesis was frequently observed between the clusters, after the consonants, such as after /d/ in the first syllable of *sandwich*, in both the Real Word Repetition Test (e) and the Word-in-Sentence Repetition Test (f), although the target segment was judged as correct whether or not the participants put some vowel after the segment. This phenomenon was not observed in the Non-word Repetition Test (g). This observation of vowel epenthesis will be discussed in the next section along with the results above.

1.4.2.7 The Non-word Repetition Test (g)

There were 77 segments in the Non-word Repetition Test (g). Table 24 shows the IF values. The interrater reliability was .66 in this test, and only the assessment by Judge A is shown as results in the following tables. The assessment by Judge B is shown in Appendix B7.

Table 24 shows the IF scores in the Non-word Repetition Test (g). The highest IF scores were Items 07, 50, 51, 57, and 74, which were all .65, and the lowest IF was Item 62 which was .03. Table 25 reports 18 items with high IF values and 13 items with low IF values. The high IF values ranged between .64 and .65. Among the high IF items, 14

items were consonants, and four items were vowels. Thus, the consonants occupied the majority of the high IF values.

Table 24

IF Scores in the Non-word Repetition Test (g) (N = 104)

Item	Target	IF	Item	Target	IF	Item	Target	IF
g01	p	.61	g27	k	.38	g53	g	.63
g02	l	.43	g28	t	.64	g54	ε	.46
g03	əʊ	.61	g29	ɪ	.64	g55	t	.62
g04	t	.61	g30	dʒ	.64	g56	ə	.60
g05	v	.34	g31	ʌ	.64	g57	p	.65
g06	ɪ	.48	g32	l	.61	g58	ɪ	.61
g07	n	.65	g33	ə	.57	g59	dʒ	.64
g08	f	.64	g34	s	.62	g60	ɔ	.63
g09	ε	.38	g35	l	.40	g61	m	.64
g10	ʃ	.62	g36	ɔ	.25	g62	ɪ	.03
g11	b	.63	g37	p	.63	g63	z	.09
g12	ɪ	.27	g38	ə	.28	g64	p	.64
g13	ɪ	.39	g39	g	.59	g65	ε	.37
g14	ʃ	.63	g40	ε	.63	g66	ɪ	.50
g15	g	.64	g41	t	.63	g67	ə	.60
g16	l	.55	g42	ɔ	.47	g68	ʃ	.59
g17	ε	.29	g43	b	.62	g69	ɪ	.64
g18	v	.47	g44	æ	.55	g70	t	.55
g19	s	.63	g45	t	.58	g71	æ	.36
g20	p	.64	g46	ə	.60	g72	l	.63
g21	eɪ	.30	g47	f	.58	g73	ɪ	.63
g22	d	.49	g48	l	.49	g74	f	.65
g23	ɪ	.64	g49	əʊ	.42	g75	ɒ	.63
g24	t	.64	g50	s	.65	g76	n	.54
g25	ɪ	.27	g51	p	.65	g77	t	.57
g26	ε	.48	g52	ʌ	.47			

Table 25

The Items with High and Low IF Values in the Non-word Repetition Test (g)

<u>High</u>					<u>Low</u>				
Item No.	Items	target	position	IF	Item No.	Items	target	position	IF
g07	/vɪn/	n	3	.65	g09	/fɛʃ/	ɛ	2	.38
g50	/spʌɡɪtə/	s	1	.65	g27	/tɪɛktɪ/	k	4	.38
g51	/spʌɡɪtə/	p	2	.65	g65	/pɛ.ɪəʃɪt/	ɛ	2	.37
g57	/pɪdʒɔ̃mɪz/	p	1	.65	g71	/æɪfɒnt/	æ	1	.36
g74	/æɪfɒnt/	f	4	.65	g05	/vɪn/	v	1	.34
g08	/fɛʃ/	f	1	.64	g21	/spɛɪdɪ/	eɪ	3	.30
g15	/ɡlɛv/	ɡ	1	.64	g17	/ɡlɛv/	ɛ	3	.29
g20	/spɛɪdɪ/	p	2	.64	g38	/slɔ̃pə/	ə	5	.28
g23	/spɛɪdɪ/	ɪ	5	.64	g12	/bɪɪʃ/	ɪ	2	.27
g24	/tɪɛktɪ/	t	1	.64	g25	/tɪɛktɪ/	ɪ	2	.27
g28	/tɪɛktɪ/	t	5	.64	g36	/slɔ̃pə/	ɔ̃	3	.25
g29	/tɪɛktɪ/	ɪ	6	.64	g63	/pɪdʒɔ̃mɪz/	z	7	.09
g30	/dʒʌɪə/	dʒ	1	.64	g62	/pɪdʒɔ̃mɪz/	ɪ	6	.03
g31	/dʒʌɪə/	ʌ	2	.64					
g59	/pɪdʒɔ̃mɪz/	dʒ	3	.64					
g61	/pɪdʒɔ̃mɪz/	m	5	.64					
g64	/pɛ.ɪəʃɪt/	p	1	.64					
g69	/pɛ.ɪəʃɪt/	ɪ	6	.64					

The observation that the number of consonants was more than the number of vowels in the high IF group is the same as the Real Word Repetition Test (e) and the Word-in-Sentence Repetition Test (f). Among the consonants ranked in the high IF group, the number of onset position was seven, and the number of coda position was one.

Regarding the low items, 13 items had IF scores ranging from .03 to .38. Among these, there were eight vowels and five consonants. With respect to the proportion of

consonants and vowels, however, there were more vowels in the low IF group. These were /ɛ/ in /fɛʃ/, /pɛɪəʃɪt/, and /glɛv/, /æ/ in /æɪfɒnt/, /ɔ/ in /slɒpə/, /eɪ/ in /speɪdɪ/, /ɪ/ in the third syllable of /pɪdʒɒmɪz/, and /ə/ in /slɒpə/. The lowest IF was /ɪ/ in the third syllable of /pɪdʒɒmɪz/. According to Judge A, most of the participants did not pronounce the vowel as [ɪ]. They pronounced it as [ɑ] instead. An approximant /ɹ/ used in the second consonant of the onset cluster in /bɹɪʃ/ and /tɹɛktɪ/ was ranked in the low IF group. The consonants in the low group were /k/ in /tɹɛktɪ/, /z/ in /pɪdʒɒmɪz/, and the second consonant of the cluster /ɹ/ in /bɹɪʃ/ and /tɹɛktɪ/. According to both Judge A and Judge B, /k/ in /tɹɛktɪ/ was pronounced like the Japanese geminate consonant (soku-on in Japanese), and /z/ in /pɪdʒɒmɪz/, and the second consonant of the cluster /ɹ/ in /bɹɪʃ/ and /tɹɛktɪ/ was likely deleted by the participants. Judge A and Judge B also reported that vowel epenthesis was hardly ever observed in this test, which is opposite to the phenomena in the Real Word Repetition Test (e) and the Word-in-Sentence Repetition Test (f). This observation of vowel epenthesis will be discussed in the next section along with the results above.

From the results of the Non-word Repetition Test (g) it can be seen that the nucleus vowels were harder to produce, and that the deletion of consonants was observed in the clusters and coda position.

The overall results of the tests described above are summed up as follows:

1. Auditory perceptive ability and oral productive ability of the consonants were higher than those of the vowels.
2. Auditory lexical discrimination was influenced by Japanese loan words.
3. Both perception and production of nucleus vowels were difficult for the participants.

4. Discrimination of onset/coda consonants was influenced by the successive/precedent vowels.
5. While the similar sounds that are substituted as one sound in Japanese were hard to distinguish, producing the segment independently was possible for some of the participants.
6. Production of segments was influenced by L1 loanword knowledge.
7. Auditory distinction of contrastive consonants in coda position was more difficult than the distinction in onset position.

1.4.3 Comparison between perceptive and productive ability

The perception tests and the production tests were conducted independently and whether the perception of a phoneme is better than production of the phoneme or vice versa was not clarified due to the different methods of evaluation. The perception tests were evaluated on test scores, while the production tests were rated by two judges on a binary scale. Nevertheless, it is interesting to compare the perception and production tests using the same words and in both with and without reference to lexical representation condition.

First, the five one-syllable non-words that were examined in the Non-word Perception Test (a) and in the Non-word Repetition test (g) were compared on the condition of without lexical representation. Comparison was also made between two derived non-words employed in the Non-word Perception Test (a) and real words employed in the Real Word Repetition Test (e) and the Word-in-Sentence Repetition Test (f). The results are shown in Table 26. The non-words derived from real words were /pləʊt/ from *plate*, /vɪn/ from *van*, /fɛʃ/ from *fish*, /b.ɪʃ/ from *brush*, and /glɛb/ from *glove*.

Table 26

Comparison Between Five One-syllable Non-words and Two Real Words

	derived from	Item	<u>Perception</u>				<u>Production</u>		
			A	B	feature	IF	Item	Tar- get	IF
1	plate /pleɪt/	a01	/pəʊt/	/pəʊt/	cluster reduction	.93	g01	p	.61
		a09	/pəʊt/	/pləʊt/	cluster reduction	.92	g02	l	.43
		a17	/ləʊt/	/pləʊt/	cluster reduction	.81	g03	aʊ	.61
							g04	t	.61
2	van /væn/	a02	/zɪn/	/zɪn/	place in coda	.65	g05	v	.34
		a10	/vɪn/	/zɪn/	place in onset	.97	g06	ɪ	.48
		a18	/vɪn/	/vɛn/	vowel	.95	g07	n	.65
3	fish /fɪʃ/	a05	/fɛʃ/	/fɛʃ/	voicing	.99	g08	f	.64
		a13	/vɛʃ/	/fɛʃ/	voicing	.67	g09	ɛ	.38
		a21	/fɪʃ/	/fɛʃ/	vowel	.94	g10	ʃ	.62
4	brush /brʌʃ/	a06	/bɪɪs/	/bɪɪʃ/	place in coda	.99	g11	b	.63
		a14	/bɪɪs/	/bɪɪθ/	place in coda	.85	g12	ɪ	.27
		a22	/bɪɪʃ/	/bɪɪʃ/	place in coda	.96	g13	ɪ	.39
							g14	ʃ	.63
5	glove /glʌv/	a08	/gleɪb/	/gleɪb/	manner	.95	g15	g	.64
		a16	/gleɪb/	/gleɪv/	manner	.43	g16	l	.55
		a24	/gleɪv/	/gleɪv/	manner	.92	g17	ɛ	.29
							g18	v	.47
6	sponge /spʌndʒ/	a07	/spændʒ/	/spændz/	place in coda	.76	e01	s	.96
		a15	/spændʒ/	/spændʒ/	place in coda	.97	e02	p	.98
		a23	/spændʒ/	/spænʒ/	place in coda	.38	e03	ʌ	.80
							e04	n	.98
							e05	dʒ	.83
7	train /treɪn/	a04	/tɔɪn/	/tɔɪn/	cluster reduction	.84	e66	t	.98
		a12	/tɔɪn/	/ɔɪn/	cluster reduction	.98	e67	ɪ	.86
		a20	/tɔɪn/	/tɔɪn/	cluster reduction	.99	e68	eɪ	.82
							e69	n	.86

In addition, /spændʒ/ was derived from *sponge*, and /tɹɔɪn/ was derived from *train*. In the Non-word Perception Test (a), the test items were designed based on observing the following features: cluster reduction in /pləʊt/ and /tɹɔɪn/, place in both onset and coda, and vowel in /vɪn/, voicing and vowel in /fɛʃ/, place in coda in /bɪŋ/ and /spændʒ/, manner in /glɛb/. In order to collate perception with production variables, the result of each item is described first.

/pləʊt/ is derived from *plate* in which cluster reduction in onset position was observed in perception test. The reduction of the second consonant (Item 09) had a better score than the reduction of the first consonant (Item 17). In production, IF scores of all the segments in /pləʊt/ ranged between .43 and .61. The second consonant /l/ of the cluster had the lowest IF. It was observed by Judge A that some participants produced [ɹ] instead of [l]. It was presumed that it was more difficult for Japanese children to change both in manner and place from stop or bilabial to lateral or alveolar in the cluster [pl]. As [l] and [ɹ] are liquid sounds, it was likely that Japanese children assimilated the two segments and articulated /ɹ/. The researcher herself frequently comes across Japanese children in EFL classrooms who are likely to pronounce [ɹaɪk] instead of [laɪk] in “what do you like?” The cause is assumed to be that both the manner of [j] precedent to “like” is the same manner *approximant* as [ɹ] but [l] is *lateral approximant* so it is likely easier for Japanese learners to produce [ɹ] than [l]. It was an interesting contrastive phenomenon that while the first consonant deletion was lower in perception, the second consonant deletion was more problematic in production.

/vɪn/ was derived from *van* and was tested in both onset position and coda position, and in the vowel change in perception test. It was noteworthy that this non-word had three different points to observe. First, in perception test, nasal sounds in coda position seemed difficult for Japanese children to discriminate as seen in the IF

value of .65. On the contrary, the discrimination of place changes between two fricatives on the onset /z/ and /v/ turned out to have a high achievement rate as seen in the IF value of .97. Second, production was likely more difficult than perception although evaluation method was different from each other. The production of onset consonant /v/ and vowel /ɪ/ seemed to be especially difficult. Judge A rated that 86 participants pronounced [b] instead of [v] on the onset. The place change from labiodental to bilabial and the manner change from fricative to stop on the onset was predicted due to the lack of the phoneme /v/ in Japanese. Third, while the discrimination of the two vowels, /ɪ/ and /ε/ also had high IF values of .95, production achievement was much lower ranging between .34 and .65. Surprisingly, 29 out of 104 participants were evaluated as wrong. Judge A rated that many participants who were evaluated as wrong pronounced [e] or similar sounds instead of [ɪ]. Conversely to the result of discrimination between /ɪ/ and /ε/, the production of [ɪ] was .48. Both vowels /ɪ/ and /ε/ are unrounded and lax, and the only difference between them is the height of tongue position: /ɪ/ is high and /ε/ is middle. It can be assumed therefore that this caused the error of pronunciation, even though the participants were watching the Model's mouth movement during the repetition test. This phenomenon will be corroborated with acoustical observation later in this section along with the vowel of /feɪ/.

/feɪ/ was derived from *fish* in which voicing on the onset position, /vɛʃ/ - /fɛʃ/ and vowel change /ɪʃ/ - /εʃ/ were tested in the Non-word Perception Test (a). Although the same pattern /fɛʃ/ - /fɛʃ/ in voicing gained almost perfect correctness, discrimination between /v/ and /f/ dropped to .67 in IF value. Regarding the vowel, while the discrimination between the vowels /ɪ/ and /ε/ were .94 in IF value, the production of /ε/ dropped to .38 in IF value. This is the same phenomenon as the discrimination between /vɪn/ and /vɛn/. According to Judge A, 80 participants pronounced [ʌ]

or [a] instead of [ɪ]. In addition, 14 participants pronounced this non-word like a real word [fɪʃ]. It is probable that they associated this non-word with real word meaning. These errors in producing the vowels in the case of /vɪ/ and /fɛʃ/ will be elaborated by way of acoustical observation of vowel quality in the following section.

/brɪʃ/ was derived from *brush*. This consonant in coda position was also observed in the Non-word Perception Test (a). The distinction between /s/ and /θ/, and, /s/ and /ʃ/ were observed. While the distinction between /s/ and /ʃ/ was made with .99 in IF value, the comparison of /s/ and /θ/ was slightly lower at .85. It is to be expected that it should be more difficult for Japanese learners of English to distinguish /θ/ which is substituted as /su/ (ス) from /s/ than to distinguish /ʃ/ which sounds like /ɕu/ (シユ) in Japanese from /s/. In production, the IF value of coda /ʃ/ was .63. Thus, even though it was possible for the participants to distinguish the target consonant from the substitutive sounds, producing the single target sound was not easy. Both judges reported, however, that deletion of the second consonant in the cluster was frequently observed. According to Judge A, the number of the second consonant deletion was 39 while the number of the first consonant deletion was two. It should also be noted that production of the vowel /ɪ/ was also relatively low in IF value, which was .39. The difficulty in producing the vowels will be more discussed later in this section.

/glɛv/ was derived from *glove* in which manner in the coda position was observed in the Non-word Perception Test (a). IF value for the distinction between /b/ and /v/ (Item a16) was .43, which seemed much more difficult than detection of the same words patterns (Item 08 and Item 24). IF value for producing the coda /v/ was .47, which was also relatively low. This non-word was likely associated with the meaning of the real word from which it was derived. It was interesting to note that the total number of the participants who pronounced [glɔv], [glɔb], or the sounds similar to /guɔrɔbu/

(グローブ) in Japanese was 44. The two judges assumed that this was attributed to the word familiarity of the real word. Thus, the production of the vowel /ε/ was very low with the IF value being .29.

These five one-syllable non-words were compared with the one-syllable real words *sponge* and *train* on production level in Table 26. In the Non-word Perception Test (a), /spændʒ/ was derived from *sponge* in order to observe the distinction of place of consonants in coda position among /dʒ/, /dz/, and /ʒ/, and /trɒm/ was derived from *train* in order to observe cluster reduction. The auditory distinction between /dʒ/ and /dz/ (Item a07) was .76, the same word pattern /dʒ/ (Item a15) was .97, and the distinction between /dʒ/ and /ʒ/ was .38 in IF values. Thus, the distinction between /dʒ/ and /ʒ/ was much more difficult than the distinction between /dʒ/ and /dz/ in auditory discrimination. This is understandable since the distinction between /dʒ/ substituted as /ʒ/ (ジ) in Japanese and /dz/ as /zu/ (ヅ) in Japanese is easier than the distinction between /dʒ/ and /ʒ/, both of which are hard to discriminate for Japanese learners of English. On the other hand, the production of /dʒ/ was relatively high; .83 as rated by Judge A. This is because consonant /dʒ/ is similar to /ʒ/ (ジ) in Japanese so that Judge A's perception of merely one single sound might have been rather permissive in rating the participants' production as correct. A similar thing might have occurred in the Real Word Repetition Test (e) and the Word-in-Sentence test (f). This is because one single segment produced by the participants was permissibly rated as correct rather than auditory discrimination between comparing pairs of segments, such as /f, h/, /b, v/, and /s, θ, ʃ/ that were tested in the Non-word Perception Test (a), the Open Oddity Test (c), and the End Oddity Test (d).

Train was observed in the Real Word Repetition Test (e) and the Word-in-Sentence Repetition Test (f). /trɒm/ which was derived from it was employed

in the Non-word Perception Test (a) in order to observe consonant reduction in the onset clusters. Although auditory discrimination between consonant clusters and the reduction of the second consonant /ɹ/, /tɹɔm/ - /tɔm/, was .84, which is lower than the discrimination between the clusters and the reduction of the first consonant, /tɹɔm/ - /ɹɔm/, which was .98. The IF values of both items were relatively high. Regarding IF values in the Real Word Repetition Test (e), the second consonant /ɹ/ was .86. This was also relatively high. Most of errors were a reduction of /ɹ/ and a vowel epenthesis was observed by both judges between the clusters. It is assumed that this phenomenon was attributed to L1 transfer. This will be discussed further subsequently. These two one-syllable real words contrastively have higher IF values than non-word production.

It was found overall that the participants were generally better in perceiving English phonemes than in producing them, except in the case of discriminating the comparing phonemes if one of them did not exist in the Japanese inventory.

1.4.4 Comparison of vowels and consonants

The quantitative results overall showed that the participants were better at both perceiving and producing consonants than vowels except for some comparing pairs, such as /f/ and /h/, /s/ and /θ/, and /b/ and /v/. In the Lexical Discrimination Test (b), while perception of consonants was better overall than perception of vowels, both perception and production of nucleus vowels seemed difficult for Japanese children. The results of the Open Oddity Test (c) and the End Oddity Test (d) indicated that discrimination of onset/coda consonants was influenced by the successive/precedent vowels. Furthermore, the results of three production tests (the Real Word Repetition, the Word-in-Sentence Repetition, and the Non-word Repetition) clarified that production of vowels was more difficult than that of consonants. This result is supported by

Allen-Tamai's finding (2009) that Japanese children are influenced by Japanese morae in perceiving English phonemes.

There were more vowels that seemed to be more difficult for the participants to both perceive and produce than consonants. In the Real Word Repetition Test (e), the vowels /æ/ in *hamburger*, schwa /ə/ in *hamburger*, *computer*, and *flower*, /ɪ/ in *toilet*, and a diphthong /aʊ/ were ranked in the low IF group. Four consonants /r/ ranked in the low IF group were the postvocalic approximants to the schwa /ə/. The combination of /ə/ and /r/ is actually represented as /ər/ (See p. 60), which does not exist in Japanese. In Word-in-Sentence Repetition Test (f), the same vowels occupied the low IF group as Real Word Repetition Tests (e), and in addition, /ʌ/ in *sponge*, /æ/ in *sandwich* and *kangaroo*, schwa /ə/ in *kitchen*, and three liquid /ɹ/ were ranked in the low IF group. In production with Non-word Repetition Test (g), /ɛ/ in /fɛʃ/, /pɛ.ɹəʃɪt/, and /glev/, /æ/ in /æɹɪfɒnt/, /ɔ/ in /slɒpə/, /ɪ/ in /pɪdʒɒmɪz/, /eɪ/ in /speɪdɪ/, and /ə/ in /slɒpə/ were the vowels ranked in the low IF group. In these three production tests, vowels occupied the majority of the items in the low IF group. These results indicate that whether or not the observed words were real or non-real, producing vowels was difficult for the Japanese participants. Conversely, the upper IF segments were consonants both with and without lexical representation. Thus, consonants were easier for the participants to produce than vowels. This result should be taken into consideration in designing explicit instruction of English phonemes.

1.4.5 Vowel quality

A question to be considered here is the degree of difficulty in producing vowels for the participants. As mentioned in the collation of perception and production of non-words in Table 26, errors of vowels /vɪn/ and /fɛʃ/ were auditorily evaluated by

Judge A. Also the vowel quality of the two non-words was analyzed acoustically. These two non-words were chosen among five one-syllable non-words for acoustical analysis in a point of the same CVC structure. As described in the Literature Review, the vowel quality is decided by formant frequencies, particularly Formant 1 (F1) and Formant 2 (F2) which represent the tongue position of the speaker. The researcher thought it important to employ an acoustical analysis to measure F1 and F2 for the purpose of corroborating the findings in the auditory assessments of the observed vowels by the two raters. The raters' judgments were compared partly with the acoustic analysis on the Wavesurfer software ver.1.8.8, using *linear predictive coding analysis* (LPC analysis hereafter) in order to determine the location of the formant frequencies. In the LPC analysis, the mean of an interval of 50 milliseconds of each peak of the two formants was measured (Huber, Stathopoulos, Curione, Ash, & Johnson, 1999). Since the Model was a male adult native speaker of English, it is understandable that the values of F1 and F2 that he produced were relatively lower than the values produced by the participant children as Peterson and Barney (1952) and Hillenbrand, Getty, Clark, and Wheeler (1995) indicated. In addition, due to the noise at the recording site, it was impossible to analyze acoustically all of the participants' vowel production.

For the acoustical analysis of vowel quality, nine normally developing L1 English children participated in data collection as a reference group (NS group hereafter) and pronounced the same non-words. These children live in the mid-eastern part of U.S. and are aged between 5 and 8 years old. Their mean age was 7 years and 6 months old. The purpose of the data collection was explained to all the parents of the participants. None of the parents disapproved of their children participating in this study. None of the NS children reported a hearing problem. In addition, the average score of F1 and F2 values of 46 ten- to 12-year-old L1 English children in Hillenbrand *et al.*'s study (1995) was

also compared with the Japanese participants. The researcher presumed that their vowel quality might also have variance in F1 and F2 values, as the nine children in NS group were still in the developmental stage of L1 consonants⁷ (Sander, 1972; Templin, 1957).

In order to compare the same number of the participants with L1 children, the participants who gained high IF values in the perception tests and whose substantial acoustical level had good quality enough to analyze were extracted. The descriptive analysis is shown in Table 27.

Table 27

Descriptive Analysis of Formant Frequencies of Vowel in [vin] (Hz) Produced by High IF Participants, NS Group, and the L1 Children in Hillenbrand et al.'s Study (1995).

Formants	/vin/	N	M	SD
F1	Japanese correct	8	550	100
	Japanese wrong	8	592	222
	NS	8	573	82
	Hillenbrand (1995)	46	511	—
F2	Japanese correct	8	2040	182
	Japanese wrong	8	1819	537
	NS	8	2383	152
	Hillenbrand (1995)	46	2552	—

Note. SD of NS in Hillenbrand et al. (1995) was not stated in their study.

⁷. According to Dodd, Holm, Hua, and Crosbie's investigation (2003), 97.4% of normally developing L1 English children aged between 3;0 and 3;11 have acquired English vowels. According to Pollock (2002), and Pollock and Berni (2003), 93.9% of L1 American English children aged between 2;06 and 2;11 have acquired English vowels with the exception of rhotic sounds.

In this acoustical analysis of vowel quality, the sound level of one NS participant's production of [vin] was not good enough to analyze acoustically, so eight participants were extracted for each group in reference to IF scores. The eight participants evaluated as correct were considered the correct group and the eight participants evaluated as wrong by Judge A in the Non-word Repetition Test (g) were considered the wrong group in order to compare with a group of NS children.

Regarding F1 values in [vin], they were dispersed between 511 Hz and 592 Hz. The mean value of Hillenbrand's study (1995) was the lowest (511 Hz), the Japanese correct group was the second lowest (550 Hz), NS group was the second highest (573 Hz), and the F1 values of Japanese wrong group (592 Hz) was the highest. Regarding the mean value of F2, they were dispersed between 1819 Hz and 2552 Hz. The Japanese wrong group gained the lowest mean value (1819 Hz), the Japanese correct group was the second lowest (2040 Hz), Hillenbrand's study was the second highest (2552 Hz), and NS group had the highest F2 mean value (2383 Hz). Both the *SD* values of F1 and F2 values produced by the Japanese wrong group were dispersed while those of NS and the Japanese correct groups were clustered.

Figure 7 shows a scatter diagram of the formant frequencies (F1 and F2) produced by the four groups: the Japanese correct group as 1, the Japanese wrong group as 2, NS group as 3, and mean values of Hillenbrand's study (1995) as 4. The vertical axis shows the F1, and the horizontal axis shows the F2. It should be noted that the extent of the variance in F1 and F2 values is different from each other as described in the Literature Review, the extent of the variance was observed between the groups and within the groups for each F1 and F2 in the scatter diagram. Figure 7 shows that while the values of NS group and the mean value of Hillenbrand form a cluster, and the values in the Japanese correct group are rather closer to the NS cluster except for one value

than the values in the Japanese wrong group.

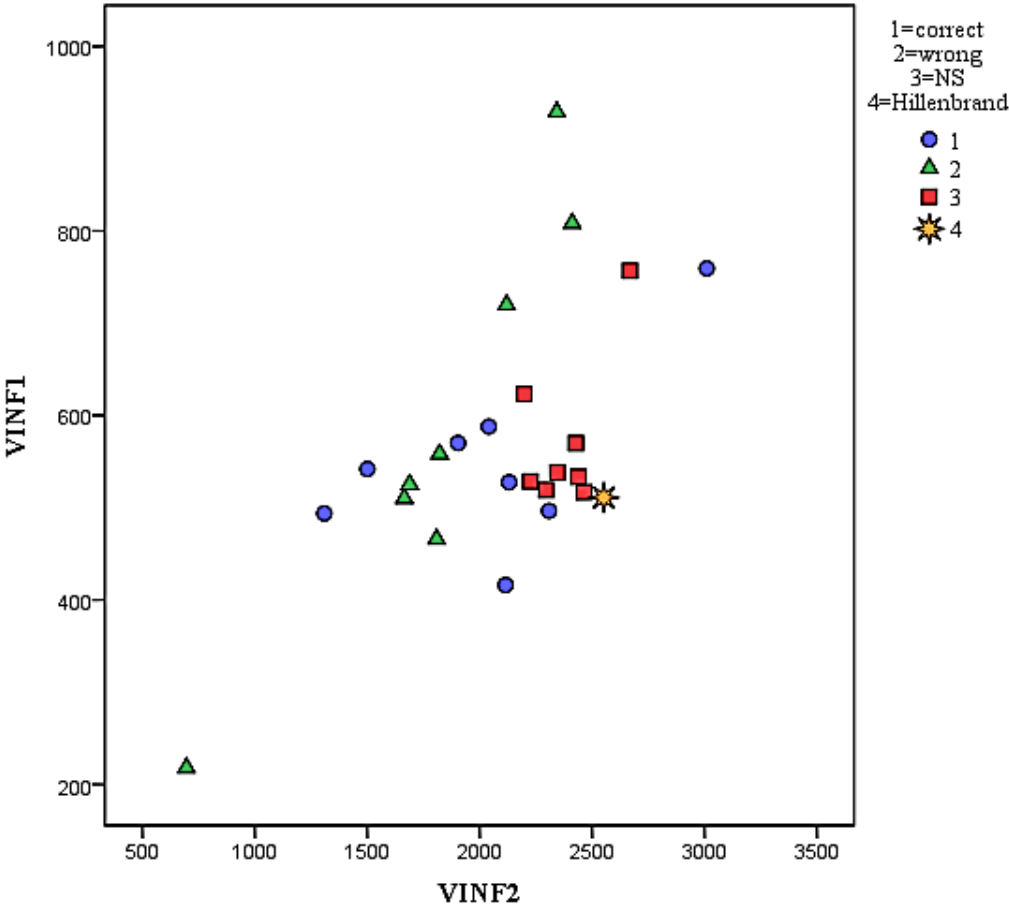


Figure 7. Vowel quality (F1 and F2) in [vin] produced by the four groups.

In case of [fɛʃ], the sound level of all the nine NS participant's production was good enough to analyze acoustically. So the nine participants evaluated as correct for the vowel quality of [fɛʃ] and the nine participants evaluated as wrong were extracted from the participants who gained high IF values in the perception tests and whose substantial acoustical level had good quality enough to analyze. Table 28 shows the descriptive analysis of formant frequencies of the vowel in [fɛʃ] produced by high IF participants, NS group, and the L1 children in Hillenbrand's study.

Table 28

Descriptive Analysis of Formant Frequencies of Vowel in [fɛʃ] (Hz) Produced by High IF Participants, NS Group, and the L1 Children in Hillenbrand et al.'s Study (1995).

Formants	/fɛʃ/	N	M	SD
F1	Japanese correct	9	929	377
	Japanese wrong	9	950	362
	NS	9	833	241
	Hillenbrand (1995)	46	749	—
F2	Japanese correct	9	2239	446
	Japanese wrong	9	1940	444
	NS	9	2002	429
	Hillenbrand (1995)	46	2267	—

Note. SD of NS in Hillenbrand et al. (1995) was not stated in their study.

Regarding the F1 value in [fɛʃ], they were dispersed between 749 Hz and 950 Hz. The mean value of Hillenbrand's study (749 Hz) was the lowest, NS group (833 Hz) was the second lowest, the Japanese correct group (929 Hz) was the second highest, and the Japanese wrong group gained the highest value in F1. Regarding the values of F2, they were dispersed between 1940 Hz and 2267 Hz. The mean value of the Japanese

wrong group (1940 Hz) had the lowest mean value, NS group (2002 Hz) was the second lowest, Japanese correct group (2139 Hz) was the second highest, and Hillenbrand's study (2267 Hz) gained the highest. In this vowel quality, there was not a great difference of the *SD* values of both formant frequencies between the groups.

Figure 8 shows the formant frequencies produced by the four groups: the Japanese correct group as 1, the Japanese wrong group as 2, NS group as 3, and mean values of Hillenbrand's study (1995) as 4. As indicated in Table 28, there is not a great difference in the variance in *SD* of both F1 and F2 between the groups, and the values of each group were more dispersed than the values that the four groups produced in [vɪn]. Thus, it is difficult to affirm the decisive difference among the groups.

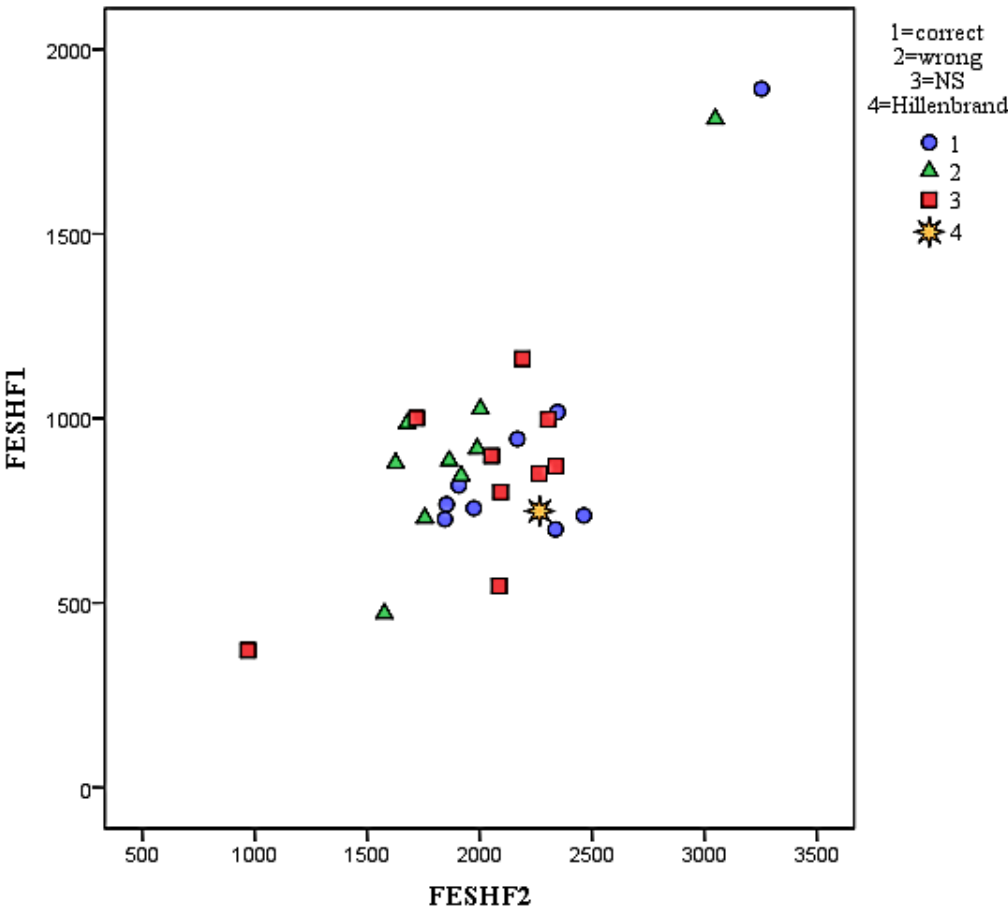


Figure 8. Vowel quality (F1 and F2) in [feɪ] produced by the four groups.

The participants' vowel quality in [vɪn] and [fɛʃ] were collated with the participants' learning experience of English after school in each group. Table 29 shows the participants' perception IF values and the learning experience of English among the two Japanese groups in [vɪn]. Table 30 shows the participants' perception IF values and the learning experience of English among the two Japanese groups in [fɛʃ].

As for the result of the vowel quality in [vɪn], while seven participants in the correct group had learning experience of English after school, only one participant in the wrong group did. The mean IF value of the correct group was higher than that of the wrong group. Regarding the result of [fɛʃ], the collation of the participants' IF values in perception tests and their learning experience of English was quite different from the collation in [vɪn]. In Table 30, the number of the participants who had learning experience of English after school was seven in the correct group and six in the wrong group. The mean perception IF values are the same .89 between the groups. It is interesting to notice that there were only three participants (ID 14, 45, and 85) who were evaluated as correct both in [vɪn] and [fɛʃ] among the participants with English learning experience. On the other hand, ID 33 and ID 69, who were returnees from L1 English countries, were evaluated as correct in [vɪn] but evaluated as wrong in [fɛʃ]. Their IF values in perception tests were over .90. This indicates with the fact of dispersion of F1 and F2 values in [fɛʃ] among the Japanese participants and NS participants that the articulation of [ɛ] may be difficult even for children who can pronounce English sounds relatively well.

Table 29

Comparison of Mean High IF Values in the Perception Tests Between the Correct and Wrong Japanese Groups in [vin]

<u>Correct group</u>			<u>Wrong group</u>		
ID No.	Percep- tion IF	✓ English after school	ID No.	Percep- tion IF	✓ English after school
33	.96	✓	21	.93	
72	.92	✓	31	.89	
85	.92	✓	49	.87	✓
69	.92	✓	100	.86	
45	.91	✓	37	.86	
12	.91	✓	17	.85	
40	.90		34	.83	
14	.89	✓	62	.81	
Mean	.92		Mean	.86	

Table 30

Comparison of Mean High IF Values in the Perception Tests Between the Correct and Wrong Japanese Groups in [fɛʃ]

<u>Correct</u>			<u>Wrong</u>		
ID No.	Percep- tion IF	English after school	ID No.	Percep- tion IF	English after school
21	.93		33	.96	✓
85	.92	✓	56	.92	✓
20	.91		10	.92	✓
45	.91	✓	69	.92	✓
88	.89	✓	40	.90	
35	.89	✓	31	.89	
14	.89	✓	43	.88	
6	.88	✓	60	.81	✓
53	.87	✓	48	.78	✓
Mean	.89		Mean	.89	

1.4.6 The relationship between perceptive and productive ability

In order to examine RQ5: How are their receptive and productive abilities of English sounds related?, correlational analyses and the structure equation modeling were conducted.

Table 31 shows descriptive statistics of the participants. The number of the participants, the minimum and the maximum score of each test, the mean, standard deviation, skewness, and kurtosis are shown in the table. The mean value is represented to one decimal place. The standard deviation (*SD*), skewness, and kurtosis are shown to two decimal places. Three participants were not able to take the Lexical Discrimination Test (b), and one participant was not able to take the Non-word Perception Test (a). Two participants who took the Word-in-Sentence Test (f) were deleted from the analysis due to the partial lack of the recorded data. Concerning that the Lexical Discrimination Test (b) which was conducted one year after the other tests had been administered as described in the previous section, the following statistical analyses were conducted.

Table 31

Descriptive Statistics of the Seven Tests

	<i>N</i>	Min.	Max.	<i>M</i>	<i>SD</i>	<i>Skewness</i>	<i>Kurtosis</i>
(a) Non-word Perception	103	15	23	20.0	1.94	-.58	-.26
(b) Lexical Discrimination	101	9	25	20.2	2.50	-1.59	5.50
(c) Open Oddity	104	8	23	18.2	3.39	-1.19	1.18
(d) End Oddity	104	7	24	18.6	3.48	-1.12	1.33
(e) Real Word Repetition	104	36	82	67.3	6.90	-.79	2.94
(f) Word-in-Sentence	102	27	82	59.5	9.07	-.59	1.59
(g) Non-word Repetition	104	51	73	62.9	4.48	-.19	-.142

Pearson's Correlation Coefficient was calculated for all the variables except the Lexical Discrimination Test (b). Since the researcher had been conducting English sound instruction 11 times (495 minutes) to the participants who became grade 6 in the new academic year 2015, it was surmised that the participants might have been improving their perceptive and productive abilities to some extent. Table 32 shows the result of the correlation analysis.

Table 32

Correlation among the Six Variables

	(a)	(c)	(d)	(e)	(f)	(g)
Non-word Perception (a)	1					
Open Oddity (c)	.27**	1				
End Oddity (d)	.31**	.53**	1			
Real Word Repetition (e)	.24*	.40**	.35**	1		
Word-in-Sentence (f)	.13	.47**	.37**	.49**	1	
Non-word Repetition (g)	.17	.32**	.25*	.45**	.56**	1

Note. * $p < .05$, ** $p < .01$.

There was a statistical significance between the variables except between the Non-word Perception (a) and the Word-in-Sentence Repetition (f), and between the Non-word Perception (a) and the Non-word Repetition (g). The correlation value index was regarded; $.84 < |r| < 1.0$ as strongly correlated, $.63 < |r| < .84$ as moderately correlated, $.45 < |r| < .63$ as weakly, and $0 < |r| < .45$ as almost uncorrelated.

Although the result of Pearson's Correlation Coefficient shows statistically significant correlations between the variables, most of r values were weak according to the strength of the correlation coefficients (r) index. There were weak correlations

between the Open Oddity (c) and the End Oddity (d) ($r = .53$), between the Open Oddity (c) and the Word-in-Sentence Repetition (f) ($r = .47$), between the Real Word Repetition (e) and the Word-in-Sentence Repetition (f) ($r = .49$), between the Real Word Repetition (e) and the Non-word Repetition (g) ($r = .45$), and between the Word-in-Sentence Repetition (f) and the Non-word Repetition (g) ($r = .56$).

Furthermore, while production variables were weakly correlated with each other, perception variables were hardly correlated within the perception variables except between the Open Oddity (c) and the End Oddity (d). Regarding the relationship between the perception variables and the production variables, there was a weak correlation between the Open Oddity (c) and the Word-in-Sentence Repetition (f). In addition, it was surprising that there was no correlation between the Non-word Perception (a) and the Non-word Repetition (g).

Next, a Multiple Regression Analysis was conducted to examine the relationship between the Lexical Discrimination Test (b) and the other six variables. Since the Lexical Discrimination Test (b) was conducted one year after the other six tests, this analysis shows that the Lexical Discrimination (b) as a dependent variable was predicted by the other variables. Table 33 summarizes the descriptive statistics and analysis results. The mean and *SD* of all the tests are shown in Table 31. The correlation coefficient shows that, the dependent variable (the Lexical Discrimination) is correlated more significantly with production variables than perception variables although the correlation between the dependent variable and production variables is weak.

Table 33

The Result of the Multiple Regression Analysis

	Variables	Correlation with (b)	<u>Multiple regression weights</u>			
			<i>b</i>	<i>SEB</i>	β	<i>p</i>
Dependent	Lexical Discrimination (b)		3.127	3.699		.400
Independent	1. Non-word Perception (a)	.202*	.130	.115	.107	.263
	2. Open Oddity (c)	.212*	-.047	.087	-.061	.590
	3. End Oddity (d)	.194	-.017	.077	-.024	.828
	4. Real Word Repetition (e)	.392**	.074	.041	.195	.073
	5. Word-in-Sentence (f)	.397**	.064	.027	.260	.019
	6. Non-word Repetition (g)	.370**	.116	.057	.204	.045

Note. * $p < .05$, ** $p < .01$.

The Multiple Regression Model with all six predictors produced $R^2 = .259$, $F(6, 94) = 5.484$, $p < .001$. As can be seen in Table 33, the Word-in-Sentence Repetition (f) and Non-word Repetition (g) had significant positive regression weights, indicating that the participants with higher scores on these tests were predicted to have higher scores on the Lexical Discrimination Test (b), after controlling for the other variables. It is interesting that the productive ability of the Non-word Repetition (g) presumably predicts the participants' auditory discriminative ability, that is the ability of discriminating the real word from the similar sounds.

Next, Structural Equation Modeling (SEM hereafter) was conducted. This analysis is a combination of factor analysis and regression or path analysis. It uses various types of models to describe relationships among the observed variables, with the same type of quantitative tests using a theoretical models hypothesized by the researcher (Hox & Bechger, 1998; Schumacker & Lomax, 2010). The hypothesis that perceptive ability affects productive ability was tested with the computer program AMOS 23.0

(IBM, 2014). The method of estimation used was maximum likelihood (ML). The model is shown in Figure 9. All the variables except Level E (the Lexical Discrimination Test b) were used in the analysis.

The labels of the variables in this analysis were: Level B stands for the Non-word Perception (a), Level F (O) stands for the Open Oddity (c), Level F (E) stands for the End Oddity (d), Level I (W) stands for the Real Word Repetition (e), Level I (S) the Word-in-Sentence Repetition (f), and Level J stands for the Non-word Repetition (g). Factor loadings of individual tasks on their respective constructs are indicated on the right upper side of each box. The scores of Level B task that represents the Non-word Discrimination (b), for instance, has the lowest loading (.14) on perception while that of Level F that represents the Open Oddity (c) has the highest loading (.61), and another Level F that represents the End Oddity (d) has a lower loading (.46). The ability to produce English segments on Level J, that is the Non-word Repetition (g) task, was the lowest loading (.33) on the production while the two tasks on Level I that are the Real Word Repetition (e) on the left (W) and the Word-in-Sentence Repetition (g) on the right (S) have higher loadings in about the same values than Level J which are .51 and .49 respectively.

The standardized regression coefficient was .75 from perceptive ability to productive ability. This model explains 56% of the variance in the productive ability construct, as indicated on the upper right side of the construct oval in Figure 9.

The goodness of fit of the estimated model was assessed using four indices: χ^2 with degrees of freedom and p value, the minimum discrepancy divided by its degree of freedom (CMI/DF), the comparative fit index (CFI), the root mean square error of approximation (RMSEA). The model has a χ^2 value of 4.532 with 8 degrees of freedom ($p = .806$). The comparative fit index was 1.00, and RMSEA was .000. Thus, the data

adequately fitted the proposed model. Therefore, the hypothesis that perceptive ability affects productive ability was supported.

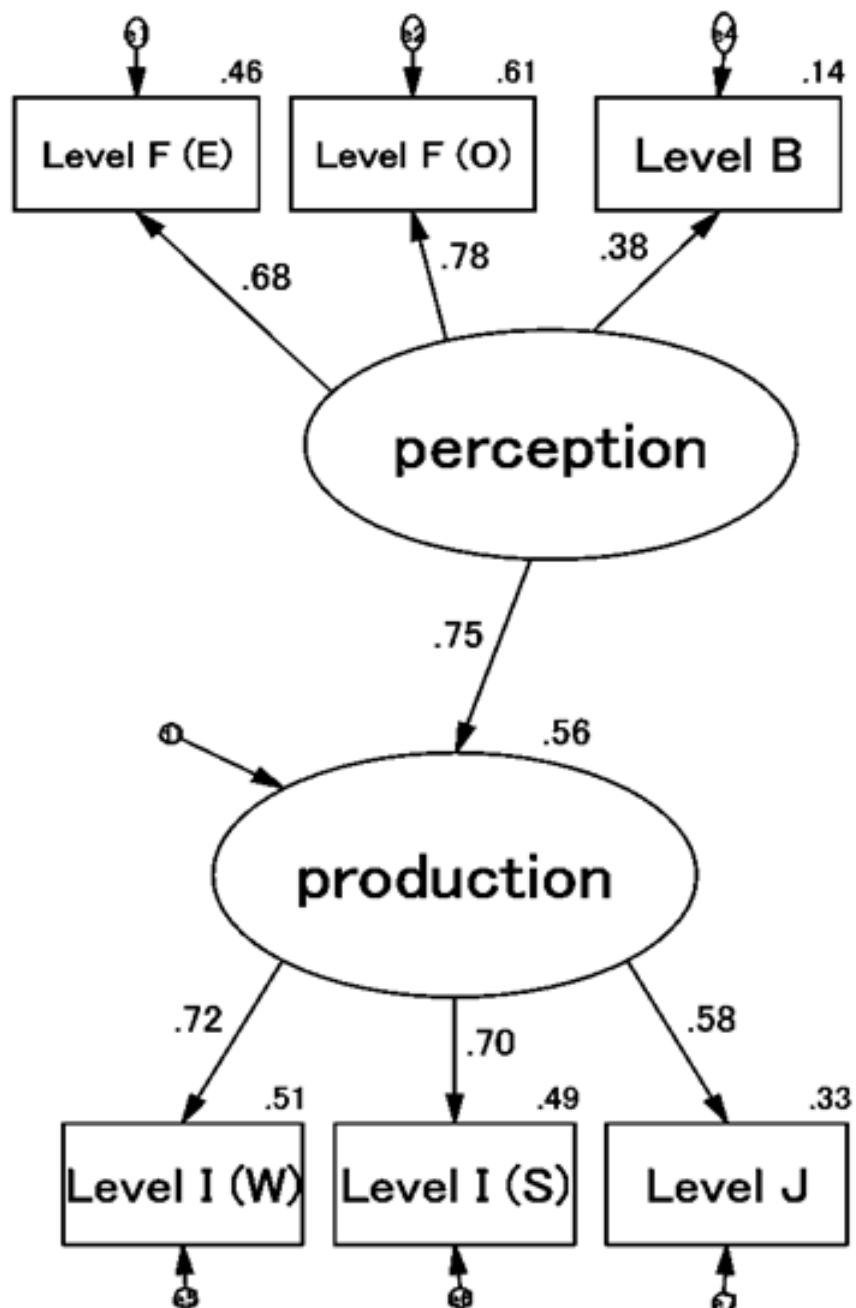


Figure 9. SEM analysis for L2 older children's perception and production of English phonemes.

The results of the tests described above can be summarized as follows:

1. Auditory perceptive ability and oral productive ability of the consonants were higher in IF values than those of vowels.
2. Auditory lexical discrimination was influenced by L1 knowledge of loanwords.
3. Both perception and production of nucleus vowels were difficult for the Japanese children.
4. Discrimination of onset/coda consonants was influenced by the successive/precedent vowels.
5. While the similar sounds were hard to distinguish, production of the phoneme independently was possible.
6. Production of phonemes was influenced by pronunciation of loanwords.
7. Auditory distinction of the consonants paired with similar sounds in coda position was more difficult than the distinction in onset position.
8. Productive ability may promote perceptive ability of vocabulary.

These results will be discussed in the next section.

1.5 Discussion and conclusion

In the previous section, quantitative results were presented. In order to address RQ (1): Can Japanese EFL children perceive English sounds accurately?, and RQ (2): What affects their understanding of English sounds?, four auditory tests were conducted. The results overall revealed that the Japanese participants were better at perceiving consonants than vowels except for the consonants paired with similar sounds, and discrimination of onset/coda consonants was influenced by the successive/precedent

vowels. Regarding auditory distinction of the similar sounds of consonants, coda position was more difficult for the participants than onset position. For example, the distinction between /b/ and /v/, /m/ and /n/, /dʒ/ and /ʒ/, and between /s/ and /θ/.

In order to answer RQ (3): Can they produce English sounds accurately?, and RQ (4): What affects their production of English sounds?, three oral production tests were conducted. The results showed that producing vowels was more difficult for the participants than producing consonants. Contrary to the results for the perception tests, the participants were able to produce the contrastive phonemes independently. The results from perception and production tests led to the finding that perception and production of vowels were more difficult than that of consonants.

In order to address RQ (5): How are their receptive and productive ability of English sounds related?, Pearson Correlation Analysis was conducted first. While the three tests to measure productive skills were moderately correlated with each other, the two tests to measure their reception knowledge on the same level (Level F) correlated highly with each other. One receptive test on Level F had a weak correlation with one productive test on Level I. Second, the Multiple Regression Analysis was conducted to observe whether the post-test on Level E had any relationship with the six tests. The result showed that the two productive tests were expected to have higher scores on the post-test. Third, Structural Equation Modeling was conducted. The data fitted the model showing that perceptive ability affects productive ability.

In this section, first of all, one interesting finding from the analysis is reported. This relates to the participants' loan word knowledge which might have triggered L1 transfer in the production tests. While rating the participants' speech based on the articulatory accuracy of a single phoneme on a binary scale (correct or wrong = 1/0), vowel epenthesis was frequently observed among the participants.

Table 34

Vowel Epenthesis Observation in Production Tests

Tests		N of vowel epenthesis
Real Word Repetition (e)	Judge A	139
	Judge B	183
Word-in-Sentence (f)	Judge A	620
	Judge B	377

Table 34 shows the number of vowel epenthesis that Judge A and Judge B observed in the Real Word Repetition Test (e) and the Word-in-Sentence Repetition Test (f). Both judges reported that vowel epenthesis in the Non-word Repetition Test (g) was scarcely observed. The vowel epenthesis was frequently observed between the consonant clusters, such as *flower*, and *train*. The highest number of vowel epenthesis occurred between /d/ and /w/ in *sandwich*. These English words were familiar to the participants as loan words. It was presumed that since *sandwich* is written as /saNdoiQcçi/⁸ (サンドイッチ) in Japanese, the pronunciation of the loan word had influenced the participants' pronunciation even though they attempted to repeat after the Model's pronunciation in which /d/ was pronounced really weakly. Vowel epenthesis was also observed in the final syllable of *hospital*. This phenomenon occurred presumably because of the influence of Japanese pronunciation of loan words as well. This word is not a high familiar word for Japanese children. Instead, this case was possibly influenced by Japanese orthography as represented in katakana form. Even if the participants were not familiar with this word, they might have seen it in written form in Japanese representation /hosuipitaru/ (ホスピタル) before they learned the English

⁸. N represents a Japanese moraic nasal, Q as a geminate consonant (T. Vance, 2008).

pronunciation /haspɪtɫ/ in which the vowel in the final syllable is not pronounced. Thus, it can be surmised that some of the participants who knew the orthographic representation in Japanese katakana might have been influenced by their lexical knowledge in L1 rather than by imitating the Model's pronunciation.

It was also interesting that the participants put more vowels in the Word-in-Sentence Test (f) than in the Real Word Repetition Test (e). For example, regarding one-syllable word *leaf*, while the number of the participants who added [ʊ] or [ɪ] after the coda consonant [f] was 0, the number of adding these vowels after [f] increased to 21 on the sentence level. Regarding the one-syllable word *sponge*, while the total number of the participants who added [ʊ] or [ɪ] between the onset clusters and [ɪ] after the coda consonant was 12 in the Real Word Repetition Test (e), the number increased to 117 on sentence level according to the observation of Judge A. These two words were positioned as a subject in a sentence: “The leaf is green and yellow,” which has seven syllables, and “The sponge is soft,” which has four syllables. This phenomenon may have contributed to the participants' burden of memory load and the open syllabic feature of Japanese both of which might have provoked the stretching coda sound of the sentence. Furthermore, it is assumed that the repetition of L2 sounds on the sentence level required the participants to have adequate sound production skills which should be more complicated than the repetition on word level. This means that the sentence level concerns not only segmental but also suprasegmental skills, which is difficult for the participants at the novice level. As a result, this possibly caused the higher the number of vowel epenthesis in sentence level than in word level. The difference of the number of vowel counting between Judge A and Judge B was probably due to the experience of evaluation of vowel epenthesis. Judge B was not accustomed to this judgment although Judge A had trained her.

Concerning the participants' L1 transfer, it might have also caused difficulty in auditory discrimination between long vowel and short vowel, such as the case of /ɪ/ and /i/. While English long vowels and short vowels have different distinctive features, Japanese long vowels are the prolonged sounds of short vowels. In addition, the Japanese participants might have perceived a diphthong as two morae in the Open Oddity (c) and the End Oddity (d) tests. This result is supported by Allen-Tamai (2009) who indicated that Japanese children are influenced by Japanese morae in perceiving English phonemes. The results of this study indicate that L1 transfer cannot be ignored for L2 Japanese older children in learning English sounds.

As indicated in the correlational studies in the previous section, while production variables were weakly correlated with each other, there was almost no correlation within the perception variables except between the Open Oddity (c) and the End Oddity (d). In terms of the correlation between the perceptive variables and the productive variables, there was only a weak correlation between the Open Oddity Test (c) which is Level E and the Word-in-Sentence Repetition Test (f) which is Level I. SEM showed that the data adequately fitted the model and showed that perceptive ability affects productive ability. The Multiple Regression Analysis showed that the Word-in-Sentence Repetition Test (f) and the Non-word Repetition Test (g) were predicting variables of the Lexical Discrimination Test (b). This indicates that if a child can perceive L2 sounds correctly, the child may be able to produce the sounds, even though the word is not familiar to the child. In the case of instruction for a certain period of time, if the child can produce the sounds that he/she can perceive, the child's perceptive ability can be improved beyond the initial state of the perceptive ability. The finding that the non-word repetition task predicts the future L2 auditory discriminative ability corroborates the claim by Gathercole (2006) and Service (1992) that non-word

repetition task ability and the ability to repeat accurately unfamiliar words were associated with foreign language vocabulary acquisition.

In conclusion, this investigation of Japanese older children's receptive and productive ability of English phonemes in an EFL setting has found overall as follows:

1. They are better at perceiving a phoneme than producing a phoneme.
2. They have difficulty in auditory discrimination of paired consonants when one of them does not exist in the Japanese inventory.
3. They have difficulty in both perceiving and producing English vowels.
4. Their L1 loan word knowledge has an influence on their ability to perceive and produce L2 sounds.

The difficulties in both perceiving and producing vowels, and auditory discrimination of some consonants which do not exist in the Japanese inventory led the researcher to consider explicit instruction of English sounds for children in Grade 5 in the following academic year of grade 6. Thus, this study will be completed in the framework of Sequential Explanatory Design (Creswell, 2009). The teaching method and the whole curriculum will be described in the next chapter.

Chapter II

THE QUALITATIVE STUDY

2.1 The purpose of this research

This qualitative study aims to report on how Japanese older children in an EFL setting responds to instruction on English sounds. The results and discussion in Chapter I, which investigated Japanese older children's receptive and productive ability of English phonemes in an EFL setting, clarified as follows:

1. They are better at perceiving a phoneme than producing a phoneme.
2. They have difficulty in auditory discrimination of the paired consonants which sound similar to Japanese (the target paired sounds hereafter).
3. They have difficulty in both perceiving and producing English vowels.
4. Their L1 loan word knowledge has an influence on their ability to perceive and produce L2 sounds.

An English sound instruction was designed as part of a *whole language approach*⁹ for the participants in Grade 6 in the following academic year as part of FLA.

⁹. *Whole language approach* is an integrative teaching approach often employed in teaching English to young learners. This approach takes the stance that meaning lies not in an individual word or a sentence but in the whole context. Thus, a new word or a new expression is expressed through the story context (Allen-Tamai, 2010). English lessons for Grade 6 in the new academic year 2015 were designed to strengthen English sound instruction included in the Japanese fairy story retelling project and a musical song project for the purpose of reinforcing the participants' awareness both of English segmental and suprasegmental aspects. This thesis, however, focuses on only the segmental aspects.

In this chapter, the research method is first introduced and contains a description of the participants, instruction, teaching materials, and data analysis conducted using the participants' reflection notes. In order to collate the findings in the quantitative study with this study, all the tables, figures, and footnotes are the sequential numbers through the two studies. The results will clarify the participants' awareness of the English sound system and their attitudes, which will lead to the conclusion in this chapter. The qualitative results will be corroborated with the quantitative findings in the next chapter in order to yield the conclusion of this study.

2.2 Method

This study will be completed in the framework of sequential explanatory design (Creswell, 2009). The qualitative study was designed to investigate how the participants responded to explicit instruction, and how they improved their awareness and changed their attitudes towards the English sound system through their reflection notes.

2.2.1 Participants and research site

The participants in the qualitative study were the same participants in Chapter I who became Grade 6 students in the new academic year 2015. One participant in Grade 5 transferred to another elementary school. Thus, the number of the participants in this qualitative study was 103. This qualitative study started in the new academic year in (new) Grade 6 from April, 2015 and continued to the end of February, 2016. As described in 1.3.1 in Chapter I (The Quantitative Study), the researcher was allowed to have 17 lessons a year to teach English to Grade 5 students in the previous academic year, which was half of the required 35 classes a year for FLA. This was due to the limitation of teaching hours set by the district education board. The rest of the hours

were team-taught by the homeroom teachers and an ALT. In the new academic year 2015, the researcher implemented English lessons under the same limitations as the previous academic year. There were 17 English lessons implemented by the researcher herself working with the same elementary school teacher as the previous academic year who was in charge of FLA. She was also a homeroom teacher in one of the three classrooms in Grade 6.

2.2.2 Instruction

Despite the fact that these participants had been taught English phonemes to some extent during Grade 5, it was necessary for me to consider and design the curriculum for Grade 6 in the new academic year grounded on the quantitative findings described above. From the finding that consonants are easier for the participants to perceive and to produce than vowels, except for the consonants that do not exist in the Japanese inventory, it was decided to focus more on the consonants more during the first half FLA lessons of a year so that the participants in the new Grade 6 would be able to discriminate and produce the consonants including the target paired sounds. Then, it was planned that the *English sound instruction* be shifted gradually to the target vowels. Bearing in mind that older children seem to process L2 sounds with meaning and the participants were going to junior high school the following year, it was important that they should enrich their L2 vocabulary at the same time as acquiring English phonemes through comprehensible input in other classroom activities.

2.2.2.1 English sound instruction

The *English sound instruction* conducted in this study was composed of (a) *phonemic awareness exercise*, (b) *pronunciation practice*, and (c) *phonics training*.

Phonemic awareness is “an understanding that speech is composed of a series of individual sounds” (Yopp, 1992, 1995). *Pronunciation practice* is to help the participants to understand how to articulate English sounds on the segmental level. *Phonics* refers to letter-sound relationship (Ehri & Nunes, 2002). According to Allen-Tamai (2010) and Zygouris-Coe (2001), it is important to teach phonemic awareness to foster L2 children’s awareness of sounds before teaching phonics. These elements were part of the English sound instruction of this study that will be described below based on the constructs of the speech processing model proposed by Stackhouse and Wells (1997). That is, “both phonological and literacy development are dependent on children’s underlying speech processing skills” (Stackhouse & Wells, 1997, p. 57). In addition, given the older children’s maturity, their high literacy skills in L1 orthography skills, and my own long teaching experience to EFL learners, it was felt that the participants would naturally match L2 sounds with letters. Thus, FLA in Grade 6 was basically conducted with letters of the alphabet when teaching L2 oral sounds. This is affirmed by quite a number of Japanese researchers who believe that aural-visual information using alphabet letters helps Japanese older children in upper grades of elementary schools to learn English sound-letter relationship (Noro, 2004; Ogawa, 2008). Furthermore, it was taken into consideration that in the participants’ secondary school in the following year, their English skills would tend to shift from speaking-centered to reading-centered. So writing letters when teaching English sounds should not be separated from fostering their listening and articulation of English sounds.

Appendix C2 shows instruction time durations in Grade 6 FLA that I taught. The total number of teaching lessons during the year was 17 which amounted to 765 minutes. The English sound instruction amounted to 309 minutes, which was about 120 minutes longer than the English sound instruction that the participants had during Grade 5. It

should be noted that the English sound instruction was sometimes performed while teaching new vocabulary and teaching stress position in English words in comparison to Japanese loan words. Thus, the English sound instruction occasionally included some other activities.

2.2.2.1.1 Phonemic awareness instruction

Pointing out that “phonemes are the smallest units that make up spoken language,” and “phonemic awareness refers to the ability to focus on and manipulate phonemes in spoken words,” Ehri and Nunes (2002) referred to six kinds of concrete phonemic awareness abilities in a language classroom:

1. *Phoneme isolation* is the ability to recognize individual sounds in a word. For example, to identify the onset / coda sound of a word.
2. *Phoneme identity* is the ability to find the same phoneme in different words. For example, to recognize /b/ sound among *bike*, *boy*, and *bell*.
3. *Phoneme categorization* is the ability to find an odd sound in a sequence of three or four words, for example, from *bus*, *bun*, and *rug*.
4. *Phoneme blending* is the ability to combine a sequence of separately pronounced individual sounds into a recognizable word. For example, /k/ /æ/ /t/ is combined into *cat*.
5. *Phoneme segmentation* is the ability to break a word into individual phonemes by counting sounds. For example, *cat* is composed of three phonemes, /k/, /æ/, and /t/.
6. *Phoneme deletion* is the ability to recognize a word even if one single phoneme

is removed. For example, if /s/ is removed from *smile*, it will be *mile*.

(Ehri & Nunes, 2002, p. 111-112)

Paulson (2004) examined the phonological development of 80 L1 preschool children 4- and 5-year-old and investigated the relative difficulty of ten phonological tasks: Rhyming that included detection and production, alliteration that included detection and categorization, blending that included syllables, onset/rime units, and phonemes, and segmenting that included syllables, onset /rime units, and phonemes. As a result, Paulson found that there were significant changes in the developing phonological awareness every six months, and she pointed out that phonemic awareness was relatively more difficult than syllable or onset / rime awareness. Although segmenting onset/rime improved 14% from 4-year-old to 5-year-old, segmenting phonemes improved only 4%. Paulson also indicated from her analysis that due to the demand on phonological working memory, the tasks that require isolation, production, or recall of sounds in words were more difficult than the tasks to match the sounds in words.

Table 35 shows the result of the rank of phonological awareness tasks among 4- and 5-year-old participants in Paulson's investigation. Blending syllables was the easiest task for both 4- and 5-year-old children, and 5-year-old children completed the task better than 4-year-old children. Blending and segmenting phonemes were more difficult for L1 young children than blending and segmenting syllables, and segmentation was more difficult for them than blending.

Table 35

*Subskill Percent Correct Score Ranking from Highest to Lowest for 4- and 5-year-old
(Revised from Paulson, 2004, p. 99)*

Rank	Task	4-year-old	5-year-old
1	Blending syllables	84%	92%
2	Segmenting syllables	62%	81%
3	Rhyme detection	58%	74%
4	Alliteration categorization	53%	71%
5	Blending onset/rime	42%	61%
6	Alliteration detection	32%	57%
7	Rhyme production	31%	54%
8	Blending phonemes	13%	29%
9	Segmenting onset/rime	8%	22%
10	Segmenting phonemes	3%	7%

These findings and six kinds of concrete phonemic awareness abilities proposed by Ehri and Nunes (2002) were taken into consideration when teaching phonemic awareness to Japanese EFL older children in this study, especially whether they should be taught in the same order as L1 children. The results of the quantitative study in Chapter I indicate that the nucleus vowels were difficult for the participants both to perceive and produce. Although Paulson found that blending phonemes was easier for her participants than segmenting phonemes, I felt that the Japanese participants should be taught these in the reverse order due to their difficulty with nucleus vowels. Thus, it was planned that phoneme blending should be taught after phoneme segmentation.

2.2.2.1.2 Pronunciation instruction

Regarding sound production, the participants were taught simple features, and manner and places of the consonants explicitly. For example, when pronouncing nasal

sounds, /m/ and /n/, I interrupted the participants' pronunciation when they were repeating the words in *letter-sound association activity* (so-called *phonics jingle*, explained in the next section), and said, "Pinch your nose. Can you articulate these sounds? Can you say *mama*? No, you can't! When you pronounce /m/ and /n/ sounds, the air is released from your nose. OK. Can you say *mama*? How about /n/? Can you put the tip of your tongue on your gum above your upper teeth, and articulate /n/ sound?"

The other example is teaching the bilabial sounds. I said, "Now can you say *mama*, *baba*, and *papa*? What parts of your mouth are used to say these words? Yes, you are using both your upper and lower lips." This way of demonstrating and describing the articulation of sounds frequently occurred in the classrooms when I noticed that some participants were having difficulty in sounding out the target phonemes. The most frequent interruptions that occurred in the classroom were when the participants put a vowel after the consonant to extend it. This phenomenon was especially noticeable when they were producing the plosive sounds. For example, some of the participants tended to pronounce, "b: [bu], bison..... p: [pu], peacock...." Since the participants were in Grade 5, I had noticed that many students put vowels after the plosive sounds. Therefore, I surmised that those who failed to produce the right consonants would also fail to produce consonant clusters from the results of *vowel epenthesis* in production tests in the quantitative study. Thus, I intentionally set words such as *sprout*, *twig*, *crash*, *speed*, *three*, *star*, *stand*, *shut*, *snake*, and so on (See Appendix C2) which have consonant clusters on the onset/coda position as a challenging item in the working-sheet task.

In addition to these basic English sound instructions, the points of concern were: (a) good auditory ability of English phonemes would improve production ability, thus, those *target paired sounds* should be frequently focused on, (b) the vowels should be

taught after the participants were better at consonant auditory and production skill, (c) L1 loanword influence should be explained to the participants on the occurrence of vowel epenthesis and in the comparison between English words and Japanese loan words. Regarding (a), the pairs of /l/ and /ɾ/, /b/ and /v/, and /f/ and /h/ were frequently focused on, by extending auditory discrimination practice, telling the participants explicitly the listening and producing technique.

Regarding (b), it was planned to focus on the ambiguous vowels substituted as Japanese /a/ (ア) around the middle of the second term after the participants had become better at discriminating and producing the target paired consonants. Both of the target paired consonants and vowels were explicitly demonstrated by showing and explaining the face muscles and the tongue movement with easy words in Japanese and letting the participants imitate my demonstration. Owing to the time spent for explicit demonstration and practice, the total time for the English sound instruction increased by about 120 minutes more than the instruction in Grade 5 FLA.

Regarding (c), the utilization of loan words was fully considered in the instruction. It was evident from the quantitative results that the participants were influenced much by the pronunciation of loanwords when producing English sounds. At the same time, I was convinced that the participants were cognitively mature enough to compare the two languages. Loanwords activities were conducted four times during the first term. The participants were intentionally asked to pronounce loanwords in Japanese and repeat after the teacher (me) in English so that they could notice the difference between the two words from both a segmental and suprasegmental point of view. The vocabulary used in loan words activities are shown in Appendix C1.

2.2.2.1.3 Phonics

Although it is not the same concept as phonemic awareness, *Letter-sound correspondence* is also an important element that should be taught to beginner level EFL older children. Since the bottom of L1 children's speech processing system is developed dichotomously into speaking ability and literacy ability (Stackhouse & Wells, 1997), it seems that L2 children acquire the foundation of literacy skills through phonemic awareness instruction. This concept is supported by studies which show phonemic awareness instruction facilitates children learning to read and spell. Williams (1980) taught segmentation and blending with letters printed on wooden squares to learning disabled (LD) students. The result showed that the LD students raised their phonemic awareness using letters during phonemic awareness instruction. Bradley and Bryant (1983, 1985) found a causal relationship between phonemic awareness instruction with letters and reading acquisition. Blachman and her colleagues (Ball & Blachman, 1991; Blachman, Ball, Black, & Tangel, 1994; Tangel & Blachman, 1992) also investigated the effectiveness of phonemic awareness instruction with letters. They found that letter-sound association led an additional effect of reading ability besides phonemic awareness enhancement. Concerning the EFL older children who were supposed to start learning English as a subject in junior high school after graduating from elementary school, I strongly felt as a teacher that I should deal with letters in English sound instruction.

These three instructions were taught concurrently through the materials in the following section.

2.2.2.2 Concerns as a teacher

In the second and the third term, if there were relatively easy onset/coda items in

the worksheets, I intentionally asked the participants to work in pairs. The participants then tried to think of how to manipulate the onset/coda phonemes. My concern was that this should be done as pair-work and not by individuals on their own because some participants still had difficulty with letter-sound associations. Teaching a large class, I found some participants were fast learners but others were slow learners, and some were active in class but others were passive towards the lessons. From the viewpoint of Vygotsky's *zone of proximal development* as ZPD (Vygotsky, 1962) I intentionally had all the participants work in pairs so that the good participants could help those who were still slow and poor at the task. At the same time, the HRT and I attempted to walk around the class every time when we checked the answers on the worksheet. This is because we felt that the participants wanted us to check the answers and give a direct compliment to them if their answers were correct. Also in case of making errors, the participants wanted us to identify what was wrong in the answers. These teacher actions during the class were always performed based on the notion of Bruner's *scaffolding* (Bruner, 1975; Wood, Bruner, & Ross, 1976).

2.2.3 Teaching materials

English sound instruction in Grade 6 classrooms had three basic materials: (a) *letter-sound association* (sounding out alphabet letters, so-called *phonics jingle*) as a warmup activity, (b) *English sound worksheets* (*Fill-in-blank worksheets*, abbreviated to *FBW* hereafter), and (c) *Alphabet card activity*. A *letter-sound association* and *FBW* were administered in almost every class. Most of words in this worksheet were for onset/coda recognition. The findings of the quantitative study showed that consonants were easier for the participants than vowels for auditory discrimination. In the middle phase of the second term in the academic year 2015, vowel recognition was gradually

employed in the worksheet activity. Subsequently, *Alphabet card activity* was introduced in the third term in order to strengthen auditory discrimination of vowels. These three activities were routinely performed in FLA Grade 6 classrooms in the academic year 2015.

2.2.3.1 Letter-sound association

The sounding out of alphabet letters was performed as a warmup activity almost every lesson. This activity had been conducted since the participants were in Grade 5. Showing picture cards assembled in alphabetical order, a letter name, its sound, followed by a word were pronounced. The participants repeated after me, for example, “a: [æ], alligator, b: [b], bison, c: [k] crab, ch: [tʃ] chimpanzee...” This activity is *onset identification* according to Ehri and Nunes (2002) for raising the participants’ phonemic awareness. The time duration was around 10 minutes at the beginning of a class. The vocabulary in this activity was chosen from the same category in order to increase the participants’ English vocabulary knowledge. Bearing in mind that EFL older children should learn a certain amount of English vocabulary by the time they go to junior high school, I kept introducing one category set for a certain period of time. For example, all food words from A to Z in the first term of Grade 5, all animal words in the second and third term of Grade 5, and all action verbs during classes in Grade 6. The words were selected taking into consideration of the comprehensible input level of EFL older children. Thus, I did not use highly familiar words that all the participants knew already. For example, “a” for not an *ant* but an *alligator*, “b” for not a *bear* but a *bison*. I considered that it was pedagogically necessary to stimulate the older children’s academic knowledge and cognitive maturity. The vocabulary used for this activity is shown in Appendix C1.

2.2.3.2 Fill-in-blank worksheets (FBW)

This task was conducted so that the participants could raise their phonemic awareness and phonics skills as well as increase their vocabulary before going to junior high school. This worksheet task called *Fill-in-blank worksheets* (abbreviated to FBW in Appendix C2) was the most important English sound activity for the participants in FLA. In this worksheet, the participants put a corresponding letter of a pronounced phoneme in the blank of onset, coda, or nucleus position of a word. Figure 10 shows an example of this task.

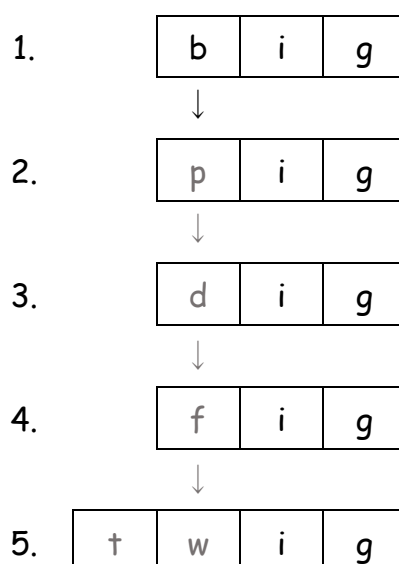


Figure 10. An example of one onset sound identification in Fill-in-blank worksheet.

Note. The participants were supposed to fill the grey letters after listening to a word.

The word *big* was pronounced first. I then explained to the participants that the initial letter would be replaced by some other sound, and told them to put a letter corresponding to the sound they heard from the alphabet bank shown at the bottom of the worksheet. This task corresponds to *phoneme identification* according to Ehri and Nunes (2002). The level of words employed in this task was carefully considered so the target words went from an easy to a difficult auditory level for the participants. The

second word was *pig* after the original word *big*, the third was *dig*, and the fourth was *fig*. The onset /p/ and /d/ are plosive voiced sounds that seemed easy for the participants to catch. The fourth /f/ was a fricative voiceless sound that the participants had difficulty in discriminating from /h/ in the perception tests in the quantitative study. The fifth word was *twig* which seemed quite challenging to the participants. I placed two successive consonants as a consonant cluster and was concerned that the participants would put wrong phonemes that they transferred from L1 Japanese. In fact, there were some participants who put “h” instead of “f” in the fourth blank, and “u” or “i” in the second blank of No.5. In this FBW task, 70 words for onset position, 15 words for coda position, and 6 words for nucleus position were used. The total number was 91 words: 76.9% were assigned to onset position, 16.5% to coda, and 6.6% to nucleus position. The largest proportion was occupied by onset position. FBW task was conducted during Lesson No. 5, 6, 8, 9, 10, 11, 12, and 13 shown in Appendix C2 and C3. Each item started with vocabulary used in the storytelling, the musical song, or cross-curricular lessons that the participants had learned in their English lessons. This task had already begun when the participants were in Grade 5. Thus, they occasionally came across the same words that they had used in Grade 5. This was due to my concern that the participants needed to have opportunities to deal with the same sounds as frequently as possible in the limited number of English classes a year. Some items for this task were intentionally made based on the quantitative investigation where the participants had difficulty in discriminating one from the other, such as a combination of /l/ and /ɹ/, /b/ and /v/, /f/ and /h/, and the vowels /ʌ/, /æ/, /ɑ/, and /o/ substituted as Japanese /a/. For example, quite a number of participants had difficulty in discriminating between /l/ and /ɹ/ in the first term in Grade 6 although the /l/ and /ɹ/ distinction had been frequently taught since Grade 5. Many participants wrote in their reflection notes at the end of the

first term that they had difficulty in distinguishing /l/ from /ɹ/. I also found quite a number of participants filling *l* instead of *r* in the worksheet, and vice versa. When I found this, I interrupted giving the lecture and told the participants to pay attention to *light* and *right*. I said, “Point to the *lights* on the ceiling with your *left* finger if you hear *light*, and raise your *right* hand if you hear *right*. This activity had been frequently performed since the participants were in Grade 5. At the same time, the participants were told to pay attention to my mouth movement and notice the difference of manner and place when I was articulating these sounds. As it would be difficult for the participants to understand the ways of articulating English sounds if I had used phonetic terms, I attempted to simplify my explanation and to exaggerate my mouth movement, giving them advice on how to roll and move their tongue.

2.2.3.3 Alphabet card activity

This phonics activity was conducted in the third term as pair-work to teach, in particular, the vowels substituted as Japanese /a/ (ア). A set of alphabet letters was delivered to each pair, and the participants were told to assemble the letters on the desk in alphabetical order. Then, they were told to choose letters corresponding to the sounds that they heard. Three-letter words were employed in this task. First, the participants listened to three individual phonemes and placed the corresponding letter cards on the desks. For example, /b/, /æ/, and /t/ were independently pronounced, and the participants were asked to choose *b*, *a*, and *t* from letter cards and put them on their desk. Then, the onset sound was manipulated, and the participants had to replace the letter cards in the onset position. This activity was only conducted in the third term. Seeing that the participants were accustomed to this activity, the two nucleus vowels were compared through this activity. For example, first, the participants were told to choose

the letters corresponding to /m/, /æ/, /t/, and, /m/, /ε/, /t/. At this point, some participants were struggling to choose /æ/ or /ε/ in the first set. After they set two words on their desks, they were told to identify which was the word they heard. Lesson No. 14, 15, and 17 in Appendix C2 show the words used in this activity. The participants were told to listen carefully to discriminate the two vowels. It seemed challenging for the participants to discriminate between *met* and *mat*, and between *bed* and *bad*. The vocabulary selection is shown in Alphabet card activity in Appendix C3.

2.2.4 Data collection

103 participants in Grade 6 in the 2015 academic year wrote self-reflection notes in Japanese at the end of each term. During the third term which was the final academic year of Grade 6, the participants were asked to write their reflections by answering two questions which were constructed by the researcher and given by the HRT. The first question was about their perceptive ability of English sounds. For example, they were asked to write how they reflected on their discrimination ability between the target paired phonemes. The second question was about their productive ability of English sounds (phonemes). These questions seemed difficult for the students to answer, so they were asked to explain what they thought of the task with *FBW*, *Alphabet card activities*, and anything else that the teacher did in class related to English sounds. They were also asked to write about whether they had improved their discrimination of the paired phonemes and if they thought they made efforts to perceive and produce those sounds. As the term *phoneme* was not used in class, both the teachers and the participants tended to say “oto (sound),” the Japanese word. One class hour (45 minutes) was used for writing their self-reflection notes.

The writing of reflection notes was administered by the HRT responsible for FLA

in Grade 6. She had been working with me since the participants were in Grade 5. I asked her what and how she had told the participants to write about in their reflection notes. The following is her response to my questions:

I let the students write their reflections by looking back on what they had done. They referred to their reflection notes that they had written at the end of every English lesson, and any paperwork on phonemic awareness. I asked them questions so that they could elaborate their thoughts. For example, “What sounds were difficult for you?,” “Were there any sounds that you often made mistakes with?,” or “Were there any sounds that you think you should practice more?” I didn’t force them to write anything and I never taught them how to write or what to write. They wrote their reflections during the class when Mrs. Kawai was recording their retelling of the story individually in a different room.

This comment was written in her mail in Japanese, which is shown in Appendix D1. The participants’ reflection notes were collected by the HRT and sent to the researcher. All the comments were transcribed onto Excel files, and qualitatively analyzed.

2.3 Data Analysis

As the reflection notes collected in the other terms were written by the participants based on the integrative questions concerning other activities in EFL classroom, the data collected in the third term was analyzed by KJ-method as described below. The reflections that the participants wrote about English sounds at the end of the third term in Grade 6 were qualitatively analyzed. Based upon the researcher’s stance of

analyzing the data objectively, comments from the HRT described above and the class planning notes were partly referred in order to corroborate the data from the reflection notes. The lesson plans and notes were used to recall how the interaction in the classroom went in order to interpret the participants' statements in depth.

2.3.1 KJ-method

The data were analyzed based on the KJ-method proposed by Kawakita (1967, 1970). He investigated the way of organizing a large amount of data by using cards and developed the method in which new findings from the different angles lead to the problem-solving through the four steps. According to Kawakita, this technique aims at drawing a new hypothesis and a new idea so that researchers can be free from existing theory and generality.

First, all the written reflection notes on the Excel files were printed out and cut into strips (or cards) of paper for each participant and for each question. In this stage, two pools of strips on English phonemes were extracted: one pool about perception of English sounds and the other pool about production of English sounds.

In the second step, all the strips were spread out on the table and read carefully. Strips with similar opinions and ideas were clipped together in a group with an appropriate title on each group. Several groups were made and labeled. In this stage, I intended to make groups based on the participants' statements on the four findings in the quantitative study.

In the third step, all the strips from the pools on perception and production were combined into one pool so that the strips were reallocated into groups in order to analyze the data from the different points of view. These steps were repeated several times to clarify the participants' response to English sounds instruction and to deepen

insights into their reflection notes.

2.3.2 The first analysis

In this stage, I divided the strips into groups based on how the participants responded to English sound instruction. Since the instruction was designed based on the four findings in the quantitative study, the participants' comments in their reflection notes were analyzed to observe whether their comments corresponded with the following findings:

1. The participants are better at perceiving a phoneme than producing a phoneme.
2. They have difficulty in auditory discrimination of the paired consonants which sound similar to Japanese (the target paired sounds hereafter).
3. They have difficulty in both perceiving and producing English vowels.
4. Their L1 loan word knowledge has an influence on their ability to perceive and produce L2 sounds.

It should be noted that all of the participants' written reflections were transcribed as they were. Thus, their expressions of English sounds did not use IPA symbols. Instead, all of the sounds that the participants expressed in their reflection notes were represented in italic, and the English translation is given in parentheses. All the participants' statements in Japanese version from their reflection notes shown in the following excerpts are shown in Appendix D2.

2.3.2.1 The participants are better at perceiving a phoneme than producing a phoneme.

To support this finding, it seems that some of the participants were comparing

their own skills of listening and pronunciation. They stated that, while their listening skill of the target sounds had become better, they often made mistakes in articulating the target sounds. The description by ID 7 indicated her awkwardness of articulating the target sound. The statement of ID71 indicated that she realized that her listening skill might have improved faster than her pronunciation skill. It is an interesting point that her own judgment of English pronunciation seemed to be decided by L1 influence that she thought that her pronunciation sounded Japanese.

Excerpt 1.

ID 6: ... Kikitoriwa dekiru youni nattekita keredo iunowa mada sonnani dekinai.

(Although I think listening is much better than before, I cannot pronounce very well.)

ID 7: Eigono otode dochirawo tsukaunoka sukoshizutsu wakaruyouni nattakedo kuchini dashite iutokini machigaete shimaimasu. (I can tell which sound should be used, but I tend to make mistakes when I say the sound aloud.)

ID 25: Eigoga sukoshi kikitoneruyouni nattakedo hatsuonga imaichi rikai dekinai.

(I can listen to and catch English sounds, but I still don't understand how to pronounce English.)

ID71: Gonenseito kurabete rokunenseini natte kikitoriga seikakuni nattato

omoutame eigowo hatsuonsuru seikakusaga sukoshi agattato omou. Demo

Nihongoppokunatte shimaui kotogaaru. (Because my listening accuracy skill has improved this year more than last year, I think my pronunciation accuracy also has improved to some extent. But my pronunciation is often like Japanese pronunciation.)

While many participants stated as above that they seemed to have difficulty in producing the target sounds although they thought they could discriminate the target sounds, the following participant (ID 73) wrote that his problem was how to articulate the target vowel sounds, and another participant (ID 14) wrote that she could pronounce a minute difference of the target phonemes in a song that the participants were often singing in English lessons.

Excerpt 2.

ID73: *a* to *e* no iikatano chigaiga mada umaku dekinai. (I cannot make a difference between *a* and *e* when I pronounce these sounds.)

ID 14: Tempono hayai utademo *r* to *l* ya *a* to *e* no youna komakai hatsuonno chigaimo arawaseruyouni natta. (I am now able to make the fine difference between *r* and *l*, and *a* and *e* even when I sing an English song at a fast tempo.)

It was assumed that these two participants were probably the fast learners who were on the next stage of learning. This is because ID 73 stated that his problem was articulation of the target vowels, and ID 14 stated that she could make a fine difference in her pronunciation when she was singing an English song. This is corroborated by the results in vowel quality of the quantitative study that this participant (ID 14) was one of the three participants who were evaluated as correct in [vɪn] and [fɛʃ] (See p. 102). The participants' statements in Excerpt 1 suggest that there was a general tendency for them to be better at perception than production.

2.3.2.2 The participants have difficulty in auditory discrimination of the paired consonants which sound similar to Japanese.

The consonant pairs of /l/ and /ɾ/, /b/ and /v/, and /f/ and /h/ were particularly focused on during the class. At the time of writing the reflection notes in the third term, most of the participants were stating that they could discriminate these pairs better than the previous terms or a year before. However, there were a few participants who stated that they still had a problem with discriminating the target pairs. There were also some participants who stated that they were able to discriminate some pairs but were not able to discriminate the other consonant pairs.

Excerpt 3.

ID 4: ... *l* to *r* no hatsuonno chigaiga mada wakaranai. (... I still don't understand the difference between *l* and *r*.)

ID 50: *R* to *L* no chigaiga wakaruyouni natta. *V* to *B* no chigaiga mada wakaranainode wakaruyouni shitaidesu. (Now I can tell the difference between *R* and *L*. I still cannot tell the difference between *V* and *B*, but I would like to.)

ID 96: *L* to *R* no chigaiwa kikitoneruyouni nattakedo *V* to *B* no chigaiwa mada kikitoremasen. (Although I can tell the difference between *L* and *R*, I still cannot tell the difference between *V* and *B*.)

These participants in Excerpt 3 above stated that they still had a problem in their understanding but did not elaborate what their problem was. However, some other participants described how they became able to discriminate the target pairs, or pointed out their problems in detail as described in Excerpt 4.

Excerpt 4.

ID 82: *R* to *L* wa senseino kuchino katachiwo mitara wakaruyouni nattakedo otodake kiitemo mada yoku wakaranai. (I can tell the difference between *R* and *L* if I watch the teacher's mouth carefully. But I can't tell the difference if I only listen to the sounds.)

ID 88: *r* to *l* no chigaiwa wakaruyouni nattaga hayaito mada kikitorenakunatte shimau. (Although I can tell the difference between *r* and *l*, it is hard for me to discriminate if these sounds are pronounced fast.)

ID 34: *l*, *r* ga mada machigaeru kotoga ooidesu. Soreto raito to raitono otono chigaiga kiiteiruto wakaranakunatte shimau kotomo arimasu. (I still make mistakes with *l* and *r*. So I'm still confused about the difference between "light" and "right.")

ID 75: Raito (hikari) to raito (migi) no *L* to *R* no chigaiwa hatsuonno toonno takasade wakaruyouni narimashita. (I can understand the difference between *L* and *R* in *light* and *right* from the height of the teacher's voice tone.)

ID 88 found that the speed of L2 pronunciation made his discrimination of the target pairs difficult. ID 75 describes that he found his own knack of discriminating the target pairs. It is understandable that there could be individual difference of perceptive ability among the participants at the time of writing their reflection notes.

2.3.2.3 The participants have difficulty in both perceiving and producing English vowels.

It is understandable that most of the participants stated that they had difficulty in discriminating the target vowels while they seemed to be able to discriminate the target

consonants. This is due to the fact that the vowels were taught explicitly later than the consonants as described in the method. Many participants stated their difficulty in discriminating of the target vowels in comparison with their own understanding of the consonants. Thus, there were few participants who stated that they had difficulty in articulating the target vowels.

Excerpt 5.

ID66: *a e* to *o* no houmo yoku wakaranaishi dou kuchiga hiraite irunoka mada wakarimasen. Demo hokano otowa daibu wakaruyouni narimashita. (I really don't understand the difference between *a*, *e*, and *o*. I'm not sure how the mouth is moved when these sounds are articulated. But I think I can understand the other sounds.)

ID92: Mada wakaranainowa *a* to *e* no kubetsuga tsukanai koto desu. Zenzen dekinakute kuchiwo mitemo mada wakaranai kanji desu. (What I still cannot do is to distinguish *a* from *e*. This is extremely difficult for me, and I'm still not sure even when I look at the teacher's mouth.)

ID90: *l* to *r* no kubetsuwa dekiruyouni nattaga *a e o* no tokuni *a* to *e* no kubetsuga muzukashiku kanji nantoka dekiru teido desu. Senseiga hatsuonsuru tokino kuchino katachide kubetsusuru kotoga ooidesu. (Although I can discriminate between *l* and *r*, it's difficult for me to discriminate *a*, *e*, and *o*. I can somehow manage to discriminate between *a* and *e* when I watch the teacher pronounce these sounds and look carefully at the shape of her mouth.)

ID31: *r* to *l* no chigaiwa gonenseino tokito kurabete kikitoreruyouni natta keredo *a* to *e* to *o* no chigaiga yokuwakaranai. (Although I can distinguish *r* from *l* better than in Grade 5, I really don't understand the difference between *a*, *e*, and *o*.)

ID 60: mata aratani kadaiga dekimashita. *A* to *e* no chigai desu. Beddowo eigode kakuto *bad* nanoka *bed* nanokanado sukoshi wakaranaidesu. Mata, mewo tsumutte docchiwo itteirunokato kikaretara jishinwo motte iemasen.

(... Now I have a new problem. It is the difference between *a* and *e*. When I try to write *bed* in English, I am not sure whether it's *bad* or *bed*. If I were asked which is *bed* after hearing the two words with my eyes closed, I'm not sure.)

Their statements were described as if they had come across the new problems although they thought that they had overcome the target consonants. Their reflection notes indicate that they were confused with learning the target vowels. On the other hand, there were some participants who elaborated their problems with the target vowels although they also thought that the problem was difficult. These participants stated that they had a problem of listening to the target vowels in the following Excerpt 6.

Excerpt 6.

ID 37: *a* to *e* to *o* no takasaga doreto iukotoga amari dekinai. (I cannot tell the difference between the height of the tongue among *a*, *e*, and *o*.)

ID 35: *a* to *e* no kubetsuga amari wakaranai desu. *a* to *e* no nagasaga chigauto itteita keredo amari kikitoremasendeshita. (I can't tell much about the difference between *a* and *e*. Although the teacher said that there is a difference of duration between *a* and *e*, I could not tell the difference well.)

ID 71: *a* wo hatsuonsurutokiwa kuchiwo yokoni hippatte hatsuonsurukotoga wakatta. Sonotame *a* to *e* to *u* wa hatsuonsuru hitono kuchiwo mireba chigaiga wakaruyouni natta. *o* wa wakaranai.

(I understand that I should pull my mouth sideways when pronouncing *a*. So I can now tell the difference between *a*, *e*, and *u*. But I still have difficulty with *o*.)

These participants actually responded to the instruction which I gave of the phonetic features of the vowels in easy words during the class. ID 37 and ID 71 remembered about tongue position, and ID 35 remembered about the duration of the vowels that I was demonstrating in class. These participants and the two participants in the following Excerpt 7 elaborated which vowels were difficult for them to discriminate.

Excerpt 7.

ID 57: *a* to *e* no kubetsuwa dekiruyouni narimashita. Mada wakaranai tokorowa *a* to *u* no chigaidesu. (I can tell the difference between *a* and *e*. I still cannot tell the difference between *a* and *u*.)

ID 91: *A* to *E*, to *O* no chigaiga mada amari wakatte imasen. Mata *A* to *E* wa daitai dekirukedo *A* to *O* ya *E* to *O* nadono chigaiga tokuni wakaranaidesu. (I still don't know the difference between *A*, *E*, and *O*. Although I can almost tell the difference between *A* and *E*, I really don't understand the difference between *A* and *O*, and between *E* and *O*.)

Some participants in Excerpt 5 stated that they had difficulty in discriminating [æ] and [ɛ], as in the example of the difference between *bad* and *bed* that ID 60 in Excerpt 5 described. These two sounds are substituted by /a/ and /e/ in Japanese. Some of the participants in Excerpt 6 and Excerpt 7 seemed to be able to tell the difference between [æ] and [ɛ], but they had difficulty in discriminating the similar sounds

substituted as Japanese /a/ (ア). These comments on the target vowels imply that there is an individual difference in learning speed of internalization.

2.3.2.4 The participants' L1 loan word knowledge has an influence on their ability to perceive and produce L2 sounds.

There were statements about their Japanese katakana pronunciation which the participants seemed to be unsatisfied with. At the time of their writing the reflection notes, it was assumed that the participants' knowledge of English sounds through explicit sound instruction had some influence on their statements that they tended to grasp Japanese katakana pronunciation as unfavorable when they spoke English. The following three statements show that the participants felt bad or negatively about their own pronunciation that they thought sounded like Japanese katakana (loan words).

Excerpt 8.

ID 1: Katakanani natteshimau tokoroga herimashita. Demo mada katanade ittेशimau tokoroga atte eigono otoni natte inai. (I think my katakana-like pronunciation has reduced. But there are still some parts that I tend to say in katakana rather than English sounds.)

ID 34: ... Demo mada katananoyouni natte shimatteiru tokorowa kaizen dekiteinaito omoimasu. (... but I think that my katakana-like pronunciation has not improved.)

ID 52: ... Eigoga katanayomini natte shimatta. (... I think my English was like reading katakana.)

At the end of the third term when they wrote their reflection notes, the

participants were frequently practicing a recitation of part of a story in English, which might also have had an influence on their tendency to think that they wanted to recite the story in a good pronunciation. All the participants were told to practice well and their performance of the recitation would be recorded individually at the end of the third term. The following participants stated that they learned the difference between English sounds and katakana (in their expression), or loan words. This awareness seemed to be described in a way that it was natural for the participants to master English sounds. Their statements also indicate that they were aware that their katakana pronunciation would make their English pronunciation worse.

Excerpt 9.

ID 75: Eigowo katakanato kangaezu eigowa eigo toshite mirukotowa hatsuon shitemite kanjirare mashita. (I try not to think about English in katakana but English as English. I found this through English pronunciation.)

ID 43: Doushitemo Nihongo keino hatsuonni natteshimatte itakeredo Kawai-senseini jugyouwo shite itadaite iruuchini dandan senseino hatsuonni chikazukeruyouni narimashita. (My English pronunciation had been Japanese-like sounds. Through Mrs. Kawai's English lessons, my pronunciation gradually got closer to her pronunciation.)

ID 24: Senseino eigode nihongono gairaigoto eigono hatsuonno chigaini tsuite mananda. (I learned the differences between Japanese loan words and English pronunciation in English lessons.)

ID 72: Eigono hatsuonto katakanawo nihongode iunowa mattaku betsunomonodato iukotoga wakatta. (I understood that English pronunciation is one thing, and saying katakana in Japanese is another.)

These participants' statements described above after all responded to the four points that were found in the quantitative study. It is assumed that at the time of writing the reflection notes at the end of Grade 6, the participants had overcome their difficulties to some extent. As planned, the target vowels were taught after the consonants, and the difficulty of the target vowels was reflected on the participants' statements. In addition, the majority of the positive statements related to discrimination of the target pairs. However, there were fewer statements on producing the target sounds.

2.3.3 The second analysis

Based on the first analysis of the participants' statements regarding the four findings, the second analysis concerned noticing of the participants' ways of self-evaluation in which they seemed to establish their own criterion. In this analysis, what they "can" and "cannot" do were specified. Their self-evaluation was mostly based upon their achievements in class activities, such as *FBW worksheets* and *Alphabet card activity*. *FBW worksheets* aimed at identifying the initial or ending sounds of a word and the nucleus vowels. Some participants specified in the reflection notes shown in Excerpt 10 what they "can" and "cannot" do through FBW activity.

Excerpt 10.

ID61: Watashiga rikai dekiruyouni natakotowa saigono otoga shikkari kikitoneruyouni narimashita. Watashiga mada dekinai tokorowa saishono otode *L* to *R* ga kikitorenainode korekaramo chuushite ikitaito omoimashita. (I can now discriminate the ending sounds. What I cannot do yet is to discriminate the initial sounds, especially the distinction between *l* and *r*. So, I should pay more attention

to the initial sounds.)

ID89: Saishono ototo owarino otowo umeru mondaiga maeni kurabete machigaeru kaisuuga hetta. Saishono otodakewo kaete hokano otowa sonomamano mondaiwo tsugiwa naniga dekiruka sukoshi wakatte kita. (I think the number of mistakes I make on initial-ending questions sheets has become fewer than before. I gradually understood what sound came next when the teacher changed the initial sounds.)

ID41: Saishono otowo kaetari kuizu mitaini dasunowa kekkou dekiruyouni natta. Ushirono otowo kaetari surunowa mada umaku dekinai. (I think I can do pretty well at changing sounds on the initial position. It's like a quiz. But I'm still not good at changing the ending sounds.)

ID 34: Saishono mojino rikaikara hajimatta monono saishono tsugino mojito saigono mojiwa donna mojikaga wakaruyouni narimashita. Demo mada *l, r* ga machigaeru kotoga ooidesu. (I am now able to discriminate the initial sounds, and then, the second initial sounds, and the ending sounds. But, I still have a problem with the distinction between *l* and *r*.)

ID11: Bimiyouni *a, e, o, u* no chigaiga wakaranai. Konomae yatta kikitotte *a* ka *e* kawo handanshite kinyusuru purintodewa zenmon seikai dekinakattatame *a* to *e* no chigaiwo rikai shitai. (I still don't understand the difference between *a, e, o,* and *u* sounds. As I was not able to get any correct answers in discriminating between *a* and *e* in the worksheet last time, I would like to be able to understand the difference.)

These participants' self-evaluations were made based on their identification and manipulation of phonemes through the worksheet activity. It should be noted that each participant wrote that while they had "can" things that they were able to do, they had

“cannot” things that they seemed to have felt difficult. They seemed to have considered their difficulty according to the phoneme position in a word or the number of errors they had in the worksheets. Regarding *Alphabet card activity*, in which blending task was introduced in the third term in Grade 6 in order to assess how much the participants improved their phonemic awareness, some participants wrote that they felt that this activity was more difficult than the *FBW*. These participants’ statements were collated with the planning of teaching phonemic awareness noting that the nucleus vowel seemed to be difficult for the participants to discriminate. So *identification* and *segmentation* should be taught earlier than *blending*. This activity was conducted as pair-work so that a better participant could help his/her partner who is still slow and poor at discriminating the target sounds. The following participants in Excerpt 11 compared difficulty between *FBW* and this activity. ID 27 and ID 83 said that this activity was more difficult than *FBW*. Their description of this activity was mostly “*kādo wo naraberu*” translated as “put cards in order (as the teacher pronounced each sound).”

Excerpt 11.

ID27: ... Sonotano mojiwa hotondo zenbu purintoni seikaiwo kakeruyouni natta.

Demo mittsu mojiwo naraberu tokiniwa shiranai tangomo atta. (I could fill in the most of the letters in the worksheets. But when putting the cards in order while listening to three letters, there were words I didn’t know.)

ID 17: *R, L, C, K* no hatsuonmo waku youninatte machigaimo sukunaku natta.

Jibunde purintoni tsukurukotoga dekiruyouni natta. Demo tango-kādo de Kawai-senseiga ittanowo naraberunoga umaku dekizuni nakanaka ippatsude seikou dekimasen. (I became able to tell the difference between *R* and *L*, and *C* and *K*.

The number of errors has become fewer. I can put letters in the worksheet. But I really could not put the cards in order well when Mrs. Kawai pronounced the words.)

ID 83: Tangono mondai (Sensei ga iu tango no anaume) wa daitai dekiruyouni natta.... demo senseino iu kotobawo naraberu mondaiwa muzukashikatta desu. (I could do most of the questions in the worksheets...but questions where the teacher pronounces and we put letter-cards in order were difficult.)

The participants who made these comments regarding these class activities seemed to employ their own “can-do” scales in order to self-evaluate their improvements by confirming how much they could do and could not do. In addition, it was interesting that I did not find any comments regarding this self-evaluation which compared their own achievements with other participants although Alphabet card activity was conducted in pairs. Although the degree of the participants’ understanding and improvements of the target sounds may have differed in how much they were able to describe their problems, there was a tendency in their reflection notes to try to describe their own issues and improvements individually.

Then, there was a question of how the participants had become better in perceiving and producing the target sounds. The comments from the participants who wrote their improvement were carefully analyzed. Some participants stated that their caution made it possible for them to perform auditory discrimination of the target paired sounds. The following four participants in Excerpt 12 compared themselves when watching or not watching my mouth movements and described the different states of auditory discrimination.

Excerpt 12.

ID 82: *R* to *L* wa senseino kuchino katachiwo mitara wakaruyouni nattakedo otodake kiitemo mada yoku wakaranai. (I became able to discriminate *l* and *r* if I looked carefully at the teacher's mouth. But if I listened to the two sounds without looking, it was still hard for me.)

ID 87: Maeto kuraberuto *r* to *l* dattari *b* to *v* dattari rikai dekiruyouni narimashita. Senseiga hatsuonshite irutokino kuchino katachide wakaruyouni narimashita. (I'm much better at discriminating between *r* and *l*, and *b* and *v* than before. This is because I grasped the idea from the shape of teacher's mouth when she pronounced these sounds.)

ID 8: *a* to *e* to *o* wa Kawai-senseino kuchino katachiwo mite kubetsu shitekara otodemo kubetsu dekiruyouni narimashitaga *r* to *l* wa kuchide mada kubetsuga dekimasen. (I tried to watch Mrs. Kawai's mouth carefully to see the differences between *a*, *e*, and *o*, and then I was able to distinguish these sounds. But I still cannot distinguish *r* from *l*.)

ID 76: Wakaranai tokorowa *a*, *e* no kuchino katachi dakara chigaiga wakaruyounishite kuchino katachiga mirenakutemo wakaruyouni shitai. (I know I don't understand the mouth shapes of *a* and *e*, so I want to try my best to distinguish these two sounds. In the end, I want to make myself understand these sounds without watching mouth movement but discriminate auditorily.)

These statements could be attributed to my instruction in the classroom. I had noticed that some of the participants could not discriminate the target paired phonemes, such as *l* and *r*. One day, I told them to close their eyes to see whether they could discriminate these sounds without watching my mouth movement. At that time many of

the participants had difficulty in discriminating the target pairs without watching my mouth. Since that time, every time they were told to discriminate the two sounds, they watched my face and mouth movements very carefully. In addition, I frequently attempted to explain the English sound system with a demonstration and let the participants practice and drill together with me. This teacher's consistent caution seems to have influenced their consciousness during the class. It is presumed, therefore, that this is why they wrote about this in their reflection notes. At this point, many participants probably raised their awareness level of noticing and commented later in their reflection notes that watching mouth movement was very important. Schmidt (1990) explains levels of consciousness: in Level 1, learners perceive various stimuli unconsciously, in Level 2 they are able to report verbally what they have noticed through learning, and in Level 3 they understand how to solve problems, compare cognitively, and can reflect on their own consciousness. In addition, the participants self-evaluated based on the notion of the features of English sounds. As Skehan (1998) pointed out, learners are able to extract relevant features from input through instruction. Thus, it was assumed that frequent and salient features were clear examples of bottom-up processing during the English sound instruction. The statement of ID 76 indicates that the visual aid during explicit instruction had promoted his understanding and auditory discrimination. These descriptions in the participants' reflection notes imply that L2 sound instruction needs to include a visually comprehensible articulation device system for children to facilitate their comprehension. This implies that only using a CD player does not promote L2 learners' auditory ability.

Through these interactions between the teacher and the participants, the participants probably established their learning strategy to watch the teacher's cheek muscle and mouth movement carefully. According to Scarcella and Oxford (1992),

learning strategies are defined as “specific actions, behaviors, steps, or techniques, such as seeking out conversation partners, or giving oneself encouragement to tackle a difficult language task, used by students to enhance their own learning” (p. 63). In this English sound instruction, the participants must have felt the difficulty of discriminating the target pairs when one of which did not exist in the Japanese inventory. As suggested above, they seemed to have noticed that only careful listening was not enough to enable them to discriminate of the target sounds. Oxford (1990) explains that the strategy can be useful and promote language learning when the strategy relates to L2 task, fits well with learners’ learning style, and the learners can employ the strategy effectively. Concerning the level of their English skill, it was assumed that their visual strategy was necessary for the participants to promote their ability to distinguish the similar sounds. For novice level of learners, watching the teacher’s cheek muscle and mouth movement was a simple strategy but was easy for them to carry out in the classroom. ID 85 stated that her strategy of watching the mouth movement when listening carefully helped her when working on the worksheet.

Excerpt 13.

ID 85: Senseino kuchino ugokiwo yoku mite otomo yoku kikukotode seikaisuru kakuritsuga agatta. (I tried to watch the teacher’s mouth movement very carefully and listen to the sounds at the same time. Then, I found the number of correct answers in the worksheets increased.)

While working for FBW, the participants sometimes came across the target sounds. For example, they had difficulty knowing whether to put a letter *a* or a letter *e*. I tried to exaggerate my mouth movement when teaching these similar vowels, showing

the participants how my cheek muscle moved with my tongue movement. At the same time I attempted to use simple words for explaining how to articulate English vowels. In this case, I was asking them how *bad* and *bed* were pronounced, how they were different from Japanese loan words, and to sound them out. Possibly this way of interaction between the teacher and the participants, and using teaching materials such as FBW worksheets enabled the participants to employ their strategy to promote their learning attitudes. As a result of the participants' use of the strategy, it was assumed that they attempted to apply their strategy to their own articulation of the target sounds. They stated in Excerpt 14 that they were careful of their mouth movements and finally became able to understand how to articulate these vowels.

Excerpt 14.

ID 43: Shitawo umaku tsukatte senseino hatsuonto jibunno hatsuonwo dekirudake chikazukete seikakuni iukotoga dekiruyouni narimashita. (I think I became able to move my tongue well and pronounce the sounds more accurately and closer to the teacher's pronunciation.)

ID 98: Watashiwa eigowo koeni dashitari hanashitari surukotowa gonenseino tokini kurabete jouzuni nattato omoimasu. Kuchino akekataya hatsuonno shikatanadowo ishikishite nihongoppoku naranaiyouni eigowo hanasu kotoga dekimashita. (I think sounding out English sounds and speaking English are better now than they were in Grade 5. I am conscious of how to open my mouth and, and how to pronounce, so I can now speak English without Japanese accent.)

All of the participants' statements above are responses to explicit English sound instruction based on the quantitative findings. In the process of their learning, the

participants self-judged their own level of learning and established their strategy to promote their learning. Teaching materials and classroom interaction might have helped them to employ their strategy.

2.3.4 The third analysis

These qualitative analyses have been carried out in order to clarify how the participants responded to English sound instruction. In the final step, I attempted to reanalyze the data in depth from the different points of view to clarify EFL older children's learning attitude. First, I tried to focus on the statements that seemed to be matter of course and that I had not really regarded as important. Focusing on those comments, I myself attempted to collate the participants' statements with my class notes in order to recall the atmosphere of the class rather than the context of teaching. As the reflection notes were written by answering the questions about the participants' perceptive and productive abilities of English sounds, most of their statements were objective descriptions of the degree of their understanding and achievement in the target phonemes. Thus, there were a few comments to describe the participants' "contentment of learning."

The following participants' statements simply described the "joy of learning" which made me grope for what aspects of learning the participants had been pleased with. First of all, I chose one statement, Excerpt 15, in which the participant said she was just happy to learn the difference between /ɹ/ and /l/.

Excerpt 15.

ID 45: *r* to *l* no hatsuonno chigaiga yokuwakari totemo ureshikatta desu. (I was so happy to know the difference between *r* and *l*.)

Her statement was very simple but surprised me because she had been taking English lessons after school, and I thought that what I was teaching in class was easy for her. During English lessons in the third term, it was often seen that some of the participants were performing recitation of the story that they were learning during Grade 6 English lessons. Their performance was triggered by the HRT who often asked the participants to try it out in front of the class so that they could increase their own confidence. I still remember that ID 45 often raised her hand and performed her recitation. She was probably a fast learner owing to the fact that she had a learning experience out of school. I assume, however, that her experience of recitation in English in front of the class was something that she rarely was able to experience out of school. In this point, I myself learned the way of teacher's technique from the HRT which could enhance the students' motivation. This has an important implication of the HRT's responsibility in a language classroom in an EFL formal school setting. I asked the HRT her reason for asking the participants to perform in front of the class. She answered that she wanted her students to learn that it was important to express their opinions and thoughts or what they could do. Her response to my question in Japanese version is shown in Appendix D1. It was assumed that this way of the HRT's encouragement in the classroom was motivating the participants' positive learning attitude. At this point, a question of learner difference was raised. ID 45 expressed her achievement openly with her joy of learning in the reflection notes. It is understandable that fast learners like ID 45 described their achievements through the instruction. However, there were some slow learners who described their feeling through the instruction as shown in Excerpt 16.

Excerpt 16.

ID 15: Eigono saishono mojiwo kaeru tokorowa saishowa kotaewo itemo
wakaranakute rikai dekinakattakedo imawa sugoku seichou shiteirumitaide
sukoshidakedo chotto tokuini narimashita. (As for changing the initial sound, I
didn't understand even when I looked at the answer. Now I feel that I've grown up.
It's just a little progress, but I think I am better at doing the activity.)

ID 74: Sorewa mou takusan arimasu. Gonenseini kurabete umaku nattato omotte
imasu. Kihontekina kotowa wakarimashita. (There are so many things that I've
learned. I think I'm better than I was in Grade 5. I am now able to understand the
basic things.)

These participants gained low scores in both perception and production tests. In their statements they did not specify what sounds they were able to understand better. ID 15 attempted to describe that his problem had been about phoneme recognition on the initial position of a word although he did not say what phonemes he became better at. In a hesitant manner of expression, “Sore wa mou takusan...,” what ID 74 attempted to describe in his reflection notes was surprising to me as well as the statement of ID 15. The sentence “Sore wa mou takusan arimasu” is probably connected to the next sentence “Gonensei ni kurabete umaku natta.” In this Japanese expression, ID 74 seemed to have been pleased with his improvement. I had often noticed that he had been helped by his HRT during FBW task. I was told by the HRTs that these participants were slow learners. These participants' statements “seichou” meaning growth and “sore wa mou” used to express a speaker's state of being surprised or moved by unexpected things were more moderate expressions than the direct expression of ID 45. The degree of their understanding of the target sounds might not be same level

as fast learners. However, it was assumed from their notes that their attitude toward the English sound instruction had turned positive and they probably had gained self-confidence to some degree at some point after a certain period of time to understand the target sounds. Maybe it took them longer to understand the basic onset and coda sounds than the other participants. However, the participants' expressions have an important implication for language teachers about an issue of dealing with individual difference in EFL formal school setting.

In this stage of analysis, I also found that there were meta-linguistic statements in the reflection notes that described something that had not been focused in the English lessons or something that I had not intended to teach. From the first reading of their statements, I really did not notice, but when I read them many times, I found that their comments were about linguistic features of English that they seemed to have thought interesting, and which they attempted to apply to the new findings. The following participants in Excerpt 17 particularly commented on what they had noticed during the class. Each statement is followed by my interpretation of the meta-linguistic points that the participants were attempting to describe. It is understandable that the participants did not know the grammatical terms so their expressions are rather awkward.

Excerpt 17.

ID 97: Futatsume mittsumeno *r* no otoga nakanaka wakaranai. (I really don't catch the second and the third *r*.) ID 97 seems to attempt to describe the ending –er sound.

ID 20: ... Saishono ototo mannakano otono tsunagariwa roma-jito mattaku chigaukara sokomo kikatorunoga muzukashii. (... The connection of the initial sound and the middle sound is different from Roma-ji, so it's hard to catch the

sound.) ID 20 seems to be trying to find the difference between English and Roma-ji words in order to understand the word structure in English.

ID 53: Owarinootoga *p* no toki amari *p* no otoga kikoentakunaru noga mada wakaranakatta. (When *p* comes in the end, I really could not catch the *p* sound.) ID 53 seems to wonder why the ending *p* is not aspirated like the initial *p*.

ID 69: *cup*, *cop*, *cap* nadode hajimetoowariga onajidemo nakaga chigauto hokanohitoni hakkirito tsutaerukotoga dekinaikotoni kizukimashita. (I noticed that I could not tell people the word I wanted to say clearly if the middle sound was changed although the initial and ending sounds were the same like *cup*, *cop*, and *cap*.) ID 69 seemed to realize that the pronunciation of the three words which have the same initial and ending sounds depends on the changes of the vowels. At the same time she seemed to think that it was important to carry the message to others by pronouncing correctly what she wanted to say.

ID 80: “is” nado eigono aidani ireru mojinokotowo kekkou wakatte imasen. (I still don’t understand the letters which exist between the words.) ID 80 seems to describe a be-verb *is*.

With these statements stated above, these three participants noted their achievement of the English sound instruction in class as shown in Excerpt 18.

Excerpt 18.

ID 53: *l* to *r* no migiteto akarino hatsuon ga wakaruyouni natta. Saisho no oto ga *a*, *u*, *o* no tokino otonochigaiga mitsukerareruyouni natta. (I became able to tell the difference between *l* and *r* meaning *right hand* and *light*. I also became able to tell the difference between *a*, *u*, and *o* when these sounds come at the initial position of

a word.)

ID 20: *L* to *R* no chigaiwa rokunenno nigakkidewa wakaranakattakedo sangakkidewa *L* to *R* no chigaiga wakaruyouni narimashita. Demo mada nigatena monomo ari mannakano otono *a* to *e* wo kikitorunoga muzukashikute machigaeru kotomo takusan arimasu. (Although I could not understand the difference between *L* and *R* in the second term, I became able to tell the difference between *L* and *R* in the third term. However, there are things that I'm still poor at. It is hard for me to tell the difference between *a* and *e* in the middle position. So, I still make many mistakes.)

ID 69: “Light,” “Right” nadono hajimenootoga niteirumonono chigaiwo wakaruyouni narimashita. (I became able to tell the difference of the similar sounds like between “Light” and “Right.”)

ID 53 described the two achievements from the sound instruction as well as his finding of “*p*” sound. It was assumed that his attitude of concentrating on the target sounds to distinguish one sound from the other led him to find that the two *ps* in the different position sounded differently. ID 20 first noted her achievement in *l/r* discrimination. Then, her statement moved on to her problem of the vowels in the word-middle position. Her description admitted that she still made many mistakes when discriminating the nucleus vowels. Her comparison of roma-ji and English stated above infers her attempts to apply her linguistic knowledge to the new learning. ID 69 was actually a returnee from the U.S. and her English was native-like. She was born in the U.S. and came back to Japan when she was in Grade 4. I assume from her way of writing that she had not been conscious of her English articulation before she received English sound instruction, and she gradually was able to compare the two sounds from a

meta-linguistic point of view. In her reflection notes, she was writing those words *light* and *right* correctly. She told me that she had already passed Step 2 (Eiken). Contrary to her English proficiency level, her phonetic awareness raising of the nucleus vowels in /kVp/ (V: a vowel) perhaps led her to realize the importance of the accurate articulation of English sounds.

It was assumed that the participants had written these statements based on what they had encountered in the classroom and probably thought interesting to note, although these issues were not taught in English sound instruction. These metalinguistic statements did not seem to be completely understood by the participants. However, their focusing on aspects of such incidental issues seemed to have been nurtured by their positive learning attitudes and the active interaction between the teacher and the participants, and within the participants in the classroom. Furthermore, their age of cognitive maturity might have induced them to apply their linguistic knowledge to the incidental findings. Thus, at this point, it was a question of how the participants' attitude toward language learning can be defined with respect to their age and learning environment.

Through the analysis, there was a common tendency in the participants' statements in which they attempted to describe their level of understanding. At first glance, their statements had both positive and negative expressions in one sentence. On one hand, they affirmed what they had understood and what had improved in their learning. On the other hand, they seemed to attempt to describe the problems that they still had, and what they thought they should be careful of, and how they should make efforts to achieve their goals. In this description, they seemed to grasp what they were learning. That is to say, they seemed to self-analyze objectively from both sides. For example, the statements in Excerpt 19 described by the following two participants have

both positive and negative expressions in one sentence or in one statement.

Excerpt 19.

ID 36: Saishono *k* to *c* no machigaiga hettekikedo *a* to *e* no chigaiga mada wakaanakattadesu. *a* to *e* to *o* no chigaiga sukoshi wakattekimashita. *r* to *l* no chigaiwa mada nigate desu. Senseiga itta arufabettowo naraberunowa sukoshi dekiruyouni natteimashita. (Although the mistakes in the initial *k* or *c* have been fewer, I still don't understand the difference between *a* and *e*. But I know the difference between *a*, *e*, and *o* a little. I'm still poor at *r* and *l* discrimination. I think I could put alphabet cards a little better than before.)

ID 76: *R* to *L* no chigaiwa jugyouwo tooshite daitaiwa wakaruyouni natta. Dakedo *a*, *e*, *o* no *o* wa wakarukedo *a*, *e* no kubetsuga nigatede otono kikitoridemo hanbun machigatte shimattakara wakaruyouni shiteikitai. Soshite wakaranai tokorowa *a*, *e* no kuchino katachi dakara chigaiga wakaruyouni shite kuchino katachiga mirenakutemo wakaruyouni shitai. (Through the English lessons, I understood the difference between *R* and *L*. Although I know *o* in *a*, *e*, and *o*, I'm poor at the difference between *a* and *e*. Half of the blanks in FBW were mistakes, so I want to understand the difference. In addition, I know I don't understand the mouth shapes of *a* and *e*, so I want to try my best to distinguish these two sounds. In the end, I want to make myself understand these sounds without watching mouth shapes but discriminate auditorily.)

Although ID 36 and ID 76 statements differ from the point of level of awareness. Because ID 36 described her difficulty with *l* and *r* while ID 76 wrote that he almost understood the difference between the two sounds. Part of his statement was used to

describe the participants' strategy shown in Excerpt 12. While ID 36 stated that she roughly understood the difference of the vowels, ID 76 elaborated his errors in discriminating the similar vowels. However, from the different point of view, these statements are similar in that the two statements have both affirmative and negative expressions in one sentence. While these participants admitted being in the state of "cannot," they avoided denying themselves completely. Instead, they self-evaluated analytically their level of understanding. Like these two participants, the following two participants in Excerpt 20 also seemed to attempt to describe their state of achievement.

Excerpt 20.

ID 42: Dekiruyouni natakotowa *l* to *r* no kubetsuga hotondo kubetsudekiruyouni natta. *SH* nado kumiawasatta otowa anmari rikai dekiteinakatta. Demo *l* to *r*, *C* to *K* nadono nita tangowa hotondo bacchirini nareta. (I became able to tell the difference between *l* and *r*. I could not do well with combination sounds like *SH*. But I became perfect with words with similar sounds like *l* and *r*, *c* and *k*.)

ID 57: Rikai dekiruyouni natakotowa *L* to *R* no chigaiwo akarito migitede yatte renshushitanode dandan wakatte kimashita. Mata *a* to *e* no kubetsumo dekiruyouni narimashita. Mada wakaranai tokorowa *a* to *u* no chigaidesu. Tangono anaumede detekitatokini nandoka machigaeta kotoga arimashita. (I am now able to understand the difference between *L* and *R* because we practiced in class using a *light* and a *right hand*. I also can tell *a* from *e*. What I still don't understand is the difference between *a* and *u*. I sometimes had some mistakes in FBW worksheet.)

What is interesting here is that they were not negative: They did not deny everything. They were not affirmative: They did not affirm everything, either. It seemed

that they were rather analytical objectively to evaluate their level of understanding and achievements, and recognized their learning stage. This is probably a different learning style from younger children in the lower grader of elementary school who seem to be more intuitive than older children. The participants were cognitively mature, and this had an influence on their learning style. As one statement described by the participants had both negative and affirmative expressions, their anxiety and confidence seemed to have competed with each other in their learning of English sounds. Furthermore, their consciousness raising and internalization of their target sounds might have promoted their self-confidence which probably had reduced their anxiety through interaction in EFL classroom as described in the previous analysis. It was true that many participants described their difficulty with the target vowels that were still being taught during the third term in Grade 6. It was a concern that many of the participants' statements regarding the vowels were still negative descriptions, and their level of understanding and learning stage was probably lower than those of consonants. However, it seemed that they were all eager to achieve their goal, which was supported by the language teacher and the HRT. Although there were individual differences in the depth of learning, it can be said that the participants' self-analytic attitudes toward the English sounds had promoted their learning in a formal school EFL setting.

2.4 Conclusion

The participants' reflections suggest that these EFL older children's awareness of English phonemes was raised by the teacher's instruction and the frequent scaffolding through interaction between the teacher and the participants. As a result, their increased awareness led them to gradually grasp the features of English sounds and get an idea of how to first perceive the sounds, then articulate the sounds, and finally to produce the

sounds. Through this process, it was presumed that learners raised their level of awareness of the target sounds, employing a strategy that was simple but easy to conduct for the learners to achieve their goal. Skehan (1998) explains this process as an example of bottom-up processing in which learners are taught explicitly, and contrastively like a spiral over and over.

The analysis from a different angle of the participants' reflection notes revealed the participants' analytic attitude of learning L2 sounds due to their cognitive maturity and metalinguistic ability. At some point in their learning, they became aware of their level of understanding although the level may differ individually. Furthermore, the participants' reflections clarified some interesting points of older EFL children that were different from younger children learning L2 sounds.

These qualitative findings led to the conclusion that EFL older children construct their own strategy and execute it for achieving their goal of producing the target L2 sounds. This was particularly a necessity in the initial process of developing their receptive ability of English sounds supported by explicit instruction.

Chapter III

GENERAL DISCUSSION

This dissertation had two studies. The first study investigated quantitatively Japanese older children's receptive and productive ability of English sounds on the segmental level in an EFL setting. The second study investigated qualitatively how the participants responded to an English sound instruction taught by the researcher herself. These two studies were administered in the framework of Sequential Explanatory Design (Creswell, 2009).

First, the quantitative study was administered. In the Literature Review, the previous studies of English segments, linguistic differences between English and Japanese on the segmental level, and L1 English and L1 Japanese children's speech development were summarized, and the model of L1 English children's speech processing system proposed by Stackhouse and Wells (1997) was introduced. Five research questions were proposed in order to investigate the nature of sound processing system of older Japanese children at a novice level in a foreign language context by examining their ability to perceive and produce English sounds. Four perception tests and three oral repetition tests were conducted and analyzed through item facility (IF), and the relationship between the participants' perceptive ability and productive ability of English sounds was investigated through correlational analyses and Structural Equation Modeling Analysis. Combining the results with additional analyses of vowel quality produced by the participants in comparison with L1 English children, the quantitative study clarified as follows:

1. The participants were better at perceiving a phoneme than producing a

phoneme.

2. They have difficulty in auditory discrimination of paired consonants which sound similar to Japanese.
3. They have difficulty in both perceiving and producing English vowels.
4. Their L1 loan word knowledge has an influence on their ability to perceive and produce L2 sounds.

Second, the qualitative study was administered. Based on the results and findings of the quantitative study, English sound instruction was designed, and the qualitative analysis reported on the participants' response to the instruction. The study found that explicit L2 sound instruction and interaction between the researcher and the participants in the classroom led the participants to construct and execute their own strategy for perceiving and producing the target L2 sounds by raising their awareness level of the target sounds.

The findings in the present two studies resonate with a longitudinal study conducted by Muñoz (2006) who found that older Spanish children gained more benefits in English learning than children whose onset age of the target language was much younger when their learning environment was limited only to formal school instruction. Concerning EFL formal school setting, Muñoz (2006) raised an intriguing question of how learners whose exposure to the target language is limited only in a formal school setting and who begin the targeted language (TL hereafter) learning during the critical period are still able in the initial stages of learning to acquire the TL. In her research, Muñoz (2008) defined “instructed foreign language learning” distinguishing from naturalistic setting: First, instruction time is between two to four hours a week (The time duration of one class is approximately 50 minutes). Second,

exposure to the TL during the class is limited in quantity. Third, the TL is not a communication tool among students. Fourth, the teacher's TL is not always fluent: may have a foreign accent. Lastly, The TL is not used outside the classroom. In these conditions, Muñoz (2006) investigated four groups of different ages longitudinally: younger children (age of onset was 8), older children (age of onset was 11), adolescents (age of onset was 14), and adults (age of onset was 18 or older). In addition to various measurements, oral interviews, a picture cited narrative, a minimal pair discrimination test, and a word imitation test were conducted regarding oral perception and production in English. All the groups were tested at three different times: Time 1 (200 hours of English learning after the onset), Time 2 (416 hours after the onset), and Time 3 (726 hours after the onset). Interestingly, Muñoz (2006) did not find any long-term advantages of earlier onset in the group of younger children in the formal learning setting. Muñoz suggested that the participants' age was associated with the scores of the test due to their cognitive maturity, and suggested that even though the onset of learning English was at a younger age, the implicit learning during younger age was not effective enough to surpass older onset and cognitive maturity. Spada and Lightbown (2008) supported Muñoz's investigation (2006, 2010) that if learners' learning environment is limited only to formal school setting, older children, adolescents and adults appear to benefit from instruction. L2 older children's cognitive maturity in this study was also associated with their attitudes in the classroom. In addition, the teacher's scaffolding through explicit English sound instruction might have raised their awareness of the difference between L1 and L2 sounds.

Instruction is inevitably explicit in EFL formal school setting. Japanese older children particularly have no option but to be explicitly instructed under the extremely limited hours of instruction, which is a very different learning situation from a

naturalistic L2 setting. Ellis, N. (2002) states that language acquisition can be sped up by explicit instruction and that the initial registration of a language representation may well require attention and conscious identification. Derwing and Munro (2005) claim that explicit L2 pronunciation instruction including teaching phonological form is necessary for L2 learners even in an ESL community in order to foster their awareness of the differences between their own productions and those of proficient speakers. Thus, explicit L2 sound instruction is much more indispensable for an EFL formal school setting where the exposure to English sounds is much shorter than an ESL setting. DeKeyser (2000) estimated that a minimum of 10 years of input is necessary in the case of implicit learning if a learner aims at ultimate attainment of L2 in a naturalistic L2 setting, which converts into 18 years of formal school learning. Kersten (2015) pointed out that, while in L1 and naturalistic L2 acquisition, learners are exposed to a large amount of input, in classroom-based L2 development, this is not always the case. Gallardo del Puerto, Lecumberri, and Iragui (2009) investigated whether the age of beginning a new language at school had any effect on oral English production of Basque and Spanish bilingual children who were given English pronunciation instruction explicitly through story-based curriculum. There were three groups of children at different onset ages: 4-, 8-, and 11-year-old. Gallardo del Puerto *et al.* assessed their English production of final consonant and consonant clusters which are very different from Spanish and Basque, as to observe to what extent their pronunciation is influenced by L1. The result showed surprisingly that the older onset group (starting at the age of 11) of children was less influenced by L1 than younger onset groups (starting at the age of 4- and 8-year-old). This finding indicates that this is partly due to older children's more cognitive matureness and links to an assertion claimed by Piske, MacKay, and Fledge (2001) that children's circumstance of learning a new language and exposure to

the target language might have influenced the results. It was, however, the English sound instruction in the present study which limited the number of the target phonemes and gave the participants frequent opportunities of drill and practice that probably enabled the participants to grasp the patterns of perceiving and producing the sounds. The limitation of teaching hours was also considered as a factor influencing the participants' ability to establish their own strategy to achieve their goal.

Besides the importance of explicit sound instruction, there are some points to be discussed about the ways older children learn L2 sounds. First, it is clear that older children cannot learn without understanding meaning when teaching them L2 sounds. It should be noted that quite a number of participants wrote in their reflection notes that they seemed dissatisfied even though they were able to produce the target L2 sounds through the instruction. They wrote that they wanted to know the meaning of the words which contained the target sounds. The two participants in the following examples show their unsatisfactory states of learning L2 sounds as shown in Excerpt 21.

Excerpt 21.

ID 82: *a b c no kadowo narabete tangowo tsukurunomo daitaiwa dekirukedo imiga wakaranakara imiga wakaruyouni naritai.* (I can now make words using alphabet cards. But, I want to know the meaning of the words.)

ID 31: *Sensei no hatsuonsuru tangowo kikitotte kaku kotowa daitai dekiruyouni nattakeredo sonotangono imiga wakaranai baaiga ooito omotta.* (Although I can almost put letters in the blanks as the teacher pronounces, I think I do not know the meaning of the word.)

These statements indicate that teaching only L2 sounds to older children is not

their way of learning, which may be different from younger children learning L2 sounds. The older children did not feel they were learning when they did not know the meaning. Thus, the tendency of their meaning-dependency in the EFL classroom agrees with the SEM analysis that the factor loadings of non-word tests in both perception and production were much lower than those of other tests, although the result showed that the data adequately fitted the proposed model. The result supported the finding that perceptive ability affects productive ability. For the L2 Japanese older children, however, the Non-word Perception Test and the Non-word Repetition Test might have been something totally different from perceiving and producing English sounds. This suggests that their motor program had not worked in the same way as for English sounds. Therefore, meaning is very much associated with L2 older children's internalization of learning L2 sounds.

Second, it was clear that EFL older children established their own strategy in order to master L2 sounds, which is definitely different from the style of younger children learning a new language. This finding is perhaps related to the fact that the participants were at pre-puberty age and cognitively mature enough to develop their own strategy for learning a new language. The participants tended to be pleased to learn L2 sounds and to evaluate their level of learning analytically.

Third, older children's learning of L2 sounds can be taught with letter-sound correspondence. In short, it is better to introduce letters together with sounds to L2 older children in teaching English phonemes. As indicated in the qualitative study, it was natural for the participants to be taught L2 sounds with L2 letters in view of their maturity and high literacy skills in L1 orthography. The model used for this investigation was constructed to find any cause of speech and literacy difficulties of L1 English children, based on the notion that speech processing system of a child develops

dichotomously into spoken and written language (Stackhouse & Well, 1997). In the procedure of L1 sound acquisition, it is understandable that a child's correct articulation of the target phoneme may influence the child's ability to read aloud the letter corresponding to the target phoneme. If either perceiving or producing the target phoneme has something wrong, the child may not be able to acquire the appropriate sound of the phoneme. Thus, although this study did not investigate L2 older children's basic ability of English literacy, the researcher observed while teaching them English sounds in classrooms that the participants were conscious of the association between L2 sounds and letters which definitely facilitated their L2 sounds acquisition.

These notions of learners' sensitivity to L2 linguistic features lead back to the starting point of this investigation where I had often noticed that some children acquire L2 English sounds quickly but others do not. Through the analysis of the participants' perceptive and productive ability of English sounds, it seemed that their test scores might be related to their academic abilities and L1 abilities. The elementary school teachers with whom I worked on this project agreed that the participants who gained low scores in both perception and production tests were mostly slow learners in other subjects. While teaching them English for two years, I also had a strong feeling as a teacher that students who speak Japanese clearly and fluently with appropriate articulation could absorb a new sound system easily. This is probably due to their auditory sensitivity that they could listen to their own produced sounds well and articulate the sounds properly.

Numerous studies have investigated whether language acquisition, especially regarding perception of linguistic sounds, has any relationship with non-linguistic sounds, such as perception of musical sounds. For example, it has been investigated that a learner who can perceive musical sounds well may discriminate linguistic sounds as

well. This is because young learners seem to use auditory analysis skills in the processing of language. Lamb and Gregory (1993) claimed that phonemic awareness skills, such as blending and segmenting, are similar to musical skills, such as rhythmic, melodic and harmonic discrimination. Anvari, Trainor, Woodside, and Levy (2002) examined the relationship between phonological awareness and music perception skills of L1 English young children between the ages of four and five years old. Anvari *et al.* found that musical perception skill may have the same auditory mechanisms associated with phonological awareness. Deutsch, Henthorn, and Dolson (2004) suggested a close relationship between linguistic sounds and non-linguistic sounds, such as tonal languages and pitch. The participants in this study were at the initial level of L2, and what they were taught in the classroom was phonemic awareness which was the same context as L1 younger children were taught in the studies of Lamb and Gregory (1993), and Anvari *et al.* (2002). A study of Finnish older children at novice level of L2 also obtained the similar results. Milovanov, Huotilainen, Välimäki, Esquef, and Tervaniemi (2007) investigated the relationship between musical aptitude and L2 pronunciation skills among Finnish children between the ages of 10 and 12 years old who were either in their first or second year of learning English and had very little understanding of the English phonemic system. Milovanov *et al.* divided the participants into two groups: a group of children with good foreign language production skills and another group of children with less-advanced production skills. The participants were asked to repeat English words after the model speaker targeting the phonemes that Finnish does not have. They also took musical aptitude tests consisting of the tasks of pitch, loudness, rhythm, time, timbre and tonal memory. The result showed that the group with good English pronunciation was significantly better than the group with less-advanced English pronunciation in tasks of pitch discrimination, timbre, rhythm, and tonality.

Milovanov *et al.* suggested that older children who were able to produce L2 sounds accurately possibly shared the same neural mechanism with musical skills. However, Bowles, Chang, and Karuzis (2015), who investigated aptitude of native English speakers for mastering L2 lexical tone of a pitch language, found a contrasting result that the language specific tests were stronger predictors of L2 aptitude than musical aptitude tests. This should be discussed from the points of the participants' age and the level of learning. Bowles *et al.* suggested that "although musicality may be important for initial learning of lexical tone contrasts, it may be less relevant for transfer of learning to new talkers once an initial level of competence with training set has been established" (p. 25). Their statement mentions that there may be appropriate aptitude tests corresponding to the stages of learning level. It is understandable that the participants in Bowles *et al.*'s study were adult learners so their cognitive matureness as well as their L1 and L2 knowledge probably attributed to the results on the L2 linguistic tests, while children at novice level in L2 may be affected by non-linguistic factors, such as their sound-sensitiveness and cognitive development.

Lastly, it should be noted that the present study indicated that the limited number of the target phonemes made it possible for the participants to raise their awareness of English sounds. One indication from the acoustical analysis in the quantitative study was that the participants' tendency in their tongue movement partly caused their difficulty in articulating some English vowels. Combining these points, only "familiarizing learners with the sounds of English" in FLA does not mean that Japanese older children can learn substantially the sounds of English. They cannot learn unless English sounds are instructed explicitly and demonstrated as the features of L2 sounds in the classroom. This may be a very simple conclusion but it is most fundamental for a beginner learner when learning a new language.

Chapter IV

CONCLUSIONS AND IMPLICATIONS

4.1 Summary of this investigation

This study investigated the nature of Japanese older children's L2 speech processing system and the possibility of teaching English sounds in an EFL primary education level. It has clarified the following points:

1. Older L2 Japanese children are better at perceiving a phoneme than producing a phoneme.
2. They have difficulty in auditory discrimination of the paired consonants which sound similar to Japanese.
3. They have difficulty in both perceiving and producing English vowels.
4. Their L1 loan word knowledge has an influence on their ability to perceive and produce L2 sounds.

Based on these findings, English sound instruction was conducted. As a result, the participants raised their awareness levels of English sounds and established their own strategies to achieve their goal. This mixed method investigation has also clarified that meaning and sound-letter association were cognitively crucial in older children's learning style.

Before conclusion, limitations, pedagogical implications, and future studies are suggested in this section.

4.2 Limitations

There are several limitations to be acknowledged in this study.

First, as this investigation was administered in an EFL school setting, it was not possible to conduct all the tests listed in the speech processing profile sheet proposed by Stackhouse and Wells (1997) due to the limitations of time that the research site could offer for the tests. In addition, although the three perceptive tests and the three productive tests were conducted at the same time, another perceptive test (the Lexical Discrimination Test) was conducted a year after the six tests had been conducted.

Second, although there were some other qualitative data along with the reflection notes, such as classroom observation notes, video-recording, and interviews with the participants, I could not use them for the qualitative analysis in this study. The method in the qualitative study should have been fully considered in addition to KJ-method in order to analyze the participants' changes in the classroom more objectively. Even though this research put more emphasis on the quantitative study, the use of multiple qualitative data collections, multiple theories, and multiple methodologies should have been considered in order to establish the affirmative validity of the qualitative analysis (Denzin, 1978; Fielding & Fielding, 1986). Furthermore, as described in the previous section, the participants' musical history in the demographic information was not used in the qualitative analysis.

Third, I was allowed to meet with the participants for 17 lessons during the academic year, which was a half of FLA, to provide them with English sound instruction. Thus, it was quite difficult for me to fully instruct English sounds in the classroom. This limitation of class hours led me to focus on a limited number of English sounds. Consequently, explicit instruction of the target pairs might have raised the participants' awareness of the English sound system more conspicuously. It also should

be noted that another half of lessons a year which was taught by the HRT and an ALT were concurrently administered within a two-year English program. Although those lessons taught by them did not focus on English sounds explicitly, the participants had opportunities to be exposed to English spoken by a native speaker of English. However, it seemed that there was no way to control the other instruction conducted by the native speaker.

Fourth, since this study was not laboratory-based but conducted at an elementary school, it cannot be denied that the acoustical environment in data collection of the participants' production was worse than laboratory-based data collection due to school noise. This caused difficulty in analyzing all the vowels acoustically produced by the participants.

Fifth, regarding the quantitative data analysis, the reliability of the Non-word Perception Test (a), and the Non-word Production Test (g) did not gain satisfactory reliability values. Another limitation was that although the three production tests were judged by the two raters in the quantitative study, IF analysis was conducted based only on Judge A's assessment.

4.3 Pedagogical implications

Five years have passed since FLA started in 2011. Although elementary school teachers who are responsible for teaching FLA seem to still be unaccustomed to teaching English to their students in the classroom, MEXT (2014) has publicized a new foreign language policy called "English Education Reform Plan corresponding to Globalization." This vision aims to "enhance English education substantially throughout elementary to lower/secondary school upon strengthening English education in elementary school in addition to further advancing English education in lower/upper

secondary school” (MEXT, 2014). According to this reform plan, pupils in the third and fourth grades in public elementary schools will have FLA one to two times a week in order to build a foundation of communication skills as the current form of FLA in the upper grades. Pupils in the fifth and six grades will receive English language class as a regular subject twice a week (70 classes a year) in order to develop their basic English language skills, in addition to the current FLA which focuses on listening and speaking to help them become more accustomed to English. In this plan, MEXT (2014) suggested that, while classroom teachers teach the middle graders, specialized language teachers should teach the upper grades.

Aiming at forming a concrete framework of English Education Reform with an eye to the Tokyo Olympics and Paralympic Games in 2020, a draft outline of the revised school curriculum guideline called “Core Curriculum” was proposed by Tokyo Gakugei University (2016). The university team commissioned by MEXT conducted a nationwide survey of the current pre-service teacher education programs in universities as well as teacher training programs in order to ensure that teachers and prospective teachers will have similar groundings in English teaching. The proposed curriculum includes what knowledge and English skills are necessary for elementary school students, and what knowledge and teaching skills for teachers and prospective teachers. “Core Curriculum” also imposed teachers and prospective teachers to improve English abilities and obtain necessary knowledge and teaching skills, such as child SLA, teacher talk, elicitation of pupils’ spoken language in English, material production, basic knowledge of phonetics, vocabulary, and grammar (Gakugei University, 2016, p. 98-101).

Although “Core Curriculum” points out that English sounds should be taught, it does not elaborate how and to what extent English sounds should be taught. This thesis

study implies that older children should be taught the English sound system explicitly, which enables pupils to promote the basic elements of reading and writing skills by learning English sounds in combination with phonemic awareness, pronunciation, and phonics. In order to implement explicit English sound instruction at an elementary school level, teacher training and pre-service teacher education are in urgent need. It is also a serious issue to train ALTs and outsourced English teachers for teaching English sounds to young learners. It seems that not only elementary school teachers but also many ALTs and Japanese teachers of English teaching young learners teach only phonics and misunderstand that teaching phonics means teaching English sounds. As Allen-Tamai (2010) points out, phonemic awareness should be taught before teaching phonics. In order to execute explicit sound instruction, the contents of English as a regular subject for the upper grade students of elementary schools should be fully considered. This study clarified that explicit sound instruction was both visually and auditorily necessary to be taught to L2 older children. The use of only a CD player in English classrooms does not always promote learners' perceptive and productive abilities of English sounds. Older children need to be taught by trained teachers who can demonstrate how to articulate the target sounds so that they can learn the proper movement of their cheek muscles and tongue in order to articulate L2 sounds. Through teaching the participants English phonemes, the researcher felt strongly that these basic skills should be taught before older children complete their primary education.

In a formal school setting where exposure to English is extremely limited, it is impossible for the child to get accustomed to L2 sounds naturally. However, it would be possible for Japanese older children to have a sufficient quantity of exposure to English sounds if English class as a regular subject meets two classes per week and they could learn English through meaningful contexts. For example, English sounds can be taught

though the vocabularies in a fairytale in which English classes can be extended to cross-curricular themes in a whole approach. If homeroom teachers and ALTs are fully trained, they will be able to utilize their teaching skills of other subjects for English lessons and consider students' comprehension of English sounds.

4.4 Suggestions for future studies

This thesis study was initially planned to investigate not only the nature of English segmental aspects but also suprasegments aspects of Japanese older children in an EFL setting. It was, however, difficult to put both segmental and suprasegmental aspects together in the thesis study. As Major (2001) claimed, if L2 learners want to master L2 native-like speech, they must master both the segmental and suprasegmental aspects of the L2 sound system. Thus, the participants' suprasegmental aspects should be measured and collated with the results of segmental research in this study. A more persuasive discussion and suggestion would be possible if an integrative study is fulfilled with suprasegmental study.

In this study, the quantitative findings led to the analysis of the vowel quality. In fact, the number of the vowels to be observed was limited, and the two observed vowels [ɪ] and [ɛ] were relatively close in tongue positions. It is expected that the future study will focus on more vowels concerning tongue positions on the condition that the precedent and successive consonants are replaced. Furthermore, only the vowel quality between the participants and L1 English children was compared through acoustical analysis in consideration of cross-linguistic views on children's segmental development. Concerning the age of the participants and L1 transfer, the comparison with adult Japanese learners of English can also be considered as a future study.

While the qualitative data taken from the classroom, such as classroom

observation notes, video-recording, and interviews with the participants, were not used in this study, it is favorable to analyze those data to deepen an insight of the participants' awareness of English sounds as a further study. The further qualitative study will have more specific and pedagogical implications in students' change of attitudes, strategies, and awareness of L2 specific features in a language classroom.

Moreover, it is hoped that individual differences and aptitude of perceiving and producing L2 sounds among older children will be clarified by investigating the relationship between musicality and L2 aptitude. Although I collected information of the participants' learning history of musical instruments as well as their learning history of English out of school, it was not included in the analysis of the present study. Thus, it will be interesting to investigate the factors of L2 older children's individual differences in perceptive and productive abilities in the near future.

4.5 Conclusion

Based on these findings, I conclude, that it is essential to develop concrete programs of teaching English sounds and letters within the framework of FLA for the upper grades of elementary school children in order to raise both their spoken and literacy abilities in English. The present formal English education at elementary school level probably uses English sounds in the classrooms but really does not teach English sounds. This study has shown the possibility of teaching sounds effectively to L2 older children.

In teaching a new language to older children, hoping that they will become good speakers as well as acquire other linguistic skills in the future, it is probable that on one hand, the basic speaking instruction is determined by their own academic and L1 abilities. However, if the English curriculum and teacher training system for English

sound instruction to promote learners' auditory and oral ability of a new language at primary school level in an EFL setting are sufficiently developed, the future of Japan will be illuminated with our children who can communicate with people all over the world in an intelligible manner.

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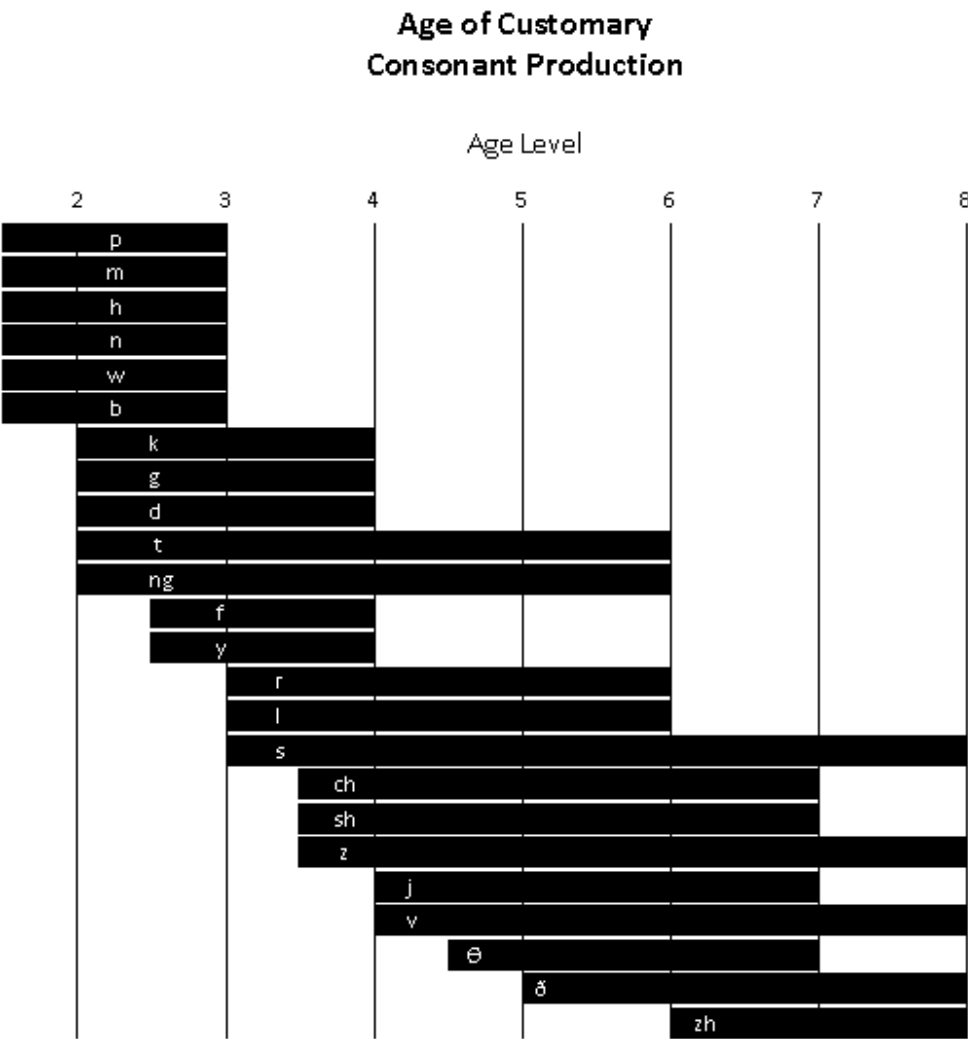
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Appendices

Appendix A (Literature Review)

Appendix A1. English Consonants (Ohtaka, 1998, p.35; Yavaş, 2006, p. 9)

place manner	Bilabial	Labio- dental	Inter- dental	Alveolar	Retroflex	Palato- alveolar	Palatal	Velar	Uvular	Pharyn- gal	Glottal
Stop	p b			t d				k g			ʔ
Fricatives		f v	θ ð	s z		ʃ ʒ					h
Affricate						tʃ dʒ					
Nasal	m			n				ŋ			
Liquid				l	ɭ						
Glide	w						j	w			



Appendix A2. Articulation Developmental Chart by American Speech and Hearing Association (1972).

Appendix A3. Grunwell's Profile of Phonological Development: Phonological System (Grunwell, 1987, pp. 116-117, 230)

Stage I . (0;9-1;6)	Nasal Labial Plosive Fricative Approximant Lingual	First words tend to show: - individual variation in consonants used; - phonetic variability in pronunciations; - all simplifying processes applicable.	Phonotactic structure
Stage II . (1;6-2;0)	m p b w n t d	Reduplication Consonant harmony FINAL CONSONANT DELETION CLUSTER REDUCTION	FRONTING of velars STOPPING GLIDING /r/ ➡ [w] CONTEXT SENSITIVE VOICING
Stage III . (2;0-2;6)	m p b w n t d (ŋ) (k g) h	Final consonant deletion CLUSTER REDUCTION	(Fronting of velars) STOPPING GLIDING /r/ ➡ [w] CONTEXT SENSITIVE VOICING
Stage IV . (2;6-3;0)	m p b n t d ŋ k g	Final Consonant Deletion CLUSTER REDUCTION	STOPPING /v ð z tʃ dʒ/ /θ/ ➡ [f] FRONTING /ʃ/ ➡ [s] Gliding /r/ ➡ [w] Context Sensitive Voicing
Stage V . (3;0-3;6)	f w s z (l) j h	Clusters appear: obs.+approx. used: /s/ clusters may occur	STOPPING /v ð/ (/z/) /θ/ ➡ [f] FRONTING of /tʃ dʒ ʃ/ Gliding /r/ ➡ [w]
Stage VI . (3;6-4;0) (4;0-4;6)	m p b f v n t d s z ŋ tʃ dʒ k g ʃ		/θ/ ➡ [ŋ] /ð/ ➡ [d] or [v] (PALATALIZATION OF /tʃ dʒ ʃ/)

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	w	l (r)	j	h		Gliding /r/ ➡ [w]	
Stage VII. (4;6<)	m	n	ŋ			(/θ/ ➡ [ŋ])	
	p b	t d	tʃ	dʒ	k g	(/ð/ ➡ [d] or [v])	
	f v	θ ð	s z	ʃ	ʒ	(/r/ ➡ [w] or [v])	
	w	l r	j	h			

Appendix A4. Articulation Development of Japanese Children

Age	Takagi & Yasuda (1967)	Noda <i>et al.</i> (1969)	Nakanishi, Ohwada, & Fujita (1972)
by 3;0			
3;0 - 3;5	w, j, m, p, t, d, g, tʃ, dʒ	j, m, t, tʃ	
3;6 - 3;11	ɸ, n	p, k, g, ʒ, ɸ	
4;0 - 4;5	ç, h, k	h, ç, n, r, ʃ	w, j, h, ç, p, b, m, t, d, n, k, g, tʃ, dʒ
4;6 - 4;11		w, d	
5;0 - 5;5		s	ʃ
5;6 - 5;11	b	ts, z	s, ts
6;0 - 6;5	dz		dz, r

Appendix B (The Quantitative Part)**Appendix B1. Tests Used in This Study**

	Test names	Level	Lexical/ Non-lexical	Test type	Aim
Perception	The Non-word Perception (a)	B	Non-lexical	Same/different (Nathan, Stackhouse, Goulondris, & Snowling, 2004; Stackhouse & Wells, 1997; M. Vance, 1995; M. Vance, Stackhouse, & Wells, 2005)	Discriminate speech sounds without reference to lexical representation.
	The Lexical Discrimination (b)	E	Lexical	Word-choice (M. Vance, 1995)	Choose the nominated word in a sentence
	The Open Oddity (c)	F	Non-lexical (for L2 children)	Odd-man-out (Allen-Tamai, 2009)	Measure the internal structure of phonological representations without reference to lexical representations.
	The End Oddity (d)	F	Non-lexical (for L2 children)	Odd-man-out (Allen-Tamai, 2009)	Measure the internal structure of phonological representations without reference to lexical representations.
Production	The Real Word Repetition (e)	I	Lexical	Repetition (M. Vance, Stackhouse, & Wells, 1995, 2005)	Measure the accuracy of produced L2 phonemes on word level with reference to lexical representations.
	The Word-in-Sentence (f)	I	Lexical	Repetition (M. Vance <i>et al.</i> , 1995, 2005)	Measure the accuracy of produced L2 phonemes on sentence level with reference to lexical representations.
	The Non-word Repetition (g)	J	Non-lexical	Repetition (Nathan <i>et al.</i> , 2004; M. Vance <i>et al.</i> , 2005)	Measure the accuracy of produced L2 phonemes on word level without reference to lexical representations.
Additional	The Auditory Word Meaning Test			(Cassidy, 2004; M. Vance <i>et al.</i> , 1995, 2005)	Verify L2 receptive word auditory knowledge

Appendix B2. Perception Tests

B2. The Lexical Discrimination Test (b)

例. あなたは犬が好きですか？ [dogs]

- ① Do you like /dɛgz/ ?
- ② Do you like /dɔgz/ ?
- ③ Do you like /dɪgz/ ?

1. あなたは歌えますか？ [sing]

- ① Can you /sɪŋ/ ?
- ② Can you /sɛŋ/ ?
- ③ Can you /suŋ/ ?

2. これはバスですか？ [bus]

- ① Is this a /bɛs/ ?
- ② Is this a /bɪs/ ?
- ③ Is this a /bʌs/ ?

3. なんと大きなお家でしょう！ [house]

- ① What a big /hɔɪs/ ?
- ② What a big /haɪs/ ?
- ③ What a big /haus/ ?

4. あのお花はきれいです。 [flower]

- ① That /flaʊər/ is pretty.
- ② That /flouɪ/ is pretty.
- ③ That /flaɪe/ is pretty.

5. あの地図を見てください。 [map]

- ① Look at that /mɛp/.
- ② Look at that /mæp/.
- ③ Look at that /mɪp/.

6. このドレスはとても美しいです。 [dress]

- ① This /dɪɛs/ is very beautiful.
- ② This /dɪæs/ is very beautiful.
- ③ This /dɪs/ is very beautiful.

7. このスカートは大きすぎます。 [skirt]

- ① This /skɔrt/ is too big.
- ② This /skout/ is too big.
- ③ This /skart/ is too big.

8. 手を挙げてください。[hand]
① Raise your /hund/.
② Raise your /hɪnd/.
③ Raise your /hænd/.
9. あなたは車を運転できますか？ [car]
① Can you drive a /kɑr/ ?
② Can you drive a /ki/ ?
③ Can you drive a /kaʊ/ ?
10. ハンバーガーが食べたいです。[hamburger]
① I want to eat a /hɛmbɪgər/.
② I want to eat a /hæmburgər/.
③ I want to eat a /hɪmbougər/.
11. トイレに行ってもいいですか？ [toilet]
① May I go to the /taʊlɪt/ ?
② May I go to the /tɒʊlɪt/ ?
③ May I go to the /tɔɪlɪt/ ?
12. あれは黄色いアヒルです。[duck]
① That is a yellow /dʌk/.
② That is a yellow /dɛk/.
③ That is a yellow /dɪk/.
13. これは新しいコンピューターです。[computer]
① This is a new /kɪmpɪtər/.
② This is a new /kəmpjʊtər/.
③ This is a new /kæmpoutər/.
14. このサンドイッチはおいしいです。[sandwich]
① This /sɪndwɪʃ/ is very delicious.
② This /sendwɪʃ/ is very delicious.
③ This /sændwɪʃ/ is very delicious.
15. そのカンガルーには赤ちゃんがいます。[kangaroo]
① The /kɛŋɡɹaɪ/ has a baby.
② The /kæŋɡəɹu/ has a baby.
③ The /kɪŋɡɹɛɪ/ has a baby.

16. このナイフを使わないでください。[knife]

- ① Don't use this /naɪf/.
- ② Don't use this /nouf/.
- ③ Don't use this /neɪf/.

17. スポンジを取ってください。[sponge]

- ① Pass me a /spɛndʒ/.
- ② Pass me a /spɪndʒ/.
- ③ Pass me a /spʌndʒ/.

18. お母さんは台所にいます。[kitchen]

- ① Mother is in the /kɪtʃən/.
- ② Mother is in the /kætʃɪn/.
- ③ Mother is in the /kɛtʃun/.

19. 電車に乗りましょう。[train]

- ① Let's get on the /tɹɔɪn/.
- ② Let's get on the /tɹɪɪn/.
- ③ Let's get on the /tɹeɪn/.

20. お金をかせぎたいです。[money]

- ① I want to get some /mɛnə/.
- ② I want to get some /mɪne/.
- ③ I want to get some /mʌnɪ/.

21. 葉っぱは木になります。[leaf]

- ① A /lɪf/ grows into a tree.
- ② A /leɪf/ grows into a tree.
- ③ A /luf/ grows into a tree.

22. 魚を食べましょう。[fish]

- ① Let's eat some /fɛʃ/.
- ② Let's eat some /fɪʃ/.
- ③ Let's eat some /fəʃ/.

23. イチローのグローブは赤いです。[glove]

- ① Ichiro's /glɪv/ is red.
- ② Ichiro's /glʌv/ is red.
- ③ Ichiro's /glɛv/ is red.

24. このブラシを使いなさい。 [brush]

- ① Use this /bɹɪʃ/.
- ② Use this /bɹʊʃ/.
- ③ Use this /bɹɪʃ/.

25. あなたは毎日走りますか? [run]

- ① Do you /ɹɛn / everyday?
- ② Do you /ɹʌn/ everyday?
- ③ Do you /ɹʌn / everyday?

Note: The following three tests are shown in 1.3.2.1 Perception tests.

The Non-word Perception Test (a)

The Open Oddity Test (c)

The End Oddity Test (d)

Appendix B3. Production Tests

Appendix B3a. The Real Word Repetition Test (e)

1. sponge (1 syllable)
2. sandwich (2 syllables)
3. hospital (3 syllables)
4. duck (1 syllable)
5. money (2 syllables)
6. umbrella (3 syllables)
7. leaf (1 syllable)
8. kitchen (2 syllables)
9. kangaroo (3 syllables)
10. knife (1 syllable)
11. flower (2 syllables)
12. computer (3 syllables)
13. train (1 syllable)
14. toilet (2 syllables)
15. hamburger (3 syllables)

(1 syllable×5, 2 syllables×5, 3 syllables×5)

(Revised from M. Vance, Stackhouse, & Wells, 1995, 2005, which was originally auditory discrimination test.)

Appendix B3b. The Word-in-Sentence Repetition Test (f)

1. The tráin is véry fást.
2. Í'm ín the tóilet.
3. Thís is a tásty hámburger.
4. The knífe is in the kíchen.
5. Wáter the flówers.
6. Úse your compúter.
7. A léaf is gréen and yéllow.
8. Kíck the kangaróo.
9. Lóok at the yéllow dúck.
10. I néed some móney.
11. Táke your umbrélla.
12. The spónge is sóft.
13. I wánt to éat some sándwich.
14. The dóctor is ín the hóspital.

(Revised from M. Vance, Stackhouse, & Wells, 1995, 2005.)

Appendix B3c. The Non-word Repetition Test (g)

1. /pləʊt/
2. /vɪn/
3. /fɛʃ/
4. /bɪŋʃ/
5. /glɛv/
6. /spɛɪdɪ/
7. /tɪɛktɪ/
8. /dʒʌlə/
9. /slɔpə/
10. /gɛtə/
11. /bætəfləʊ/
12. /spʌgɪtə/
13. /pɪdʒɔmɪz/
14. /pɛɪəʃɪt/
15. /æɪfɒnt/

(Revised from Nathan, Stackhouse, Goulondris, & Snowling, 2004; M. Vance, Stackhouse, & Wells, 2005.)

Appendix B4. The Auditory Word Meaning Test

(2枚目が児童用シート) 5分

問：これから先生が発音する単語の意味に合っていると思う日本語に○を付けてください。単語は2度発音されます。

1~15= used also in the Real Word Repetition Test / The Word-in-Sentence Repetition Test)

Test script (問題番号)

sponge	25
sandwich	12
hospital	11
duck	9
money	28
umbrella	23
leaf	29
kitchen	27
kangaroo	13
knife	17
flower	8
computer	10
train	20
toilet	7
hamburger	4
bread	30 (This item is not included in this study.)

16~30= derived words for non-words tests

(問題番号)

plate	6
van	14
fish	1
brush	19
glove	5
spider	16
tractor	24
jelly	26
slipper	22
guitar	18
butterfly	21
spaghetti	3
pajamas	15
elephant	2

立会小学校 2015 年度 6 年生外国語活動 CLASS NAME: _____

問：これから先生が発音する単語の意味に合っていると思う日本語に○をつけて下さい。単語は二度発音されます。

番号	A	B	C
1	魚	かめ	うさぎ
2	アリ	ぞう	カバ
3	スパゲッティ	温泉	スープ
4	サンドイッチ	ハンバーガー	ハム
5	バット	球	グローブ
6	お皿	おはし	フォーク
7	トイレ	ベッド	台所
8	種	木	花
9	アヒル	カラス	クジャク
10	テレビ	電話	コンピュータ
11	病院	警察署	消防署
12	砂	パン	サンドイッチ
13	コアラ	ダチョウ	カンガルー
14	バス	大型車	電車
15	バナナ	パン	パジャマ

番号	A	B	C
16	クモ	ハムスター	トラ
17	フォーク	ナイフ	スプーン
18	ピアノ	ギター	バイオリン
19	歯	ブラシ	茶色
20	飛行機	船	電車
21	バター	トンボ	ちょうちょ
22	ブーツ	スリッパ	サンダル
23	かさ	レインコート	長ぐつ
24	トラック	トラクター	電車
25	スポンジ	スポーツ	スプーン
26	ゼリー	アイスクリーム	プリン
27	お風呂	玄関	台所
28	銀行	真似をする	お金
29	種	葉っぱ	芽
30	パン	ハンバーガー	茶色

Appendix B5. Consent letter form

品川区立立会小学校 5 学年 6 学年保護者各位
早期英語学習者の英語音声研究へのご協力のお願い

平成 26 年 9 月吉日
立会小学校 5 学年 6 学年外国語活動担当
神田外語大学児童英語教育研究センター
河合 裕美
連絡先：kawai-h@kanda.kuis.ac.jp

初秋の候、ますます御健勝のこととお慶び申し上げます。日頃から立会小学校の外国語活動に対しましてご高配、ご理解いただきまして厚く御礼申し上げます。

さて、この度は早期英語学習者の英語音声習得状況を調査するため、今学期から来学期にかけて外国語活動の時間内にお子様の英語音声の録音、リスニングテストの実施、及びインタビュー実施につきましてお子様のご協力をお願いしたく、保護者様のご理解とご承諾をお願い申し上げます。今回の研究内容につきましては星野豊校長先生のご理解とご理解をいただいております。調査は日本人早期英語学習者のスピーチ処理システムを明らかにするために行うものです。

録音した音声、テスト結果、インタビュー内容につきましては研究活動のみに使用し、お子様の氏名やプライバシーについては特に配慮し、公表するようなことは一切ございません。また、お子様のご負担にならないよう、上記実施事項につきましては 5 学年 6 学年の外国語活動担当の先生方と日程調整等をご相談させていただいた上で実施する予定でございます。個別の音声録音につきましては、実施日に神田外語大学児童英語教育課程を履修修了予定の 4 年生の大学生が研修を受けた上で担当させていただきます。お子様が緊張しないよう最大限に配慮するよう研修指導いたしますので何卒ご理解の程よろしくお願い申し上げます。

つきましては、何かご不明な点がございましたら、外国語活動担当の先生、または上記河合のメールまでお問い合わせいただきますようお願い申し上げます。今年度の外国語活動がお子様にとって充実したものになりますよう全力で取り組む所存でございますので、重ねてご理解の程よろしくお願い申し上げます。

早期英語学習者の音声習得についての調査

実施時期：1 回目（10 月初旬～中旬）

2 回目（2 月下旬～3 月初旬ごろ）

実施責任者：河合裕美

実施内容：

個別音声再生テスト（音声を聞いて真似をする形式、個別にインタビューも含めて 20 分程度）

リスニング形式テスト（語彙の意味や英語の音声の聞き分けをする）

Appendix B6. The participants' Demographic Information Card

2014 立会小学校英語音声再生テスト情報カード

*このアンケートは学校の成績とは何の関係ありません。英語の研究をする上で必要ですが、お名前は他の人には知らされませんから安心してアンケートに答えてください。このアンケートを持って先生から言われた教室に行き、このアンケート用紙を係りの人に渡してください。

名前： _____ (ひらがなで)

5年・6年 () 組 () 番

年齢： _____ 才 誕生日： _____ 月

各質問に答えてください。あてはまる答えに○をつけてください。

1. あなたは放課後に音楽を習っていますか？

①習っている

②習ったことがある

③習っていない (こちらに○をつけたら6番の質問に答えてください)



2. 何の楽器 (歌も含めて) を習っていますか？ (習ったことがありますか？) 当てはまるものにすべて○をつけてください。

①ピアノ

②エレクトーン

③バイオリン

④歌

⑤ドラムなどの打楽器

⑥金管楽器 (楽器名： _____)

⑦木管楽器 (楽器名： _____)

⑧その他 (楽器名： _____)

3. いつからその楽器を習っていますか？ (習いましたか？)

() 才から

() 才から

() 才まで

4. 週 (月に) に何回習っていますか？ (習いましたか？)

週に () 回

月に () 回

5. その楽器を毎日どれくらい練習しますか？ (練習していましたか？)

①30 分以下

②30 分～1 時間

③1 時間～2 時間

④2 時間以上

次のページに質問が続きます。

6. あなたは放課後に英語を習っていますか？

①習っている

②習ったことがある

③習っていない（こちらを答えた人はこれで終わりです。）



7. 英語は何歳から習っていますか？（習いましたか？）

（ ）才

（ ）才から（

）才まで

8. 週（月に）何回ならっていますか？（習っていましたか？）

週に（ ）回

月に（ ）回

9. 英語の教室名を教えてください。（ ）

Appendix B7. Judge B's Assessments on Production Tests

IF Scores of the Real Word Repetition Test (e) Based on Judge B's Assessment (N = 103)

Item	Target	IF	Item	Target	IF	Item	Target	IF
e01	s	.99	e29	b	.98	e57	k	1.00
e02	p	.99	e30	ɹ	.38	e58	ə	.90
e03	ʌ	.95	e31	e	.83	e59	m	1.00
e04	n	.99	e32	l	.60	e60	p	.99
e05	dʒ	.78	e33	ə	.79	e61	j	.99
e06	s	.99	e34	l	.98	e62	u	.99
e07	æ	.33	e35	i	.99	e63	t	.96
e08	n	.97	e36	f	.93	e64	ə	.37
e09	d	.82	e37	k	1.00	e65	r	.35
e10	w	.67	e38	ɹ	.99	e66	t	.99
e11	ɹ	.92	e39	tʃ	.86	e67	ɹ	.87
e12	tʃ	.86	e40	ə	.88	e68	eɪ	.85
e13	h	.99	e41	n	.94	e69	n	.84
e14	ɑ	.92	e42	k	1.00	e70	t	.99
e15	s	.96	e43	æ	.54	e71	ɔɪ	.81
e16	p	.98	e44	ŋ	1.00	e72	l	.60
e17	ɹ	.97	e45	g	1.00	e73	ɹ	.47
e18	t	.92	e46	ə	.99	e74	t	.13
e19	f	.88	e47	ɹ	.39	e75	h	1.00
e20	d	1.00	e48	u	.99	e76	æ	.39
e21	ʌ	.87	e49	n	1.00	e77	m	.99
e22	k	.97	e50	aɪ	.99	e78	b	.99
e23	m	.00	e51	f	.84	e79	ə	.27
e24	ʌ	.97	e52	f	.44	e80	r	.26
e25	n	.99	e53	l	.38	e81	g	.98
e26	ɹ	.67	e54	au	.17	e82	ə	.33
e27	ʌ	.94	e55	ə	.12	e83	r	.32
e28	m	.97	e56	r	.12			

IF Scores of the Word-in-Sentence Repetition Test (f) Based on Judge B's Assessment (N = 104)

Item	Target	IF	Item	Target	IF	Item	Target	IF
f01	t	.86	f29	au	.02	f57	ɪ	.74
f02	ɪ	.24	f30	ə	.02	f58	ʌ	.69
f03	eɪ	.52	f31	r	.02	f59	m	.89
f04	n	.74	f32	k	.97	f60	b	.91
f05	t	.99	f33	ə	.21	f61	ɪ	.17
f06	oɪ	.75	f34	m	.99	f62	e	.66
f07	l	.18	f35	p	.99	f63	l	.11
f08	ɪ	.18	f36	j	.90	f64	ə	.89
f09	t	.31	f37	u	.97	f65	s	.99
f10	h	.99	f38	t	.87	f66	p	.91
f11	æ	.04	f39	ə	.09	f67	ʌ	.07
f12	m	.99	f40	r	.09	f68	n	.98
f13	b	.99	f41	l	.56	f69	dʒ	.82
f14	ə	.07	f42	i	.75	f70	s	.98
f15	r	.07	f43	f	.35	f71	æ	.03
f16	g	.96	f44	k	1.00	f72	n	.97
f17	ə	.13	f45	æ	.03	f73	d	.90
f18	r	.13	f46	ŋ	1.00	f74	w	.56
f19	n	.96	f47	g	1.00	f75	ɪ	.97
f20	aɪ	.97	f48	ə	.34	f76	tʃ	.84
f21	f	.61	f49	ɪ	.13	f77	h	.86
f22	k	.98	f50	u	.97	f78	ɑ	.38
f23	ɪ	.95	f51	d	.85	f79	s	.85
f24	tʃ	.83	f52	ʌ	.87	f80	p	.88
f25	ə	.17	f53	k	.80	f81	ɪ	.83
f26	n	.86	f54	m	.95	f82	t	.76
f27	f	.08	f55	ʌ	.98	f83	ɫ	.50
f28	l	.13	f56	n	.89			

IF Scores of the Non-word Repetition Test (g) Based on Judge B's Assessment (N = 104)

Item	Target	IF	Item	Target	IF	Item	Target	IF
g01	p	.93	g27	k	.84	g53	g	1.00
g02	l	.79	g28	t	.94	g54	ε	.84
g03	au	.83	g29	ɪ	.98	g55	t	.99
g04	t	.93	g30	dʒ	.97	g56	ə	.86
g05	v	.39	g31	ʌ	.98	g57	p	.98
g06	ɪ	.93	g32	l	.98	g58	ɪ	.96
g07	n	.98	g33	ə	.96	g59	dʒ	1.00
g08	f	.99	g34	s	.97	g60	ɔ	.68
g09	ε	.42	g35	l	.77	g61	m	1.00
g10	ʃ	.93	g36	ɔ	.92	g62	ɪ	.99
g11	b	.91	g37	p	.94	g63	z	.12
g12	ɪ	.62	g38	ə	.79	g64	p	1.00
g13	ɪ	.89	g39	g	.73	g65	ε	.97
g14	ʃ	.96	g40	ε	.94	g66	ɪ	.73
g15	g	.90	g41	t	.93	g67	ə	.97
g16	l	.91	g42	ɔ	.74	g68	ʃ	.62
g17	ε	.29	g43	b	.95	g69	ɪ	.99
g18	v	.37	g44	æ	.26	g70	t	.87
g19	s	.98	g45	t	.91	g71	æ	.10
g20	p	.98	g46	ə	.97	g72	l	.47
g21	eɪ	.60	g47	f	.94	g73	ɪ	.97
g22	d	.88	g48	l	.88	g74	f	.96
g23	ɪ	.98	g49	əʊ	.71	g75	ɒ	.98
g24	t	.87	g50	s	.98	g76	n	.92
g25	ɪ	.49	g51	p	.99	g77	t	.83
g26	ε	.55	g52	ʌ	.94			

Appendix C~D (The Qualitative Part)**Appendix C1. The Word Selection for PA Instruction****The list of animal alphabet**

a	alligator	j	jaguar	sh	sheep
b	bison	k	kangaroo	t	turtle
c	crab	l	lion	u	umbrella bird
ch	chimpanzee	m	monkey	v	vulture
d	donkey	n	numbat	w	wombat
e	elephant / emu	o	owl	x	x-ray tetra
f	flamingo	p	peacock	y	yak
g	giraffe / gorilla	q	quail	z	zebra
h	hippopotamus	r	raccoon		
i	impala	s	squirrel		

The list of action verbs

a	answer the question	j	can I join you?	s	sing together
b	bake a cake	k	keep your promise	t	taste food
c	close the door	l	listen to music	u	update information
d	dream a dream	m	mail a letter	v	visit someone
e	let's end the class	n	a napping time	w	wash the dishes
f	Fly an airplane	o	open the window	x	relax in the bath
g	get some money	p	paint the picture	y	yawn
h	someone, help me!	q	quit smoking	z	zoom up
i	imagine your future	r	read a book		

The list of loan words**No. 1 (for May 28th, 2015)**

1	アパート	apartment house	11	オランダ	Netherlands
2	ビル	building	12	オムレツ	Omelet
3	カレンダー	calendar	13	パリ	Paris
4	東京ディズニーランド	Tokyo Disneyland	14	ジェットコースター	roller coaster
5	エネルギー	energy	15	サンドイッチ	sandwich
6	ギター	guitar	16	テレビ	television
7	ハート	heart	17	ユニフォーム	uniform
8	インターネット	internet	18	バレーボール	volleyball
9	km (キロメートル)	kilometer	19	ボランティア	volunteer
10	ポスト	mail box	20	ファックス	fax (facsimile)

No. 2 (for June 4th, 2015)

1	マンション	apartment building, condominium	11	メッセージ	message
2	バドミントン	badminton	12	プリン	pudding
3	コーヒー	coffee	13	ラジオ	radio
4	デパート	department store	14	シャツ	shirt
5	デザート	dessert	15	ストライク	strike
6	エレベーター	elevator, lift	16	スーパー	supermarket
7	ピーマン	green pepper	17	テーブル	table
8	ハンバーガー	hamburger	18	バニラ	vanilla
9	イタリア	Italy	19	ビタミン	vitamin
10	キロ	kilogram	20	ゼロ	zero

No. 3 (for June 11th)

1	アレルギー	allergy	11	アルバイト	part-time job
2	ビール	beer	12	ペットボトル	plastic bottle
3	キャベツ	cabbage	13	ロボット	robot
4	ドイツ	Germany	14	セーター	sweater
5	ハンカチ	handkerchief	15	ソーセージ	sausage
6	ホテル	hotel	16	スケジュール	schedule
7	インド	India	17	マフラー	scarf
8	ケチャップ	ketchup	18	チケット	ticket
9	ノート	notebook	19	トースト	toast
10	ナイト	night game	20	バイオリン	violin

No. 4 (for June 18th)

1	エアコン	air conditioner	11	リサイクル	recycle
2	パン	bread	12	サラダ	salad
3	クリスマス	Christmas	13	シャンプー	shampoo
4	ピエロ	clown	14	ガソリンスタンド	gas station
5	ヨーロッパ	Europe	15	サラリーマン	office worker
6	コップ	glass	16	タオル	towel
7	ホース	hose	17	スキー	skiing
8	ヘリコプター	helicopter	18	バイキング	buffet
9	シュークリーム	cream puff	19	ポテトフライ	French fries
10	アルバム	album	20	(電子) レンジ	microwave

Appendix C2. PA Instruction Class Planning in Grade 6 Academic Year (April 2015 to February 2016)

During the class, story-based approach and CBA were employed as well as conducting PA instruction. Basically vocabulary in the story and CBA was used for onset-coda recognition. The boldfaced letters corresponding to the target sounds in words were focused in tasks during the class.

The following abbreviated tasks/phonemic abilities:

LS = letter-sound association

PAW = PA worksheet

VL = vocabulary learning

AC = Alphabet card activity

The types of PA abilities: ID as identification, BL as blending, DL as deletion, and MO as manipulate onset sounds.

Lesson No.	Date	Time duration (min.)	PA instruction contents	PA type	Contrastive sounds +clusters
1	April 30th, 2015	23	LS about a ~ z animals PAW as review quiz in Grade 5 (onset: m ice, s un, b all, w ood, r ice, d own, h ill, t ime, h ole, d rop, and coda: w ood, t hank, l unch)	ID ID	
2	May 28th, 2015	10	LS about loan words No.1	ID	
3	June 4th, 2015	25	LS about loan words No.2 VL (onset: persimmon, r ice b all, t ree, s prout, seed, t rade, f amily, v illage, g reedy)	ID ID	/ɪ/-/l/ /f/-/h/ /b/-/v/ clusters
4	June 11th, 2015	25	LS about loan words No.3 PAW in the theme of “Photosynthesis system” (onset: sun, s unlight, c arbon dioxide, w ater, r oots, s tem, l eaves, o xxygen, f lower, and coda: s un, s tem)	ID ID	/ɪ/-/l/ /f/-/h/ /v/-/b/
5	June 18th, 2015	25	LS about loan words No.4 PAW from story vocabulary 1 A. b ig – p ig – d ig – f ig – t wig (onset) B. c rab – c ram – c rash (coda) C. s eed – f eed – n eed – s peed (onset)	ID ID	/f/-/h/ clusters
6	June 25th, 2015	14	PAW from story vocabulary 2 A. t ree – f ree – g ree – t hree	ID	/ɪ/-/l/ /f/-/h/

			(onset) B. leaf – lead – leak – lean (coda) C. new – few – stew – chew (onset)		cluster
7	July 2nd, 2015	0			
8	October 8th, 2015	12	PAW from song vocabulary 1 A. bar – car – jar – star (onset) B. all – ball – call – fall – mall (onset) C. hand – band – land – sand – stand (onset)	ID	/f/-/h/ cluster
9	October 15th, 2015	25	PAW from song vocabulary 2 A. fun – sun – gun – bun – run (onset) B. fun – fan – fin (nucleus vowels) C. time – dime – lime (onset) PAW in the theme of “Photosynthesis system” (onset: sun, sunlight, carbon dioxide, water, roots, stem, leaves, oxygen, flower, coda: sun, stem)	ID MO for A	/f/-/h/ /ɹ/-/l/
10	October 22nd, 2015	25	LS about action verbs PAW from song vocabulary 3 A. cow – bow – now – how (onset) B. bed – bad – bud (nucleus) C. nut – but – cut – shut (onset) PAW listening group activity (onset: seed, sprout, leaves, tree, flower, fruit, and coda: seed, sprout, fruit)	ID ID	/ɛ/-/æ/-/ʌ/ /f/-/h/ /ɹ/-/l/ consonant cluster
11	October 29th, 2015	25	LS about action verbs PAW from song vocabulary 4 A. make – bake – cake – lake – snake (onset) B. show – row – grow – snow – slow (onset) C. dream – cream – scream –	ID ID MO for A.	/ɹ/-/l/ consonant cluster

			stream (onset)		
12	November 12th, 2015	14	PAW from story vocabulary 5 A. jar – bar – far – star (onset) B. test – west – best – chest (onset) C. fire – tire – wire – spire (onset)	ID MO for A and B	/f/-/h/ /ɹ/-/l/ consonant cluster
13	December 3rd, 2015	13	PAW from story vocabulary 4 A. roof – room – root (coda) B. bed – bet – beg – Ben – Beth (coda)	ID	/ɹ/-/l/ /s/-/z/-/
14	January 21st, 2016	29	AC: cat – bat – fat – hat – mat + met pet – net – get – met cap – map – lap – nap – tap PAW: onset & rime: onset + -ig, -ice, -eed rime & coda: lea + f, d nucleus vowels: bed , bad , bud	BL ID	/ɛ/-/æ/-/ʌ/ /ɹ/-/l/ /f/-/h/
15	January 28th, 2016	20	PAW as quiz (onset: stars , seed , dream , figs , hand , together , leaf , spout , tree , water , flower , light , and coda: hand) AC: can – fan – man – pan – ran sun – fun – run big – pig – fig – wig	ID BL	/ɛ/-/æ/-/ʌ/ /ɹ/-/l/ /f/-/h/ consonant cluster
16	February 4th, 2016	0	The class was cancelled because the researcher had the flu.		
17	February 20th, 2016	24	PAW as quiz (onset: fly , help , relax , mail . sing, imagine , visit , zoom , listen , update , coda: help , visit , listen , wash , and nucleus vowel: nap) AC: fox – fax , pin – pen , mop – map , cap – cup , and cat – cut	ID	
	Total (min.)	309	= 40.6% of the total minutes of class lesson (765 min.)		

Appendix C3. Fill-in-blank Worksheets (FBW)

Lesson No.1

2015 年度立会小学校 6 年生英語音韻認識①

4 月 30 日音の聞き取り (「おむすびころりん」の復習)

Class: _____ NAME: _____

問：単語を聞いてあてはまる文字を入れてみましょう。単語の発音は順番通りされるわけではないのでまず意味を表す絵を探してみてくださいね。

1.

	i	c	e
--	---	---	---



7.

	o	w	n
--	---	---	---



2.

	u	n
--	---	---



8.

	i	l	l
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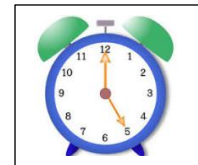
3.

	a	l	l
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9.

	i	m	e
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4.

	o	o	
--	---	---	--



10.

	o	l	e
--	---	---	---



5.

	i	c	e
--	---	---	---



11.

l	u	n		
---	---	---	--	--



6.

t	h	a	n	
---	---	---	---	--



12.

		o	p
--	--	---	---



a	b	c	d	e	f	g	h	i
j	k	l	m	n	o	p	q	r
s	t	u	v	w	x	y	z	

Lesson No. 4

2015 立会小学校 6 年生

植物の生長音韻認識プリント② June 11th

NAME: _____

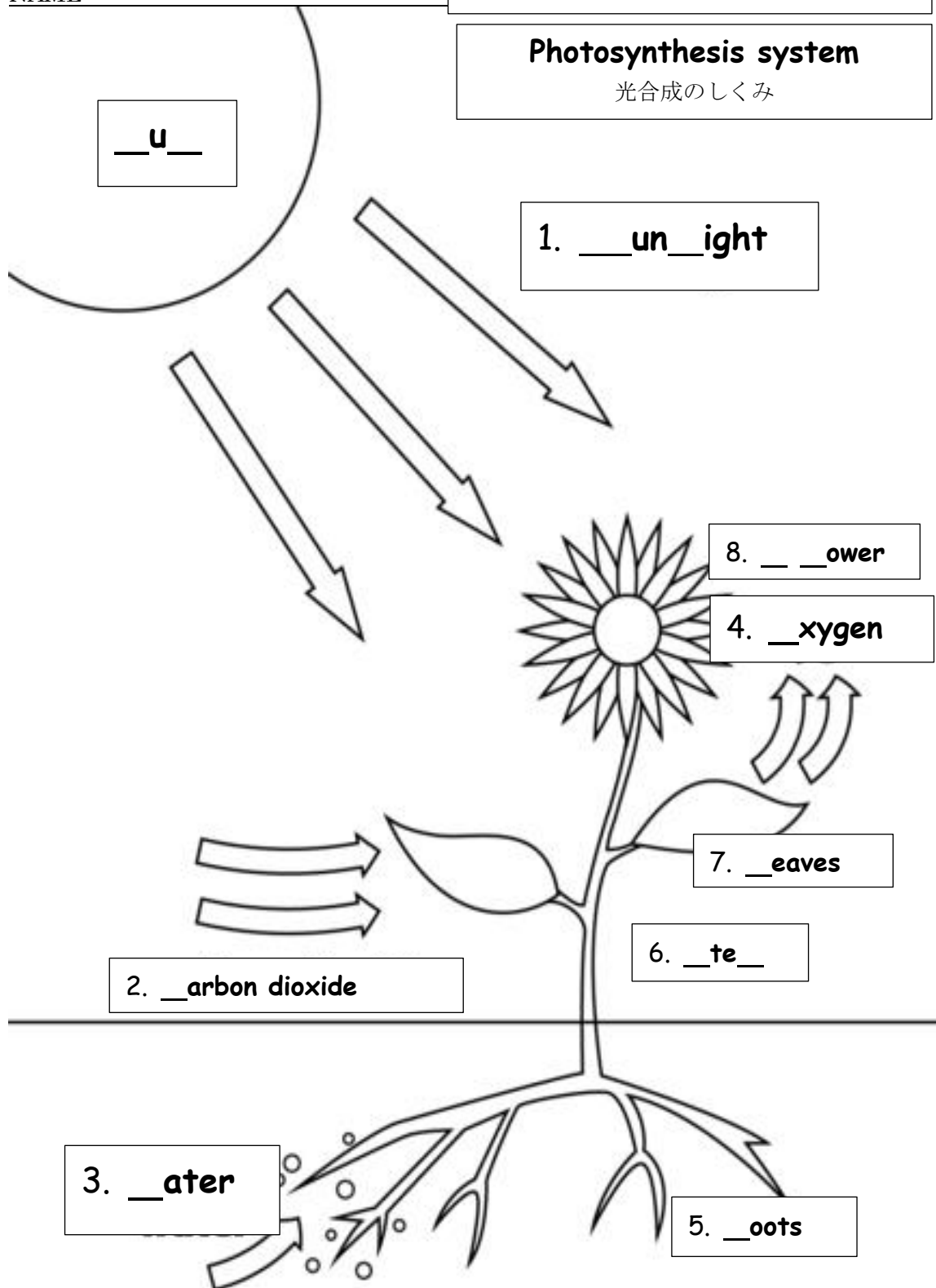
Q1 : 矢印が表しているものって何？(1~4)

Q2 : 植物の部分の名前 (5~8)

Q3 : CO₂ 削減ってどういうこと？ (日本語で)

Photosynthesis system

光合成のしくみ



Lesson No.5

立会小学校外国語活動 6 年 2015 6 月 18 日

NAME: _____

A Crab & a Monkey 音韻認識①

Let's chant together!

**Crab: Hurry up, hurry up, grow big, a persimmon seed;
come out a new sprout.**

If you don't, I'll pinch you!

最初の音を変えたら？（先生の英語の説明や発音を聞いて下のアルファベット表から文字を選んで入れてみましょう。）

A. ① <table border="1" style="display: inline-table; text-align: center;"><tr><td>b</td><td>i</td><td>g</td></tr></table> ↓ ② <table border="1" style="display: inline-table; text-align: center;"><tr><td></td><td>i</td><td>g</td></tr></table> ↓ ③ <table border="1" style="display: inline-table; text-align: center;"><tr><td></td><td>i</td><td>g</td></tr></table> ↓ ④ <table border="1" style="display: inline-table; text-align: center;"><tr><td></td><td>i</td><td>g</td></tr></table> ↓ ⑤ <table border="1" style="display: inline-table; text-align: center;"><tr><td></td><td></td><td>i</td><td>g</td></tr></table>	b	i	g		i	g		i	g		i	g			i	g	B. ⑥ <table border="1" style="display: inline-table; text-align: center;"><tr><td>c</td><td>r</td><td>a</td><td>b</td></tr></table> ↓ ⑦ <table border="1" style="display: inline-table; text-align: center;"><tr><td>c</td><td>r</td><td>a</td><td></td></tr></table> ↓ ⑧ <table border="1" style="display: inline-table; text-align: center;"><tr><td>c</td><td>r</td><td>a</td><td></td><td></td></tr></table>	c	r	a	b	c	r	a		c	r	a			C. ⑨ <table border="1" style="display: inline-table; text-align: center;"><tr><td>s</td><td>e</td><td>e</td><td>d</td></tr></table> ↓ ⑩ <table border="1" style="display: inline-table; text-align: center;"><tr><td></td><td>e</td><td>e</td><td>d</td></tr></table> ↓ ⑪ <table border="1" style="display: inline-table; text-align: center;"><tr><td></td><td>e</td><td>e</td><td>d</td></tr></table> ↓ ⑫ <table border="1" style="display: inline-table; text-align: center;"><tr><td></td><td></td><td>e</td><td>e</td><td>d</td></tr></table>	s	e	e	d		e	e	d		e	e	d			e	e	d
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Lesson No. 6

NAME: _____

A Crab & a Monkey 音韻認識②

Let's chant together!

Crab: Hurry up, hurry up, grow big, a persimmon seed!

Come out, a new sprout!

If you don't, I'll pinch you!

seed → **sprout** → **leaf** → **tree** → **fruit**

最初の音 / 最後の音を変えたら？（先生の発音を聞いて下のアルファベット表から文字を選んで入れてみましょう。）

A.				B.				C.							
①	t	r	e	e	⑤	l	e	a	f	⑨	n	e	w		
②		r	e	e	⑥	l	e	a		⑩		e	w		
③		r	e	e	⑦	l	e	a		⑪			e	w	
④			r	e	e	⑧	l	e	a		⑫			e	w

a	b	c	d	e	f	g	h	i
j	k	l	m	n	o	p	q	r
s	t	u	v	w	x	y	z	

Lesson No. 8

立会小学校外国語活動 6 年 2015 年 10 月 8 日

NAME: _____

音韻認識① **We're all in this together**

We're all in this together

Once we know

That we are

We're all stars

And we see that

We're all in this together

And it shows

When we stand

Hand in hand

Make our dreams come true

最初の音を変えたら？（先生の英語の説明や発音を聞いて下のアルファベット表から文字を選んで入れてみましょう。）

A. ① <table border="1" style="display: inline-table; text-align: center;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;">a</td><td style="width: 20px; height: 20px;">r</td></tr></table> ↓ ② <table border="1" style="display: inline-table; text-align: center;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;">a</td><td style="width: 20px; height: 20px;">r</td></tr></table> ↓ ③ <table border="1" style="display: inline-table; text-align: center;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;">a</td><td style="width: 20px; height: 20px;">r</td></tr></table> ↓ ④ <table border="1" style="display: inline-table; text-align: center;"><tr><td style="width: 20px; height: 20px;">s</td><td style="width: 20px; height: 20px;">t</td><td style="width: 20px; height: 20px;">a</td><td style="width: 20px; height: 20px;">r</td></tr></table>		a	r		a	r		a	r	s	t	a	r	B. ⑤ <table border="1" style="display: inline-table; text-align: center;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;">a</td><td style="width: 20px; height: 20px;">l</td><td style="width: 20px; height: 20px;">l</td></tr></table> ↓ ⑥ <table border="1" style="display: inline-table; text-align: center;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;">a</td><td style="width: 20px; height: 20px;">l</td><td style="width: 20px; height: 20px;">l</td></tr></table> ↓ ⑦ <table border="1" style="display: inline-table; text-align: center;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;">a</td><td style="width: 20px; height: 20px;">l</td><td style="width: 20px; height: 20px;">l</td></tr></table> ↓ ⑧ <table border="1" style="display: inline-table; text-align: center;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;">a</td><td style="width: 20px; height: 20px;">l</td><td style="width: 20px; height: 20px;">l</td></tr></table> ↓ ⑨ <table border="1" style="display: inline-table; text-align: center;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;">a</td><td style="width: 20px; height: 20px;">l</td><td style="width: 20px; height: 20px;">l</td></tr></table>		a	l	l		a	l	l		a	l	l		a	l	l		a	l	l	C. ⑩ <table border="1" style="display: inline-table; text-align: center;"><tr><td style="width: 20px; height: 20px;">h</td><td style="width: 20px; height: 20px;">a</td><td style="width: 20px; height: 20px;">n</td><td style="width: 20px; height: 20px;">d</td></tr></table> ↓ ⑪ <table border="1" style="display: inline-table; text-align: center;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;">a</td><td style="width: 20px; height: 20px;">n</td><td style="width: 20px; height: 20px;">d</td></tr></table> ↓ ⑫ <table border="1" style="display: inline-table; text-align: center;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;">a</td><td style="width: 20px; height: 20px;">n</td><td style="width: 20px; height: 20px;">d</td></tr></table> ↓ ⑬ <table border="1" style="display: inline-table; text-align: center;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;">a</td><td style="width: 20px; height: 20px;">n</td><td style="width: 20px; height: 20px;">d</td></tr></table> ↓ ⑭ <table border="1" style="display: inline-table; text-align: center;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;">a</td><td style="width: 20px; height: 20px;">n</td><td style="width: 20px; height: 20px;">d</td></tr></table>	h	a	n	d		a	n	d		a	n	d		a	n	d			a	n	d
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k	l	m	n	o	p	q	r	s	t
u	v	w	x	y	z				

Lesson No. 9

立会小学校外国語活動 6 年 2015 年 10 月 15 日

NAME: _____

音韻認識② **We're all in this together**

Together, together, together everyone

Together, together, come on lets have some **fun**

Together, were there for each other every **time**

Together together come on lets do this right

最初の音を変えたら？（先生の英語の説明や発音を聞いて下のアルファベット表

から文字を選んで入れてみましょう。）

A.			B.			C.									
①	<table border="1"><tr><td>f</td><td>u</td><td>n</td></tr></table>	f	u	n	⑥	<table border="1"><tr><td>f</td><td>u</td><td>n</td></tr></table>	f	u	n	⑨	<table border="1"><tr><td>t</td><td>i</td><td>m</td><td>e</td></tr></table>	t	i	m	e
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f	u	n													
t	i	m	e												
	↓		↓		↓										
②	<table border="1"><tr><td></td><td>u</td><td>n</td></tr></table>		u	n	⑦	<table border="1"><tr><td>f</td><td></td><td>n</td></tr></table>	f		n	⑩	<table border="1"><tr><td></td><td>i</td><td>m</td><td>e</td></tr></table>		i	m	e
	u	n													
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	i	m	e												
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③	<table border="1"><tr><td></td><td>u</td><td>n</td></tr></table>		u	n	⑧	<table border="1"><tr><td>f</td><td></td><td>n</td></tr></table>	f		n	⑪	<table border="1"><tr><td></td><td>i</td><td>m</td><td>e</td></tr></table>		i	m	e
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	u	n													

a	b	c	d	e	f	g	h	i
j	k	l	m	n	o	p	q	r
s	t	u	v	w	x	y	z	

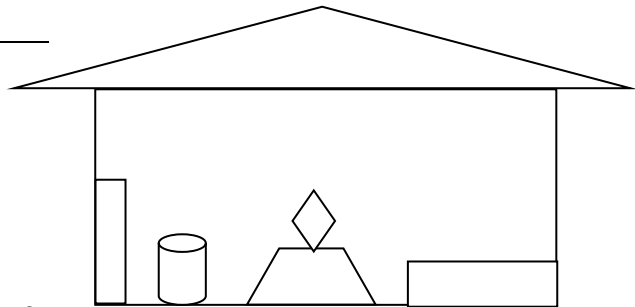
Lesson No. 10 (October 22nd, 2015)

NAME: _____

A Crab & a Monkey

音韻認識 ③

Let's chant together!



Where are they in Monkey's house?

Where is the Chestnut? It's in (on / by / under) the ~.



Chestnut

In the bed

Needle



On the roof



Wasp

by the door

Mortar



In the water jar



Cow dung

Under the fire

最初の音を変えたら？（先生の発音を聞いて下のアルファベット表から文字を選んで入れてみましょう。）

A.

①

c	o	w
---	---	---

↓

②

	o	w
--	---	---

↓

③

	o	w
--	---	---

↓

④

	o	w
--	---	---

B.

⑤

b	e	d
---	---	---

↓

⑥

b		d
---	--	---

↓

⑦

b		d
---	--	---

C.

⑧

n	u	t
---	---	---

↓

⑨

	u	t
--	---	---

↓

⑩

	u	t
--	---	---

↓

⑪

		u	t
--	--	---	---

a	b	c	d	e	f	g	h	i	j
k	l	m	n	o	p	q	r	s	t
u	v	w	x	y	z				

Lesson No. 11

立会小学校外国語活動 6 年 2015 年 10 月 29 日

NAME: _____

音韻認識③ **We're all in this together**

We're all in this together

Once we know

That we are

We're all stars

And we see that

We're all in this together

And it shows

When we stand

Hand in hand

Make our dreams come true

最初の音を変えたら？（先生の英語の説明や発音を聞いて下のアルファベット表から文字を選んで入れてみましょう。）

① <table border="1"><tr><td>m</td><td>a</td><td>k</td><td>e</td></tr></table>	m	a	k	e	⑥ <table border="1"><tr><td>s</td><td>h</td><td>o</td><td>w</td></tr></table>	s	h	o	w	⑪ <table border="1"><tr><td>d</td><td>r</td><td>e</td><td>a</td><td>m</td></tr></table>	d	r	e	a	m	
m	a	k	e													
s	h	o	w													
d	r	e	a	m												
↓	↓	↓														
② <table border="1"><tr><td></td><td>a</td><td>k</td><td>e</td></tr></table>		a	k	e	⑦ <table border="1"><tr><td>r</td><td>o</td><td>w</td></tr></table>	r	o	w	⑫ <table border="1"><tr><td></td><td>r</td><td>e</td><td>a</td><td>m</td></tr></table>		r	e	a	m		
	a	k	e													
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③ <table border="1"><tr><td></td><td>a</td><td>k</td><td>e</td></tr></table>		a	k	e	⑧ <table border="1"><tr><td></td><td>r</td><td>o</td><td>w</td></tr></table>		r	o	w	⑬ <table border="1"><tr><td></td><td></td><td>r</td><td>e</td><td>a</td><td>m</td></tr></table>			r	e	a	m
	a	k	e													
	r	o	w													
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④ <table border="1"><tr><td></td><td>a</td><td>k</td><td>e</td></tr></table>		a	k	e	⑨ <table border="1"><tr><td></td><td></td><td>o</td><td>w</td></tr></table>			o	w	⑭ <table border="1"><tr><td></td><td></td><td>r</td><td>e</td><td>a</td><td>m</td></tr></table>			r	e	a	m
	a	k	e													
		o	w													
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⑤ <table border="1"><tr><td></td><td></td><td>a</td><td>k</td><td>e</td></tr></table>			a	k	e	⑩ <table border="1"><tr><td></td><td></td><td>o</td><td>w</td></tr></table>			o	w						
		a	k	e												
		o	w													

a	b	c	d	e	f	g	h	i	j	k
l	m	n	o	p	q	r	s	t	u	v
w	x	y	z							

Lesson No. 12

NAME: _____

A Crab & a Monkey 11月12日実施

音韻認識④ Let's chant together!

Where are they in Monkey's house?

Where is the Chestnut? It's in (on / by / under) the ~.



Chestnut

In the bed

Needle



On the roof



Wasp

by the door

Mortar



In the water jar



Cow dung

Under the fire

最初の音を変えたら？（先生の発音を聞いて下のアルファベット表から文字を選んで入れてみましょう。）

A.				B.				C.							
①	j	a	r	⑤	c	h	e	s	t	⑨	f	i	r	e	
	↓				↓						↓				
②		a	r	⑥		e	s	t	⑩		i	r	e		
	↓				↓						↓				
③		a	r	⑦		e	s	t	⑪		i	r	e		
	↓				↓						↓				
④			a	r	⑧		e	s	t	⑫			i	r	e

a	b	c	d	e	f	g	h	i	j
k	l	m	n	o	p	q	r	s	t
u	v	w	x	y	z				

Lesson No. 14

NAME: _____

A Crab & a Monkey 音と文字の関係⑥ 1月21日実施

a	b	c	d	e	f	g	h	i	j
k	l	m	n	o	p	q	r	s	t
u	v	w	x	y	z				

英語の単語ってどうやってできているの？（さるかに合戦から）

何個単語ができるかな？

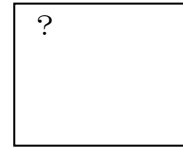
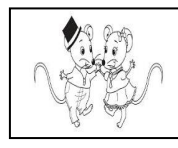
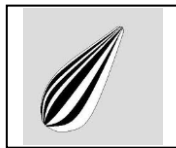
(1)

頭の音			
s	p	m	r
w	f	b	

+

-ig
-ice
-eed

= ??

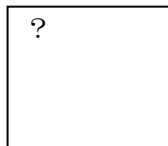
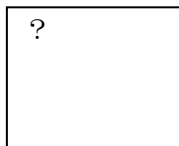


① _____

② _____

③ _____

④ _____



⑤ _____

⑥ _____

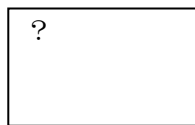
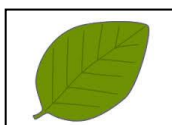
(2)

lea-

+

終わりの音	
d	f

= ??



⑦ _____

⑧ _____

(3) b

真ん中の母音

a

e

u

+d =

⑨

=

⑩

=

⑪

?

?

?

The Words Used for Alphabet card activity (Lesson 14, 15, 17)

3 文字単語 _____ _____ _____ (onset + rime)

The task was conducted in a pair.

Scatter alphabet cards on the desk (A to Z sequence if necessary)

T: pronounces sound of the letters of a word slowly. A pair of students make a three-letter word.

cat bat fat hat mat+met

pet net get met

cap map lap nap tap

can fan man pan ran

sun fun run = difficult

big pig fig wig

さるかに合戦音素認識

seed feed

sprout

leaf

tree

flower

fruit

crab

monkey

fire

bed

water

wasp

jar

roof

door

chestnut

wasp

立会小学校 6 年生外国語活動 2016
音の聞き取り②

NAME _____

16

a
e

● Listen to the teacher and write the word.

1 	bad	bed	
2 	pat	pet	
3 	man	men	
4 	pan	pen	
5 	mat	met	
6 	tan	ten	
7 	sat	set	
8 	bat	bet	
9 	lag	leg	

6

Lesson No.15

2015 年度立会小学校 6 年生英語音韻認識まとめ

2016 年 1 月 28 日 音の聞き取り (「さるかに合戦」「ハイスクールミュージカル」の復習) ①

Class: _____ NAME: _____

問: 単語を聞いてあてはまる文字を入れてみましょう。単語は順番通りに発音されません。
まず、聞いてまず意味を表す絵を探してみてくださいね。

1.

		a	r	s
--	--	---	---	---



7.

l	e	a	
---	---	---	--



2.

	e	e	d
--	---	---	---



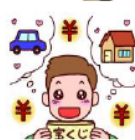
8.

		r	o	u	t
--	--	---	---	---	---



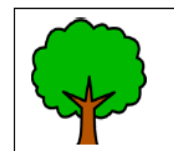
3.

	r	e	a	m
--	---	---	---	---



9.

		e	e
--	--	---	---



4.

	i	g	s
--	---	---	---



10.

	a	t	e	r
--	---	---	---	---



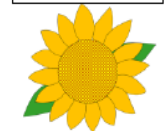
5.

	a	n	
--	---	---	--



11.

	l	o	w	e	r
--	---	---	---	---	---



6.

	o	g	t	h	e	r
--	---	---	---	---	---	---



12.

	i	g	h	t
--	---	---	---	---



a	b	c	d	e	f	g	h	i
j	k	l	m	n	o	p	q	r
s	t	u	v	w	x	y	z	

Lesson No. 17

2015 年度立会小学校 6 年生英語音韻認識まとめ
2016 年 2 月 20 日 音の聞き取り (総合復習)

Class: _____ NAME: _____

問：単語を聞いてあてはまる文字を入れてみましょう。単語は順番通りに発音されません。
まず、聞いてまず意味を表す絵を探してみてくださいね。

1. <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px; text-align: center;">l</td><td style="width: 20px; height: 20px; text-align: center;">y</td></tr></table>		l	y		7. <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px; text-align: center;">a</td><td style="width: 20px; height: 20px;"></td></tr></table>		a							
	l	y												
	a													
2. <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px; text-align: center;">e</td><td style="width: 20px; height: 20px; text-align: center;">l</td><td style="width: 20px; height: 20px;"></td></tr></table>		e	l			8. <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px; text-align: center;">i</td><td style="width: 20px; height: 20px; text-align: center;">s</td><td style="width: 20px; height: 20px; text-align: center;">i</td><td style="width: 20px; height: 20px;"></td></tr></table>		i	s	i				
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	e	l	a	x										
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	a	i	l											
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	i	n	g											
	p	d	a	t	e									
6. <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 20px; height: 20px; text-align: center;">i</td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px; text-align: center;">a</td><td style="width: 20px; height: 20px; text-align: center;">g</td><td style="width: 20px; height: 20px; text-align: center;">i</td><td style="width: 20px; height: 20px; text-align: center;">n</td><td style="width: 20px; height: 20px; text-align: center;">e</td></tr></table>	i		a	g	i	n	e		12. <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 20px; height: 20px; text-align: center;">w</td><td style="width: 20px; height: 20px; text-align: center;">a</td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr></table>	w	a			
i		a	g	i	n	e								
w	a													

a	b	c	d	e	f	g	h	i
j	k	l	m	n	o	p	q	r
s	t	u	v	w	x	y	z	

Appendix D1. The Comments from the HRT in Japanese Version.

1. The comments about what she told the participants when she let them wrote their reflection notes in the third term. This comment was written in her mail on May 7th, 2016.

Question: Please tell me how you let the students write the reflection notes. How long did they write?

質問：振り返りを書かせた状況についてお話しください。どれくらいの時間を使って、どのように子供たちに質問して書かせましたか？授業ごとの振り返りを見せながら書かせたのですか？

「振り返りの件ですが、今までの振り返りを見ながら、書かせました。子供達には、より具体的に書くように言いました。例えば、自分がいつも間違えるのは、どの発音？だとか、前に比べてわかるようになったのは、どんなこと？とか、まだまだなのは、どんなこと？など、詳しく書いてね～と言いました。振り返りは2月の最後の授業（45分間）で河合先生が音声を録音されている間に書かせました。特にこう書きなさいとは全く言っていません。」（2016年5月7日）

2. The comments about her class management during English lessons. This comment was written in her mail on May 7th, 2016.

Question: I remember you often asked your students during English lessons to perform the retelling story in front of the class. Why did you do that? Did you have any intention for this?

質問：授業中によく子供たちにみんなの前でできる人？と聞かれてましたよね？

なぜそのような質問をされていたのか教えてください。何か目的はあったのでしょうか？

「みんなの前で発表することで、自分はできているアピールしたい児童がいること。できているという認識が甘く、とにかくみんなの前でしゃべりたい児童。あの程度でみんなの前でしゃべっていいのかと、ひいてみている児童などに、完成していなくてもいいから、発表が大事と教えたい。発表する勇気を讃えたいという感じですかね。」（2016年5月7日）

Appendix D2. The Excerpts in Japanese Version.

Excerpts 1

ID 6: 聞き取りはできるようになってきたけれど、言うのは、まだそんなにできない。

ID 7: 英語の音で、どちらを使うのか少しずつわかるようになったけど口に出して言う時に、まちがえてしまうことです。

ID 25: 英語の音が聞きとれるようになったけど、発音がいまいち理解できない。

ID71: 5年生と比べて6年生になって、聞き取りが正確になったと思うため、英語を発音する時の正確さが少しあがったと思う。でも、日本語っぽくなってしまふことがある。

Excerpt 2.

ID 73: aとeの言い方の違いがまだ、うまくできない。

ID 14: テンポのはやい歌でも、rとlやaとeのようなこまかい発音のちがいもあらわせるようになった。

Excerpt 3.

ID 4: lとrの発音の違いがまだわからない。

ID 50: Rとlのちがいがわかるようになった。VとBのちがいがまだわからないのでわかるようにしたいです。

ID 96: 「L」と「R」のちがいは聞き取れるようになったけど「V」と「b」のちがいはまだ聞き取れません。

Excerpt 4.

ID 82: 「R」と「L」は、先生の口を見たらわかるようになったけど音だけ聞いてもまだよく分らない。

ID 88: rとlの違いは、分かるようになったが、速いとまだ聞きとれなくなってしまう。

ID 34: l、rがまだまちがえることが多いです。それと「ライト」「ライト」の音のちがいがきいているとわからなくなってしまうこともあります。

ID 75: ライト（光）とライト（右）のLとRのちがいは発音のトーンの高さでわかるようになりました。

Excerpt 5.

ID66: aeとoの方もよくわからないしどう口がひらいているのかまだわかりません。でも他の音はだいぶわかるようになりました。

ID92: まだわからないのは、aとeのくべつがつかないことです。ぜんぜんできなくて口をみてもまだわからないかんじです。

ID90: lとrの区別はできるようになったが、a,e,oの特にaとeの区別が難しく感じ、なんとかできる程度です。先生が発音する時の口の形で区別することが多いです。

ID 31: rとlのちがいは五年生の時と比べて聞き取れるようになったけれど、aとeとoのちがいがよくわからない。

ID 60: ...また新たに課題ができました。A と e の違いです。ベッドを英語で書くと、bad なのか bed なのかなど少し分からないです。また、目をつぶってどっちを言っているのかと聞かれたら、自信をもって言えません。

Excerpt 6.

ID37: a と e と o は高さがどれということがあまりできない。

ID 35: a と e のくべつがあまりわかりません。a と e の長さが違うと言っていたけれど、あまり聞き取れませんでした。

ID 71: 「a」を発音する時は、口を横に引っ張って発音することがわかった。そのため、「a」と「e」と「u」は発音している人の口を見れば違いがわかるようになった。「o」はわからない。

Excerpt 7.

ID 57: 「a」と「e」の区別もできるようになりました。まだわからないところは「a」と「u」のちがいです。

ID91: 「A」と「E」、と「O」の違いがまだあまりわかっていません。また「A」と「E」はだいたいできるけど、「A」と「O」や「E」と「O」などの違いが特にわからないです。

Excerpt 8.

ID 1: カタカナになってしまうところが減りました。でもまだカタカナで言うところがあるって英語の音になっていない。

ID 34: ...でもまだカタカナのようになってしまっている所はまだ改善できていないと思います。

ID 52: ...英語がカタカナ読みになってしまった...

Excerpt 9.

ID 75: 英語をカタカナと考えず、英語は英語としてみることは発音していて感じられました。

ID 43: どうしても日本語系の発音になってしまっていたけれど、河合先生に授業をしていただいているうちに、段々先生の発音に近づけるようになりました。

ID 24: 先生の英語で日本語の外来語と英語の発音の違いについて学んだ。

ID 72: 英語の発音とカタカナを日本語で言うのは全く別のものだということがわかった。

Excerpt 10.

ID61: 私が、理解できるようになったことは、最後の音がしっかり、聞きとれるようになりました。私がまだできないところは、最初の音で、L と R が聞きとれないのでこれからちょういしていききたいと思います。

ID89: 最初の音と終わりの音をうめる問題が前に比べてまちがえる回数が減った。最初の音だけをかえて他の音はそのままの問題を次は何ができるか少しわかってきた。たまに p と q をまちがえてしまう。」

ID41: 最初の音を変えたりクイズみたいに出すのはけっこう出来るようになった。後の音を変えたりするのはまだうまくは出来ない。

ID34: 最初の文字の理解から初まったものの、最初の次の文字と最後の文字はどんな文字かが、わかるようになりました。でも、まだ、l、r がまだまちがえることが多いです。

ID11: びみように a,e,o,u のちがいが分からない。この前やった聞きとって a か e かを判断して記入するプリントでは、全問正解できなかったため、a と e のちがいを理解したい。

Excerpt 11.

ID27: その他の文字はほとんど全部プリントに正解を書けるようになった。3つ文字を並べる時には、知らない単語もあった。

ID 17:... [R]、[L]、[C]、[K]の発音もわかるようになって、まちがいも少なくなった。自分で、プリントに作ることができるようになった。でも、単語カードで、河合先生がいったのをならべるのもうまくできずに、なかなか一発で成功できません。

ID83: 単語の問題(先生の言う単語のあなうめ)はだいたいできるようになった。けれど、まだ a,e,o や r,l の違いが微妙にできないので、そこがまだわからない事の1つ。また、先生の言う言葉を並べる問題、bad、bed の違いを丸するものだとも難しかったです。

Excerpt 12.

ID82: 「R」と「L」は、先生の口を見たらわかるようになったけど音だけ聞いてもまだよく分からない。

ID87: 前と比べると、r と l だったり、b と v だったり理解できるようになりました。先生が発音しているときの口の形でわかるようになりました。

ID8: 「a」と「e」と「o」は河合先生の口の形を見て区別してから、音でも区別できるようになりましたが「r」と「l」は口でまだ区別ができません。

ID76: わからないところは a,e の口の形だからちがいがわかるようにして、口の形が見れなくてもわかるようにしたい。

Excerpt 13.

ID85: 先生の口の動きをよく見て、音もよく聞くことで正解する確率が上がった。

Excerpt 14.

ID43: 舌を上手く使って、先生の発音と自分の発音をできるだけ近づけて正確に言うことができるようになりました。

ID 98: 私は英語を声に出したり話したりすることは、5年生の時に比べて上手になったと思います。口の開け方や形、発音のしかたなどを意識して、日本語っぽくならないように英語を話すことができました。

Excerpt 15.

ID 45: r と l の発音の違いがよく分かり、とてもうれしかったです。

Excerpt 16.

ID 15: 英語の最初の文字を変えるところは最初は答えを言ってもわからなくて

りかいでできなかったけど、今はすごく成長しているみたいで少しだけちょっととくいになりました。

ID 74: それはもうたくさんあります。5年生の比べて上手くなったと思っています。今までは基本てきな事はわかりました。

Excerpt 17.

ID 97: 2 回目、3 回目の r の音がなかなかわからない。

ID20: 最初の音と真ん中の音のつながりはローマ字と全く違うから、そこも聞きとるのが難しい。

ID 53: 終わりの英語が p のときあまり p の音が聞こえなくなるのがまだわからなかった。

ID 69: cup, cop, cap など初めと終わりが同じでも、中が違くと他の人にはっきりと伝えることができないことに気付きました。

ID 80: is など英語の間にに入れる文字のことをけっこう分かっていません。

Excerpt 18.

ID 53: l と R の右手と明かりの発音が分かるようになった。最初の音が a、u、o のときの音のちがいが見つけられるようになった。

ID 20: L と R のちがいが 6 年の 2 学期ではわからなかったけど、3 学期では L と R のちがいが分かるようになりました。でもまだ苦手なものもあり、真ん中の音の a と e を聞きとるのが難しくてまちがえることもたくさんありました。

ID 69: "Light", "Right" などの初めの音が似ているものの違いを読み取ることもわかるようになりました。

Excerpt 19.

ID 36: 最初の k と c のまちがえが減ってきたけど、a と e のちがいがまだわからなかったです。a と e と o のちがいが少しわかってきました。r と L のちがいは、まだ苦手です。先生がいったアルファベットを並べるのはすこしできるようになっていました。

ID 76: R と L のちがいは授業を通して大体はわかるようになった。だけど a,e,o の o はわかるけど、a,e の区別が苦手で音の聞きとり②でも半分まちがってしまったからわかるようにしていきたい。そして、わからないところは a,e の口の形だからちがいがわかるようにして、口の形が見れなくてもわかるようにしたい。

Excerpt 20.

ID 42: できるようになったことは、「l」と「r」のくべつがほとんどくべつができるようになった。「SH」などくみ合わさった音は、あんまりりかいてきていなかった。でも「l」と「r」、「C」と「K」などの似た単語はほとんどばっちりになれた。

ID 57: 理解ができるようになったことは、「L」と「R」のちがいを明かりと右手でやって練習したのでだんだんわかってきました。また、「a」と「e」の区別もできるようになりました。まだわからないところは「a」と「u」のちがいです。単語の穴うめで出てきた時に何度かまちがえたことがありました。

Excerpt 21.

ID 82: 「a」「b」「c」のをならべて単語をつくるのもだいたい是可以るけど、意味が分らないから意味が分かるようになりたい。

ID 31: 先生の発音する単語を聞き取って書くことは、だいたい是可以るようになったけれど、その単語の意味がわからない場合が多いと思った。