A Case Study of Corrective Procedures for Defective Eastern American Speech Sounds by Native Japanese Speakers

Yumiko Yanagihara

I. Introduction

1. Statement of the Problem

If the correction of defective English speech sounds as spoken by native Japanese people can be systematically carried out within a limited term, how effective can the results be? Through correction, is it possible to find any further effective and practical procedures? These are issues the experimenter has considered for several years during her teaching career.

Japanese teachers of English often have opportunities to correct defective English speech sounds as spoken by native Japanese students in class. However these corrections are generally only temporary. After correction, some of the students become able to produce the correct speech sounds and pronounce words with the corrected speech sounds within a sentence. However, this appears to occur only a few times, and since such corrections are transient, the teacher can not fully determine if the students have actually grasped the correct pronunciation, that is, if they are able to produce and differentiate the speech sounds accurately and will do so in the future. On the other hand, there are a few students who appear unable to produce some speech sounds correctly regardless of correction and practice. It is impossible to take the amount of time that would be required to help these students.

For native Japanese students, what kind of procedures are most effective, practical and enjoyable in obtaining correct English speech

sounds as quickly and easily as possible? Using systematic and intensive approaches, rather than temporary correction, how effectively can the teacher change a student's speaking ability? This study will attempt to answer some of these questions.

2. Importance of the Study

In English teaching at junior and senior high schools in Japan, what teachers most neglect is instruction in accurate English speech sounds and correction of students' defective pronunciation. In order to pass the entrance examinations of what are considered prestigious high schools or universities, proper English pronunciation is not necessary. As a matter of fact, Japanese teachers of English and their students both neglect the study of proper spoken English. Even when corrections should be taught in class, teachers only have their students repeat words or sentences including misarticulation and sometimes ignoring their students' defective pronunciation. It is felt that teachers should never treat misar-ticulation lightly or give up on correction. To produce a speech sound correctly is to differentiate it from other speech sounds accurately. Within the limited time in English class, how should teachers deal with English speech correction, in order to give their students the ability to produce and distinguish speech sounds in addition to the pleasure of producing proper English articulation? They must design much more effective, practical and enjoyable procedures. This research documents an experiment carried out on native Japanese students in order to find effective procedures for English speech correction.

3. Review of the Literature

Kawashima(1973) presented several cases of articulation defects (both functional and organic defects) and described how to correct each case through the theory of curative instruction.

Kawashima(1975) studied six types of functional articulation defects,

proper accepted English speech sounds for speech correction, the principle for the analysis of defective English speech sounds, a general tendency of defective English speech sounds produced by native Japanese speakers, and the principle for the correction of defective English speech sounds.

Takeda(1975) studied a phonetic evaluation of General American consonant phonemes as spoken by native Japanese junior high school students.

Yamagami (1988) studied a phonetic evaluation of British and American - General American and Eastern American - vowel phonemes as spoken by native Japanese teachers of English.

4. Definitions of Terms Used

Speech sounds : Jones(1960) defined, "They are certain acoustic effects voluntarily produced by the organs of speech ; they are the result of definite actions performed by these organs."

Articulation defects : Kawashima (1973) explained, "There are two types of articulation defects ; functional defects, and organic defects. Functional defects are defects of pronunciation and the following can be listed : substitution errors, addition errors, omission errors, distortion errors, nasality errors, and inconsistency errors." As the experimenter states in section 5, this study deals with only substitution errors - the only functional defects produced by these subjects. Organic defects are produced through the organs of speech, such as disorders of the palate, the mouth, the nose, the larynx, the tongue, etc.

Speech Correction : Travis(1957) stated, "It is the professional field which deals with elimination and alleviation of speech defects, or with the development and improvement of speaking intelligibility."

5. Limitation of the Study

The experimenter adopted Eastern American English speech sounds as used by Claude M. Wise(1957). This entire study is based on Accepted

Eastern American English speech sounds. Therefore, both the analysis and the correction of defective English sounds by the subjects are limited to Accepted Eastern American English speech sounds.

The correction of defective English speech sounds in this study is limited to substitution errors because the subjects' careless mistakes and first language interference errors caused all the addition, omission and inconsistency errors. Also no nasality and distortion errors could be found in the subjects' articulation tests. The following are examples of addition, omission and inconsistency errors : (Underlined speech sounds indicate misarticulations)

1) examples of carelessness errors ; [blɔd/bɔd], [_itʃ/ritʃ], [ju3 ʊ əliɡ/ju3 ʊ əli], [glɘbs/gloʊb], [tʃ3tʃ_ʌʃ3tʃl], [brit ʃ /rit ʃ], [mɪrə_/mɪrəz], [bɪjɒŋ/bɪhaind], [kɔnə/kaʊntə], etc.

2) examples of first language interference errors ; [jʊəsɛɬʊɸ/ jʊəsɛlf], [nɛkɪst/nɛkst], [lɪtʊlʊ/lɪtəl], [næʃənəɬʊ/ næʃənəl], etc.

The correction of defective English speech sounds in this study is limited to several consonant speech sounds, [f], [v], [ʃ], [s], [θ], [ð], [l], and [r], and all vowel speech sounds, [i], [I], [ɛ], [æ], [a], [u], [ʊ], [ɔ], [ɒ], [ɑ], [ʌ], [ə] (schwa), [ə (ʌ)], and [3]. The results of the subjects' first articulation test found no necessary for the correction of the other consonant speech sounds and diphthongs. However, most of the subjects did not produce all of the vowel speech sounds perfectly but rather needed to learn all of them systematically. Therefore, the experimenter instructed the subjects in vowel sounds in the following order : front vowels, back vowels and central vowels, not necessarily in order of easiest to most difficult speech sounds.

The experimenter adopted Claude M. Wise's International Phonetic Alphabet as an English phonetic notation and the Japanese Phonetic Symbols by Phonetic Society of Japan as a Japanese phonetic notation.

6. Research Description

(1) Test Population

The test population for this study included five boys in their third year in the Control Engineering Department at Kisarazu College of Technology, a girl in her third year in the Electrical Engineering Department at Kisarazu National College of Technology, a girl in her first year and a girl in her second year at Kisarazu High School, a girl in her second year at Sodegaura High School, and a girl in her third year at Seiwa Women's High School.

They met the following criteria: all subjects were born in Chiba or Tokyo; all subjects were brought up in Chiba; all subjects were educated in Chiba; and Accepted Japanese was considered to be their native dialect.

(2) Materials

Tape Recording by Edward Foy : This tape was used as a model articulation of Accepted Eastern American English. Edward Foy, of Irish descent, was born and raised near Boston. Before university, he was educated in Ireland and then spent his university years in New York. Ireland is the birth place of Victorian English and is considered to be the origin of Eastern American English. Therefore, Edward Foy speaks pure Eastern American English.

Articulation Test : The airticulation test was a 106 word paragraph presented by Virgil A. Anderson (1953) and was designed to assess the articulation of all English consonants, vowels and diphthongs (except [ɔə]speech sounds). The following tables display the number of consonant, vowel and diphthong speech sonnds in words within the paragraph in initial, medial, and final position. Also included are the total number of the speech sounds which were analyzed using the tape recording by Edward Foy.

According to the numbers in the following tables (Table 1, Table 2,

and Table 3), the experimenter judged the paragraph to be proper as an articulation test. Of course, the ideal would be that the number of consonants, vowels and diphthongs in each position be the same, but it is impossible to find such a paragraph in normal everyday texts. Also, one problem with the table of diphthongs is that there is no word with a diphthong in the initial position. All diphthongs (except [ɔ ə] diphthongs) are located in the medial or final position. Pronouncing a speech sound in the medial position is the most difficult, next being the final position because forming the mouth in the first position and producing a speech sound is easier than doing so after another sound. Therefore, a speaker who can pronounce a speech sound in the medial or final position will generally be able to produce it in the initial position. In conclusion, the experimenter believes the paragraph is suitable as an articulation test.

Table 1. Number of Consonants Included in the Articulation Test

Consonants Position	Initial	Medial	Final	Total
[p]	4	2	2	8
[b]	8	1	1	1 0
[t]	8	6	9	2 3
[d]	1	1	8	1 0
[k]	4	4	2	1 0
[g]	3	3	1	7
[m]	2	3	1	6
[n]	3	1 8	6	2 7
[ŋ]	0	2	6	8
[f]	1	5	1	7
[v]	1	2	1	4
[θ]	3	1	2	6
[ð]	1 3	1	1	1 5
[s]	7	6	5	1 8
[z]	1	2	8	1 1
[ʃ]	3	1	1	5
[ʒ]	1	0	1	2
[h]	1	1	0	2
[tʃ]	2	1	2	5
[ʤ]	1	1	1	3
[ʍ(hw)]	1	1	0	2
[w]	5	2	0	7
[j]	7	2	0	9
[l]	3	1 0	5	1 8
[r]	5	7	0	1 2

Table 2. Number of Vowels Included in the Articulation Test

Vowels \ Position	Initial	Medial	Final	Total
[I]	3	2 6	4	3 3
[i]	1	2	0	3
[ε]	1	7	0	8
[æ]	1	3	0	4
[a]	0	2	0	2
[ɑ]	0	1	1	2
[ɒ]	0	4	0	4
[ɔ]	1	4	0	5
[ʊ]	0	2	3	5
[u]	0	3	4	7
[ʌ]	0	7	0	7
[ə](schwa)	1 4	1 3	1 1	3 8
[ɚ(ʌ)]	0	2	8	1 0
[ɜ]	0	2	0	2

Table 3. Number of Diphthongs Included in the Articulation Test

Diphthongs \ Position	Initial	Medial	Final	Total
[eɪ]	0	3	1	4
[Oʊ]	0	2	1	3
[aɪ]	0	5	0	5
[ɔɪ]	0	1	0	1
[aʊ]	0	2	0	2
[ɪə]	0	2	1	3
[εə]	0	0	2	2
[ɔə]	0	0	0	0
[ʊə]	0	2	1	3

An Introduction to Modern English Speech Communication (Part 1 Articulation and Pronunciation) : Through this entire experiment in speech correction the experimenter used the words and the sentences in Part 1 of this book. This book is written for practicing articulation of all consonant, vowel and diphthong speech sounds. For each speech sound, it introduces roughly twenty words including the given speech sounds

in each position. There are five sentences given to practice the speech sounds. Each sounds appears more than three times in each sentence.

Improving Your English Pronunciation : This book was used as a secondary text, particularly for Guessing Games as outlined in the next section.

(3) Procedure

Recording the subjects' articulation test : Each subject was given the articulation test material. They were given three minutes to read the material aloud, and were not given any help. If they found a word with which they were not familiar, they guessed the pronunciation of the word from the spelling and context. The experimenter then instructed them to read the material aloud again and recorded their speech.

Analysis of the material : First the experimenter listened to the recorded tape by Edward Foy and transcribed it. Secondly, the experimenter listened to the subjects' recordings a number of times, transcribed them and compared the subjects' transcriptions with the model one. Thirdly, she analyzed what kind of misarticulations occurred. Six descriptive classifications, as used in Takehide Kawashima's study(1988), were adopted to analyze the speech sound articulation errors. These classifications were : substitution errors, addition errors, omission errors, distortion errors, nasality errors, and inconsistency errors. Finally, the experimenter interpreted the analysis of each subject to find out which speech sounds the subject should concentrate on correcting.

Correction of defective speech sounds : The experimenter began the correction of the subjects' defectjve speech sounds based on interpretations drawn from the analysis of each articulation test. The time period of these corrections was from the end of May to the end of November 1989, with the exception of August (during which month each subject was assigned to practice consonant speech sounds as homework using a tape recorded by the experimenter). As a rule, the correction took place as

one - on - one instruction conducted at the experimenter's house once a week for an hour on weekends.

Through this correction, the experimenter adopted a method which moved from easy to more difficult speech sounds. Therefore, the corrections were conducted in the following order: from consonant speech sounds to vowels, from easy speech sounds to difficult ones(in this order, with the exception of pairs or groups, such as : [l] and [r], [s] and [θ], front, central and back vowel speech sounds, etc.), in each sound, first at the sound level, next at the word level, third at the sentence level and finally, in variation.

At the sound level, the experimenter explaind the formation of the speech sound, if necessary, and had the subject repeat the sound more than three times to check whether it was correct or not.

At the word level, the experimenter had the subject repeat words including the speech sound, in the initial position several times. The experimenter had the subjects read aloud and checked for correct pronunciation. Next, the experimenter had the subjects pronounce the word, includung the speech sound, in the final position. Then, she had them pronounce the sound in the medial position in the same way as they would prinounce the word with the speech sound in the initial position. Each subject repeated these words after the experimenter.

At the sentence level, the experimenter expained the meaning of the sentence and made sure the sound was included in the words in a given sentence, when necessary. Then, the experimenter had the subject repeat the sentence. If they could not repeat it perfectly, the experimenter had them repeat, not the whole sentence, but part of the sentence, until gradually they could repeat more words and eventually the whole sentence. For example: "the bird," "wings of the bird," "the whirring wings of the bird," and "Robert heard the whirring wings of the bird." After subjects could read the sentences three times without errors or pausing, the experimenter instructed them to practice the sentence(s) as

homework. At the beginning of the next lesson, the experimenter checked to see if the subject could read the sentences correctly and smoothly three times without pause. She used a metronome for timing. The metronome was set at 120 beats per minute. During practice, if the experimenter noticed any other misarticulations, beyond the speech sounds practiced, she tried to correct them by having the subject repeat them several times. However, if the subjects could not produce the sounds correctly, the experimenter waited for a future opportunity for further practice.

In variation, the experimenter used some easy dialogues, tongue twisters and other exercises to try and encourage the subject to produce the speech sound naturally without being self-conscious.

At the end of these speech sound corrections, the experimenter played a game of guessing the speech sound with each subject She then checked if they could correctly pronounce the speech sound. The procedure of this game is as follows : ① The experimenter prepared ten pairs of words includung speech sounds which are difficult for Japanese to differentiate, such as [z] and [ð], in the initial, final and medial position as follows : "zen-then, z's-these, bays-bathe, sues-soothe, breeze-breathe, she's-sheathe, ties-tithe, wizard-withered, teasing-teething, closing-clothing," ② The experimenter randomly said three words in one pair, such as "zen, then, then." ③ The subject was asked to guess the order and answers "1, 2, 2," if [z] is number 1 and [ð] is number 2. ④ After the subject finished answering all the pairs, they randomly said three words in one pair and the experimenter guessed and answered.

Recording the students' articulation test again : After finishing all the corrections of defective speech sounds, each subject was given the same speech articulation test material and given three minutes to read through the material aloud. If they found a word with which they were not familiar, they asked the experimenter who produced the correct

pronunciation and had them repeat it. Then, the experimenter instructed subjects to read the material aloud, and articulation was recorded on tape again.

Analysis of the material : The experimenter and two English native speakers (one born and raised in Boston and living in New York, and the other born and raised in Ottawa and living there.) listened to the recording of each subject repeatedly and transcribed them into the phonetic alphabet comparing them with the transcription of the model articulation by Edward Foy. They then followed the former analysis procedure.

Comparison of the first and second analysis : The experimenter and the two native speakers compared three second analyses, and made one second analysis for each subject. She then compared the second analysis to the first for each subject and made conclusions.

(4)   Control of Variables

The experimenter carefully selected five male subjects and five female subjects to avoid in acculate study results. All subjects met the following criterion:

Age : The ten subjects in this experiment were from sixteen to eighteen years old high school students.

Sex : The experimenter selected an equal number of each sex for this experiment.

Place of birth and native dialect : The subjects were born in Chiba or Tokyo. They were brought up and educated in Chiba.

Language training : The subjects had studied English as a foreign language for five years (the three subjects in their first year and second year each learned English before junior high school).

II. Analyses, Interprerations, & Analyses

1. Analyses of the First Articulation Test

The first articulation tests were analyzed and presented in tabular form, Table 4 ~23. Alphabetical letters in the Tables, A ~L, and i, m, f, etc., stand for the following.

A = Defective Speech Sounds

B = Misarticulation

C = Normal Articulation

D = Position in a Word

E = Misarticulation Number in the Position

F = Total Misarticulations in the Substitution

G = Total Misarticulations of the Speech Sounds

H = Position in a Word

I = Misarticulations of Speech Sounds in a Given Position

J = Normal Articulation in a Given Position

K = Total Misarticulations of Speech Sounds within the Passage

L = Total Normal Articulations of Speech Sounds within the Passage

i = initial position

m = medial position

f = final position

x = No Speech Sound within the Passage

inside of ( ) = percentage.

Table 4. Substitution Errors of Consonant Speech Sounds in the First Articulation Test by Subject 1

A	B/C	D	E	F	G	H	I/J	K	A	B/C	D	E	F	G	H	I/J	K
[r]	l/r	i	1	2	10	i	5/5 (100)	10/12 (83.3)	[ð]	z/ð	i	13	15	15	i	13/13 (100)	15/15 (100)
		m	1			m	5/7 (74.4)				m	1			m	1/1 (100)	
		f	x			f	x				f	1			f	1/1 (100)	
	ɬ/r	i	4	8													
		m	4														
		f	x														
[l]	ɬ/l	i	0	2	2	i	0/3	2/18 (11.1)	[z]	dʒ/z	i	0	1	1	i	0/1 1/2 (50)	0/11 (9.1)
		m	2			m	2/10 (20)				m	1			m		
		f	0			f	0/5				f	0			f	0/8	
[v]	b/v	i	1	2	2	i	1/1 (100)	2/4 (50)	[θ]	s/θ	i	0	2	3	i	0/3	3/6 (50)
		m	0			m	0/2				m	1			m	1/1 (100)	
		f	1			f	1/1 (100)				f	1			f	2/2 (100)	
										z/θ	i	0					
											m	0	1				
											f	1					
[m]	n/m	i	0	1	1	i	0/2	1/6 (16.6)	[s]	ʃ/s	i	0	1	1	i	0/7	1/18 (5.5)
		m	1			m	1/3 (33.3)				m	1			m	1/6 (16.6)	
		f	0			f	0/1				f	0			f	0/5	

Table 5. Substitution Errors of Vowel Speech Sounds in the First Articulation Test by Subject 1

A	B/C	D	E	F	G	H	I/J	K	A	B/C	D	E	F	G	H	I/J	K
[ə]	Jɒ / ə	i	2	8	17	i	4/14 (28.6)	17/38 (44.7)	[I]	Ji/I	i	2	7	7	i	2/3 (66.7)	7/33 (21.2)
		m	4								m	5			m	5/26 (19.2)	
		f	2								f	0			f	0/4	
	ɛ/ə	i	1	4		m	11/13 (84.6)		[æ]	Jɒ / æ	i	1	4	4	i	1/1 (100)	4/4 (100)
		m	3								m	3			m	3/3 (100)	
		f	0								f	x			f	x	
	ɔ/ə	i	0	1		f	2/11 (18.9)		[ɜ]	Jɒ: / ɜ	i	x	2	2	i	x	2/2 (100)
		m	1								m	2			m	2/2 (100)	
		f	0								f	x			f	x	
	Jɒ / ə	i	0	2					[ɑ]	Jɒ: / ɑ	i	x	1	1	i	x	2/2 (100)
		m	2								m	0					
		f	0								f	1					
	Jɒ: / ə	i	1	1						ɛ/ɑ	i	0	1	1	m	1/1 (100)	
		m	0								m	1					
		f	0								f	0			f	1/1 (100)	
	ʌ / ə	i	0	1													
		m	1														
		f	0														
[ə] (ʌ)	Jɒ / ə	i	0	1	1	i	0/2	1/6 (16.6)	[ɒ]	Jɒ / ɒ	i	x	3	3	i	x	3/4 (75)
		m	1			m	1/3 (33.3)				m	3			m	3/4 (75)	
		f	0			f	0/1				f	x			f	x	

Table 6. Substitution Errors of Consonant Speech Sounds in the First Articulation Test by Subject 2

A	B/C	D	E	F	G	H	I/J	K
[r]	l/r	i	1	4	5	i	1/5 (20)	5/12 (41.7)
		m	3			m	4/7 (57.1)	
		f	x			f	x	
	ɬ/r	i	0	1				
		m	1					
		f	x					
[l]	r/l	i	1	4	4	i	1/3 (33.3)	4/18 (22.2)
		m	3			m	3/10 (30)	
		f	0			f	0/5	
[v]	b/v	i	1	3	3	i	1/1 (100)	3/4 (75)
		m	2			m	2/2 (100)	
		f	0			f	0/1	
[θ]	s/θ	i	1	1	1	i	1/3 (33.3)	1/6 (16.7)
		m	0			m	0/1	
		f	0			f	0/2	

A	B/C	D	E	F	G	H	I/J	K
[s]	θ/s	i	2	4	4	i	2/7 (28.6)	4/18 (22.2)
		m	2			m	2/6 (33.3)	
		f	0			f	0/5	
[ð]	z/ð	i	3	3	3	i	3/13 (23.1)	3/15 (20)
		m	0			m	0/1	
		f	0			f	0/1	
[z]	dʒ/z	i	0	1	2	i	1/1 (100)	2/11 (18.2)
		m	1			m	1/2 (50)	
		f	0			f	0/8	
	ð/z	i	1	1				
		m	0					
		f	0					

Table 7. Substitution Errors of Vowel Speech Sounds in the First Articulation Test by Subject 2

A	B/C	D	E	F	G	H	I/J	K
[ə]	ɑ/ə	i	2	2	9	i	2/14 (14.3)	9/38 (23.7)
		m	0			m	7/13 (53.8)	
		f	0			f	0/11	
	ɛ/ə	i	0	5				
		m	5					
		f	0					
	ɔ/ə	i	0	1				
		m	1					
		f	0					
	ʌ/ə	i	0	1				
		m	1					
		f	0					
[ə] (ʌ)	ɑ/ʌ	i	x	4	4	i	x	4/10 (40)
		m	1			m	1/2 (50)	
		f	3			f	3/8 (38.5)	
[ɜ]	ɑ/ɜ	i	x	2	2	i	x	2/2 (100)
		m	2			m	2/2 (100)	
		f	x			f	x	

A	B/C	D	E	F	G	H	I/J	K
[ɪ]	j i/ɪ	i	2	5	5	i	2/3 (66.7)	5/33 (15.2)
		m	3			m	3/26 (11.5)	
		f	0			f	0/4	
[æ]	ɑ/æ	i	1	4	4	i	1/1 (100)	4/4 (100)
		m	3			m	3/3 (100)	
		f	x			f	x	
[ɔ]	ɑ/ɔ	i	0	1	3	i	x	3/15 (20)
		m	1			m	3/4 (75)	
		f	x			f	x	
	ɜ/ɔ	i	x	2				
		m	2					
		f	x					
[ɒ]	j ɑ/ɒ	i	x	3	3	i	x	3/4 (75)
		m	3			m	3/4 (75)	
		f	x			f	x	

Table 8. Substitution Errors of Consonant Speech Sounds
in the First Articulation Test by Subject 3

A	B/C	D	E	F	G	H	I/J	K/L	A	B/C	D	E	F	G	H	I/J	K/L
[r]	l/r	i	2	7	9	i	4/5 (80)	9/12 (75)	[s]	θ/s	i	1	1	1	i	1/7 (14.3)	1/18 (5.6)
		m	5			m	5/7 (71.4)				m	0			m	0/6	
		f	x			f	x				f	0			f	0/5	
	ɬ/r	i	2	2					[θ]	z/θ	i	1	1	1	i	1/3 (33.3)	1/6 (16.7)
		m	0								m	0			m	0/1	
		f	x								f	0			f	0/2	

Table 9. Substitution Errors of Vowel Speech Sounds
in the First Articulation Test by Suject 3

A	B/C	D	E	F	G	H	I/J	K	A	B/C	D	E	F	G	H	I/J	K
[ə]	u/ə	i	0	1	11	i	0/14	11/38 (28.9)	[a]	ʌ/a	i	x	1	1	i	x	1/2 (50)
		m	0			m	10/13 (76.9)				m	1			m	1/2 (50)	
		f	1			f	1/11 (9.1)				f	x			f	x	
	ɔ/ə	i	0	3					[æ]	ɔ/æ	i	1	3	3	i	1/1 (100)	3/4 (75)
		m	3								m	2			m	2/3 (66.7)	
		f	0								f	x			f	x	
	ɛ/ə	i	0	4					[ɒ]	ɔ/ɒ	i	x	3	3	i	x	3/4 (75)
		m	4								m	3			m	3/4 (75)	
		f	0								f	x			f	x	
	ʊ/ə	i	0	3					[ɑ]	ɛ/ɑ	i	x	1	2	i	x	2/2 (100)
		m	3								m	1			m	] 1/1 (100)	
		f	0								f	0					
[ə](ʌ)	ɔ/ə(ʌ)	i	x	2	2	i	x	2/10 (20)		ɔ/ɑ	i	x			f	1/1 (100)	
		m	0			m	0/2				m	0	1				
		f	2			f	2/8 (25)				f	1					
[ɜ]	ɔ/ɜ	i	0	2	2	i	x	2/2 (100)	[ɔ]	ɑ/ɔ	i	0	1	1	i	0/1	1/6 (16.7)
		m	2			m	2/2 (100)				m	1			m	1/5 (20)	
		f	0			f	x				f	0			f	x	
[I]	ji/I	i	2	6	6	i	2/3 (66.7)	6/36 (16.7)									
		m	4			m	4/29 (13.8)										
		f	0			f	0/4										

Table 10. Substitution Errors of Consonant Speech Sounds in the First Articulation Test by Subject 4

A	B/C	D	E	F	G	H	I/J	K	A	B/C	D	E	F	G	H	I/J	K
[l]	r/l	i m f	1 0 0	1	2	i m f	1/3 (33.3) 1/10 (10) 0/5	2/18 (11.1)	[ð]	z/ð	i m f	10 0 0	10	11	i m f	10/13 (76.9) 0/1 1/1 (100)	11/15 (73.3)
	ɫ/l	i m f	0 1 0	1						s/ð	i m f	0 0 1	1				
[ɾ]	ɫ/ɾ	i m f	3 5 x	8	8	i m f	3/5 (60) 5/7 (71.4) x	8/12 (66.7)	[θ]	s/θ	i m f	2 0 1	3	5	i	3/3 (100)	5/6 (83.3)
[v]	b/v	i m f	1 2 1	4	4	i m f	1/1 (100) 2/2 (100) 1/1 (100)	4/4 (100)		z/θ	i m f	0 0 1	1		m	0/1	
[m]	n/m	i m f	0 1 0	1	1	i m f	0/2 1/3 (33.3) 0/1	1/6 (16.7)		ʃ/θ	i m f	1 0 0	1		f	2/2 (100)	
[f]	ɸ/h	i m f	0 2 0	2	3	i	1/1 (100)	3/7 (42.9)	[s]	θ/s	i m f	1 0 0	1	1	i m f	1/7 (14.3) 0/6 0/5	1/18 (5.6)
	h/f	i m f	1 0 0	1		m f	2/5 (40) 0/1										

Table 11. Substitution Errors of Vowel Speech Sounds
in the First Articulation Test by Subject 4

A	B/C	D	E	F	G	H	I/J	K	A	B/C	D	E	F	G	H	I/J	K
[ə]	J.ɑ/ə	i m f	8 1 2	11	21	i	11/14 (78.6)	21.38 (55.3)	[I]	Ji/I	i m f	2 3 0	5	5	i m f	2/3 (66.7) 3/26) (11.5) 0/4	5/33 (15.6)
	ɛ/ə	i m f	0 3 0	3		m	8/13 (61.5)		[æ]	J.ɑ / æ	i m f	1 3 x	4	4	i m f	1/1 3/3 (100) x	4/4 (100)
	ʊ/ə	i m f	0 3 0	3					[ɑ]	J ɑ/ɑ	i m f	x 0 1	1	2	i m	x 1/1 (100)	2/2 (100)
	æ/ə	i m f	3 1 0	4		f	2/11 (18.2)			ə/ɑ	i m f	x 1 0	1		f	1/1 (100)	
[ə] (ʌ)	J.ɑ/ə	i m f	x 1 4	5	5	i m f	x 1/2 (50) 4/8 (50)	5/10 (50)	[ɔ]	Iɑ/ʊ	i m f	x 4 x	4	4	i m f	x 4/4 (100) x	4/4 (100)
[ɜ]	J.ɑ / ɜ	i m f	x 2 x	2	2	i m f	x 2/2 (100) x	2/2 (100)	[ə]	J.ɑ / ɔ	i m f	0 1 x	1	1	i m f	0/1 1/5 (20) x	1/6 (16.7)

Table 12. Substitution Errors of Consonant Speech Sounds in the First Articulation Test by Subject 5

A	B/C	D (i/m/f)	E	F	G	H (i/m/f)	I/J	K
[r]	l/r	i,m,f	0,1,x	1	11	i,m,f	5/5 (100), 6/7 (85.7), x	11/12 (91.7)
	ł/r	i,m,f	5,5,x	10				
[I]	ł/I	i,m,f	0,0,1	1	1	i,m,f	0/3, 0/10, 1/5 (20)	1/18 (5.6)
[v]	b/v	i,m,f	1,2,1	4	4	i,m,f	1/1 (100), 2/2 (100), 1/1 (100)	4/4 (100)
[f]	ɸ/f	i,m,f	0,1,0	1	1	i,m,f	0/1, 1/5 (20), 0/1	

A	B/C	D (i/m/f)	E	F	G	H (i/m/f)	I/J	K
[ð]	z/ð	i,m,f	12,0,0	12	12	i,m,f	12/13 (92.3), 0/1, 0/1	12/15 (80)
[h]	f/h	i,m,f	0,1,x	1	1	i,m,f	0/1, 1/1 (100), x	1/2 (50)
[θ]	s/θ	i,m,f	1,0,1	2	3	i,m,f	1/3 (33.3), 0/1, 2/2 (100)	3/6 (50)
	z/θ	i,m,f	0,0,1	1				
[s]	θ/s	i,m,f	0,1,0	1	1	i,m,f	0/7, 1/6 (16.7), 0/5	1/118 (5.6)

Table 13. Substitution Errors of Vowel Speech Sounds in the First Articulation Test by Subject 5

A	B/C	D (i/m/f)	E	F	G	H (i/m/f)	I/J	K
[ə]	ʃ.ɑ/ə	i,m,f	8,2,7	17	22	i,m,f	8/14 (57.1), 6/13 (46,6), 8/11 (72.7)	22.38 (57.9)
	u/ə	i,m,f	0,0,1	1				
	ɛ/ə	i,m,f	0,2,0	2				
	ʊ/ə	i,m,f	0,2,0	2				
[ə] (ʌ)	ʃ.ɑ/ə	i,m,f	x,2,6	8	8	i,m,f	x, 2/2 (100), 6/8 (75)	8/10 (80)
[з]	ʃ.ɑ/з	i,m,f	x,2,x	2	2	i,m,f	x, 2/2 (100), x	2/2 (100)
[æ]	ʃ.ɑ/æ	i,m,f	1,3,x	4	4	i,m,f	1/1 (100), 3/3 (100), x	4/4 (100)

A	B/C	D (i/m/f)	E	F	G	H (i/m/f)	I/J	K
[I]	ʃi/I	i,m,f	2,1,0	3	4	i,m,f	2/3 (66.7), 1/26 (3.8), 1/4 (25)	4/33 (12.1)
	i/I	i,m,f	0,0,1	1				
[ɑ]	ʃ.%ɑ	i,m,f	x,0,1	1	2	i,m,f	x, 1/1 (100), 1/1	2/2 (100)
	ɛ/ɑ	i,m,f	x,1,0	1				
[ɒ]	ʃ.ɑ/ɒ	i,m,f	x,3,x	3	3	i,m,f	x, 3/4 (75), x	3/4 (75)
[ɔ]	ʃ.ɑ/ɔ	i,m,f	0,2,x	2	2	i,m,f	0/1, 2/5 (40), x	2/6 (33.3)
[ʊ]	u/ʊ	i,m,f	x,1,0	1	1	i,m,f	x, 1/2 (50), 0/3	1/5 (20)

Table 14. Substitution Errors of Consonant Speech Sounds
in the First Articulation Test by Subhect 6

A	B/C	D	E	F	G	H	I/J	K
[r]	l/r	i	2	6	11	i	4/5 (80)	11/12 (91.7)
		m	4			m	7/7 (100) x	
		f	x			f		
	↓/r	i	2	5				
		m	3					
		f	x					
[l]	r/l	i	0	1	3	i	0/3	3/18 (16.7)
		m	1			m	3/10 (30) 0/5	
		f	0			f		
	↓/l	i	0	2				
		m	2					
		f	0					
[m]	n/m	i	0	1	1	i	0/2	1/6 (16.7)
		m	1			m	1/3 (33.3)	
		f	0			f	0/1	

A	B/C	D	E	F	G	H	I/J	K
[ð]	z/ð	i	4	4	4	i	4/13 (30.8)	4/15 (26.7)
		m	0			m	0/1	
		f	0			f	0/1	
[z]	d/z	i	0	1	1	i	0/1	1/11 (9.1)
		m	1			m	1/2 (50)	
		f	0			f	0/8	
[s]	θ/s	i	1	1	1	i	1/7 (14.3)	1/18 (5.6)
		m	0			m	0/6	
		f	0			f	0/5	
[v]	b/v	i	1	2	2	i	1/1 (100)	2/4 (50)
		m	1			m	1/2 (50)	
		f	0			f	0/1	
[f]	φ/f	i	0	3	3	i	0/1	3/7 (42.9)
		m	2			m	2/5 (40)	
		f	1			f	1/1 (100)	

Table 15. Substitution Errors of Vowel Speech Sounds
in the First Articulation Test by Subject 6

A	B/C	D	E	F	G	H	I/J	K
[ə]	J.ɑ/ə	i	6	8	18	i	6/14 (42.9)	18/38 (47.4)
		m	1					
		f	1					
	ʋ/ə	i	0	4				
		m	3					
		f	1					
	ɛ/ə	i	0	4		m	10/13 (76.9)	
		m	4					
		f	0					
	ʌ/ə	i	0	1				
		m	1					
		f	0					
	J.o/ə	i	0	1		f	2/11 (18.9)	
		m	1					
		f	0					
[ə] (ʌ)	J.ɑ/ə (ʌ)	i	x	9	9	i	x	9/10 (90)
		m	2			m	2/2 (100)	
			7			f	7/8 (87.5)	
		f						
[æ]	J.æ / æ	i	0	3	3	i	x	3/3 (100)
		m	3			m	3/3 (100)	
		f	x			f	x	

A	B/C	D	E	F	G	H	I/J	K
[I]	Ji/I	i	2	7	7	i	2/3 (66.7)	7/33 (21.2)
		m	5			m	5/26 (19.2)	
		f	0			f	0/4	
[3]	J.ʌ/3	i	x	2	2	i	x	2/2 (100)
		m	2			m	2/2 (100)	
		f	x			f	x	
[ɑ]	J.ɑ/ɑ	i	x	1	2	i	x	2/2 (100)
		m	0			m	1/1 (100)	
		f	1			f	1/1 (100)	
	ɛ/ɑ	i	x	1				
		m	0					
		f	1					
[ʋ]	J.ɑ/ʋ	i	x	4	4	i	x	4/4 (100)
		m	4			m	4/4 (100)	
		f	x			f	x	
[ɔ]	J.ʌ/ɔ	i	x	1	1	i	0/1	1/6 (16.7)
		m	1			m	1/5 (20)	
		f	x			f	x	
[ʌ]	J.ʌ/ʌ	i	x	1	1	i	x	1/5 (20)
		m	1			m	1/5 (20)	
		f	x			f	x	

**Table 16. Substitution Errors of Consonant Speech Sounds
in the First Articulation Test by Subject 7**

A	B/C	D	E	F	G	H	I/J	K	A	B/C	D	E	F	G	H	I/J	K
[θ]	ð/θ ʃ/θ	i m f i m f	1 0 0 2 0 0	1 2	3	i m f	3/3 (100) 0/1 0/2	3/6 (50)	[v]	b/v	i m f	1 1 0	2	2	i m f	1/1 (100) 1/2 (50) 0/1	2/4 (50)
[n]	m/n	i m f	0 0 1	1	1	i m f	0/3 0/18 1/6 (16.7)	1/27 (3.7)	[r]	l/r	i m f	1 2 x	3	3	i m f	1/5 (20) 2/7 (28.6) x	3/12 (25)

**Table 17. Substitution Errors of Vowel Speech Sounds
in the First Articulation Test by Subject 7**

A	B/C	D	E	F	G	H	I/J	K
[ə]	J.ɑ / ə	i m f	0 1 1	2	7	i m f	1/14 (7.1) 4/13 (30.8) 2/11 (18.2)	7/38 (18.4)
	ʊ/ə	i m f	0 2 1	3				
	ɛ/ə	i m f	0 1 0	1				
	ɜ/ə	i m f	1 0 0	1				
[ə] (ʌ)	J.ɑ / ə (ʌ)	i m f	x 1 2	3	3	i m f	x 1/2 (50) 2/8 (25)	3/10 (30)

A	B/C	D	E	F	G	H	I/J	K
[I]	J.i/I	i m f	1 4 0	5	5	i m f	1/3 (33.3) 4/26 (15.4) 0/4	5/33 (15.6)
[æ]	J.ɑ / æ	i m f	1 2 x	3	3	i m f	1/1 (100) 2/3 (66.7) x	3/4 (75)
[ɑ]	eI/ɑ	i m f	x 1 0	1	1	i m f	x 1/1 (100) 0/1	
[ɔ]	J.ɑ: / ɔ	i m f	0 1 x	1	1	i m f	0/1 1/5 (20) x	1/6 (16.7)
[ʊ]	J.o / ʊ	i m f	x 3 x	3	3	i m f	x 3/4 (75) x	3/4 (75)

Table 18. Substitution Errors of Consonant Speech Sounds in the First Articulation Test by Subject 8

A	B/C	D	E	F	G	H	I/J	K	A	B/C	D	E	F	G	H	I/J	K
[r]	l/r	i m f	2 4 x	6	7	i m f	2/5 (40) 5/7 (71.4) x	7/12 (58.3)	[v]	b/v	i m f	1 0 0	1	1	i m f	1/8 (12.5) 0/1 0/1	1/10 (10)
	ł/r	i m f	0 1 x	1					[r]	l/r	i m f	0 0 1	1	1	i m f,	1/1 (100) 0/8 0/6	1/25 (4)

Table 19. Substitution Errors of Vowel Speech Sounds in the First Articulation Test by Subject 8

A	B/C	D	E	F	G	H	I/J	K	A	B/C	D	E	F	G	H	I/J	K
[ə]	ɔ.ɑ /ə	i m f	2 1 0	3	11	i m f	5/14 (35.7) 6/13 (46.2) 0/11	11/38 (28.9)	[I]	ɪ.i/I	i m f	1 5 0	6	6	i m f	1/3 (33.3) 5/26 (19.2) 0/4	6/33 (18.2)
	ɒ/ə	i m f	0 1 0	1					[æ]	ɔ.ɑ /æ	i m f	0 3 x	4	4	i m f	0/1 3/3 (100) x	3/4 (75)
	ε/ə	i m f	3 3 0	6					[ɑ]	ε/ɑ	i m f	0 1 0	1	1	i m f	x 1/1 (100) 0/1	1/2 (50)
	ʌ/ə	i m f	0 1 0	1					[ɔ]	ɔ.ɑ /ɔ	i m f	0 1 x	1	1	i m f	0/1 1/5 (20) x	1/6 (16.7)
[ə] (ʌ)	ɔ.ɑ /ə	i m f	x 1 2	3	3	i m f	x 1/2 (50) 2/8 (25)	3/10 (30)	[ɒ]	ɔ.ɑ /ɒ	i m f	x 3 x	3	3	i m f	x 3/4 (75) x	3/4 (75)
[ɜ]	ɔ.ɑ: /ɜ	i m f	x 1 x	1	1	i m f	x 1/2 (50) x	1/2 (50)									

A Case Study of Corrective Procedures 93

Table 20. Substitution Errors of Consonant Speech Sounds
in the First Articulation Test by Subject 9

A	B/C	D	E	F	G	H	I/J	K	A	B/C	D	E	F	G	H	I/J	K
[r]	l/r	i m f	1 0 x	1	10	i m f	5/5 (100) 5/7 (71.4) x	10/12 (83.3)	[ð]	z/ð	i m f	1 0 0	1	1	i m f	1/13 (7.7) 0/1 0/1	1/15 (6.7)
	ł/r	i m f	4 5 x	9					[θ]	ʃ/θ	i m f	1 1 0	2	2	i m f	1/3 (33.3) 1/1 (100) 0/2	2/6 (33.3)
[f]	φ/f	i m f	0 1 0	1	1	i m f	0/1 1/5 (20) 0/1	1/7 (14.3)	[s]	θ/s	i m f	0 0 1	1	3	i m f	2/7 (28.6) 1/6 (16.7) 0/5	3/18 (16.7)
[v]	b/v	i m f	0 1 0	1	1	i m f	0/1 1/2 (50) 0/1	1/4 (25)		ʃ/s	i m f	1 0 0	2				

Table 21. Substitution Errors of Vowel Speech Sounds
in the First Articulation Test by Subject 9

A	B/C	D	E	F	G	H	I/J	K	A	B/C	D	E	F	G	H	I/J	K
[ə]	ɹɚ/ə	i m f	1 1 1	3	12	i m f	3/14 (21.4) 8/13 (61.5) 1/11 (9.1)	12/38 (31.6)	[I]	ɹi/I	i m f	3 6 0	9	9	i m f	3/3 (100) 6/26 (23.1) 0/4	9/33 (27.3)
	u/ə	i m f	x 1 0	1					[ɜ]	ɹɚ/ɜ	i m f	x 2 x	2	2	i m f	x 2/2 (100) x	2/2 (100)
	ɛ/ə	i m f	2 4 0	6					[æ]	ɹᵃ/æ	i m f	1 3 x	4	4	i m f	1/1 (100) 3/3 (100) x	4/4 (100)
	ʊ/ə	i m f	0 1 0	1					[ɔ]	ɹᵃ/ɔ	i m f	0 1 x	1	1	i m f	0/1 1/5 (20) x	1/6 (16.7)
	ʌ/ə	i m f	0 1 0	1					[ɒ]	ɹᵒ/ɒ	i m f	x 3 x	3	3	i m f	x 3/4 (75) x	3/4 (75)
[ə] (ʌ)	ɹᵃ/ə (ʌ)	i m f	x 2 5	7	7	i m f	x 2/2 (100) 5/8 (62.5)	7/10 (70)									

Table 22. Substitution Errors of Consonant Speech Sounds in the First Articulation Test by Subject 10

A	B/C	D	E	F	G	H	I/J	K	A	B/C	D	E	F	G	H	I/J	K
[r]	l/r	i m f	1 2 x	3	9	i m f	4/5 (80) 4/7 (57.1) x	8/12 (66.7)	[ʒ]	z/ʒ	i m f	2 0 0	2	2	i m f	2/13 (15.4) 0/1 0/1	2/15 (13.3)
	ɾ/r	i m f	3 2 x	5					[θ]	s/θ	i m f	1 0 0	1	1	i m f	1/3 (33.3) 0/1 0/2	1/7 (16.7))
[f]	ф/f	i m f	0 2 0	2	2	i m f	0/1 2/5 (40) 0/1	2/7 (28.6)	[s]	ʃ/s	i m f	0 2 0	2	2	i m f	0/7 2/6 (33.3) 0/5	2/18 (11.1)
[v]	b/v	i m f	1 1 0	2	2	i m f	1/1 (100) 1/2 (50) 0/1	2/4 (50)									

Table 23. Substitution Errors of Vowel Speech Sounds in the First Articulation Test by Subject 10

A	B/C	D	E	F	G	H	I/J	K	A	B/C	D	E	F	G	H	I/J	K
[ə]	ɪ.ʌ/ə	i m f	4 1 4	9	14	i m f	4/14 (28.6) 6/13 (46.2) 4/11 (36.4)	14/38 (36.8)	[I]	Ji/I	i m f	3 5 1	9	9	i m f	3/3 (100) 5/26 (19.2) 1/4 (25)	9/33 (27.3)
	ʊ/ə	i m f	0 2 0	2					[æ]	ɪ.ʌ/æ	i m f	1 3 x	4	4	i m f	1/1 (100) 3/3 (100)	4/4 (100)
	ɛ/ə	i m f	0 2 0	2					[a]	i / a	i m f	x 1 x	1	1	i m f	x 1/2 (50) x	1/2 (50)
	ɪ.ʌ/ə	i m f	0 1 0	1													
[ə] (ʌ)	ɪ.ʌ/ə (ʌ)	i m f	x 1 5	6	6	i m f	x 1/2 (50) 5/8 (62.5)	6/10 (60)	[ɑ]	ɛ/ɑ	i m f	x 1 0	1	1	i m f	x 1/1 (100) 0/1	1/2 (50)
[ʒ]	ɪ.ʌ/ʒ	i m f	x 2 x	2	2	i m f	x 2/2 (100) x	2/2 (100)	[o]	ɪ.ʌ/o	i m f	x 4 x	4	4	i m f	x 4/4 (100) x	4/4 (100)
									[ɔ]	ɪ.ʌ/ɔ	i m f	0 1 x	1	1	i m f	0/1 1/5 (20) x	1/6 (16.7)

2. Interpretation of the Analyses of the First Articulation Tests

The following can be derived from the analyses of the first articulation test results.

(1)   Consonant Speech Sounds

Most subjects, except subject 7, could not pronounce the [r] sound perfectly. They sometimes produced a mixture of [r], [l], and [ɭ] sounds indicating a need to learn how to produce [r], to be able to say it naturally and to distinguish the [r] from [l] and [ɭ] sounds.

Most subjects, except subject 3, occasionally produced a mixture of [v] and [b] sounds, especially in the initial and the final position. It appears that they know how to produce [v] sounds, because they do not always make this mistake, but it was not habitual or natural. They may not have been able to produce this fricative consonant speech sound because they did not breathe with abdominal respiration.

Some subjects were not able to clearly distinguish [s], [θ], and [ʃ] sounds. It is felt that they need to learn how to make these sounds and to differentiate between them.

Some subjects will have to correct their habit of saying [zə] for "the" and to distinguish between [z] and [ð] sounds.

Some subjects will need to practice the [f] sound since they substituted [Φ] or [h] for it.

A few subjects will need to be careful about libio-dental fricative consonants [f] and [v], and lingua-dental fricative consonants [θ] and [ð].

A few subjects substituted [m] for [n], or [n] for [m]. However, they appeared to know the difference between [m] and [n] sounds, because they made this type of misarticulation only once or twice in six [m] sounds within words. Therefore, the practice of these [m] and [n] sounds would not be so important to them. The experimenter needed to pay attention to their [m] and [n] sounds during speech correction.

(2)　Vowel Speech Sounds

Through the analyses of the first articulation tests, the experimenter was convinced that all subjects should learn the vowel speech sounds systematically for the following reasons.

Most subjects substituted Japanese vowel sounds for many English vowel sounds, such as Japanese [ɑ] for English [æ], Japanese [ɑ:] for English [ɜ] and [ɑ].

Subjects were generally poor at producing [ə (schwa)] sound, for example, ①in the weak forms like "th<u>a</u>t", "<u>a</u>nd", "<u>a</u>", "<u>a</u>t", etc., ② in [ðə] for "th<u>e</u>," ③in English words used in Japanese, such as "el<u>e</u>g<u>a</u>nt", "busin<u>e</u>ss", "g<u>a</u>rage", "V<u>i</u>rginia", "av<u>e</u>nue", "nat<u>io</u>n<u>a</u>l", etc.

Subjects sometimes substituted the Japanese [ɑ] sound for the English [ə(ʌ)] sound in the final "-er" or "-or" of a word.

Subjects most frequently pronounced Japanese [o] instead of the English [ɒ] sound.

The [I] sound was generally mispronounced as the Japanese [i] sound in the initial position. Several of the same mistakes were also made in the medial position.

3．Analyses of the Second Articulation Test

The second articulation tests were analyzed and presented in tabular form, Table 24~36. The letters A ~ L, and i, m, f, etc., in the following tables are the same as on page 84.

Table 24. Substitution Errors of Consonant Speech Sounds in the Second Articulation Test by Subject 1

A	B/C	D	E	F	G	H	I/J	K/L	A	B/C	D	E	F	G	H	I/J	K/L
[n]	m/n	i m f	0 0 1	1	1	i m f	0/3 0/18 1/6 (16.7)	1/27 (3.7)	[ð]	z/ð	i m f	1 1 0	2	2	i m f	1/13 (7.7) 1/1 (100) 0/1	2/15 (13.3)

Table 25. Substitution Errors of Vowel Speech Sounds in the Second Articulation Test by Subject 1

A	B/C	D	E	F	G	H	I/J	K/L	A	B/C	D	E	F	G	H	I/J	K/L
[ə]	ɜ/ə	i	.0	1	3	i	0/14	3/38 (7.9)	[a]	ɜ/ɑ	i	x	1	1	i	x	1/2 (50)
		m	1			m	3/13 (23.1)				m	0			m	0/1 / 1/1 (100)	
		f	0								f	1			f		
	ʌ/ə	i	0	2					[ɒ]	ɔ/ɒ	i	x	1	1	i	x	1/4 (25)
		m	2								m	1			m	1/4 (25)	
		f	0			f	0/11				f	x			f	x	

Table 26. Substitution Errors of Vowel Speech Sounds in the Second Articulation Test by Subject 2

A	B/C	D	E	F	G	H	I/J	K/L	A	B/C	D	E	F	G	H	I/J	K/L
[æ]	ɪ.ʊ/æ	i	1	2	2	i	1/1 (100)	2/4 (50)	[ʌ]	ɜ/ʌ	i	x	1	1	i	x	1/2 (50)
		m	1			m	1/3 (33.3)				m	0			m	0/1	
		f	x			f	x				f	1			f	1/1 (100)	

Table 27. Substitution Errors of Vowel Speech Sounds in the Second Articulation Test by Subject 3

A	B/C	D	E	F	G	H	I/J	K/L	A	B/C	D	E	F	G	H	I/J	K/L
[ə]	ɪ.e/ə	i	0	3	3	i	0/14	3/38 (7.9)	[ʌ]	B.ɔ/ʌ	i	x			i	x	1/2 (50)
		m	3			m	3/13 (23.1)										
		f	0			f	0/11				m	1	1	1	m	1/4 (25)	
[æ]	ɪ.ʊ/æ	i	0	1	1	i	0/1	1/4 (25)									
		m	1			m	1/3 (33.3)				f	x			f	x	
		f	x			f	x										

Table 28. Substitution Errors of Consonant Speech Sounds in the Second Articulation Test by Subject 4

A	B/C	D	E	F	G	H	I/J	K/L	A	B/C	D	E	F	G	H	I/J	K/L
[f]	ʧ/f	i	0	1	1	i	0/1	1/7 (14.3)			i	0			i	0/7	2/18 (11.1)
		m	1			m	1/5 (50)										
		f	0			f	0/1		[s]	θ/s	m	1	1	1	m	1/6 (16.7)	
[ð]	z/ð	i	1	1	1	i	1/13 (7.7)	1/15 (6.7)									
		m	0			m	0/1				f	1			f	1/5 (20)	
		f	0			f	0/1										

Table 29. Substitution Errors of Vowel Speech Sounds in the Second Articulation Test by Subject 4

A	B/C	D	E	F	G	H	I/J	K/L	A	B/C	D	E	F	G	H	I/J	K/L
[ə]	J.ɑ/ə	i	2	3	3	i	2/14 (14.3)	3/38 (7.9) (14.3)	[æ]	J.ɑ/æ	i	1	2	2	i	1/1 (100)	2/4 (50)
		m	1			m	1/13 (7.9)				m	1			m	1/3 (33.3)	
		f	0			f	0/11				f	x			f	x	
[ɑ]	J.ɒ/ɒ	i	x	1	1	i	x	2/4 (50)	[ɔ]	J.ɑ/ɔ	i	1	1	1	i	1/1 (100)	1/15 (6.7)
		m	2			m	2/4 (50)				m	0			m	0/14	
		f	x			f	x				f	x			f	x	
[ʌ]	J.ʌ/ɑ	i	x	1	1	i	x	1/2 (50)									
		m	0			m	0/1										
		f	1			f	1/1 (100)										

Table 30. Substitution Errors of Consonant Speech Sounds in the Second Articulation Test by Subject 5

A	B/C	D	E	F	G	H	I/J	K/L
[ə]	z/ ʒ	i	1	1	1	i	1/13 (7.7)	1/15 (6.7)
		m	0			m	0/1	
		f	0			f	0/1	

Table 31. Substitution Errors of Vowel Speech Sounds in the Second Articulation Test by Subject 5

A	B/C	D	E	F	G	H	I/J	K/L	A	B/C	D	E	F	G	H	I/J	K/L
[ə]	J.ɑ/ə	i	0	1	1	i	0/14	1/38 (2.6)	[ɜ]	J.ɚ/ɜ	i	x	1	1	i	x	1/2 (50)
		m	1			m	1/13 (7.7)				m	1			m	1/2 (50)	
		f	0			f	0/11				f	x			f	x	
[æ]	J.ɑ/æ	i	1	2	2	i	1/1 (100)	2/4 (50)	[ɒ]	J.ɑ/ɒ	i	x	2	2	i	x	2/4 (50)
		m	1			m	1/3 (33.3)				m	2			m	2/4 (50)	
		f	x			f	x				f	x			f	x	

Table 32. Substitution Errors of Vowel Speech Sounds in the Second Articulation Test by Subject 6

A	B/C	D	E	F	G	H	I/J	K/L	A	B/C	D	E	F	G	H	I/J	K/L
[ə]	u/ə	i	0	1	3	i	0/14	3/38 (7.9)	[æ]	J.ɑ/æ	i	1	2	2	i	1/1 (100)	2/4 (50)
		m	0			m	2/13 (15.4)				m	1			m	1/3 (33.3)	
		f	1			f	1/11 (9.1)				f	x			f	x	
	J.e/ə	i	0	2														
		m	2															
		f	0															
[I]	Ji/I	i	0	2	2	i	0/3	2/33 (6.1)	[ɒ]	J.ɒ/ɒ	i	x	1	1	i	x	1/4 (25)
		m	2			m	2/26 (7.7)				m	1			m	1/4 (25)	
		f	0			f	0/4				f	x			f	x	

Table 33. Substitution Errors of Vowel Speech Sounds in the Second Articulation Test by Subject 7

A	B/C	D	E	F	G	H	I/J	K/L	A	B/C	D	E	F	G	H	I/J	K/L
[ə]	J.ɐ/ə	i m f	0 2 0	2	2	i m f	0/14 2/13 (15.4) 0/11	2/38 (5.3)	[ɒ]	J.ɐ/ɒ	i m f	x 1 x	1	1	i m f	x 1/4 (25) x	1/4 (25)
[I]	J.i/I	i m f	0 2 0	2	2	i m f	0/3 2/26 (7.7) 0/4	2/33 (6.1)	[ɔ]	JAɐ/ɔ	i m f	0 1 x	1	1	i m f	0/1 1/5 (20) x	1/6 (16.7)

Table 34. Substitution Errors of Vowel Speech Sounds in the Second Articulation Test by Subject 8

A	B/C	D	E	F	G	H	I/J	K/L	A	B/C	D	E	F	G	'H	I/J	K/L
[a]	J.ɐ/ə	i m f	0 1 0	1	2	i m f	0/14 1/13 (7.7)	2/38 (5.3)	[ɔ]	J.ɐ/ɔ	i m f	1 0 x	1	1	i m f	x 1/4 (25) x	1/4 (25)
	u/ə	i m f	0 0 1	1		f	1/11 (9.1)											
[ʌ]	J.ɐ/ʌ	i m f	x 1 x	1	1	i m f	x 1/7 (14.3) x	1/7 (14.3)	[ɒ]	B.ɐ/ɒ	i m f	x 1 x	1	1	i m f	x 1/4 (25) x	1/4 (25)

Table 35. Substitution Errors of Vowel Speech Sounds in the Second Articulation Test by Subject 9

A	B/C	D	E	F	G	H	I/J	K/L	A	B/C	D	E	F	G	H	I/J	K/L
[ə]	J.ɐ/ə	i m f	0 1 0	1	1	i m f	0/14 1/13 (7.7) 0/11	1/38 (2.6)	[ɒ]	J.ɐ/ɒ	i m f	x 1 x	1	1	i m f	x 1/4 (25) x	1/4 (25)
[æ]	J.ɐ/æ	i m f	0 1 x	1	1	i m f	0/1 1/3 (33.3) x	1/4 (25)	[I]	J.i/I	i m f	1 3 0	4	4	i m f	1/3 (33.3) 3/26 (11,5) 0/4	4/33 (12.1)

Table 36. Substitution Errors of Vowel Speech Sounds in the Second Articulation Test by Subject 10

A	B/C	D	E	F	G	H	I/J	K/L	A	B/C	D	E	F	G	H	I/J	K/L
[ə]	J.ɐ/ə	i m f	0 1 0	1	1	i m f	0/14 1/13 (7.7) 0/11	1/38 (2.6)	[3]	J.ɐ/3	i m f	x 1 x	1	1	i m f	x 1/2 (50) x	1/2 (50)
[æ]	J.ɐ/æ	i m f	0 1 x	1	1	i m f	0/1 1/3 (33.3) x	1/4 (25)	[ɒ]	J.ɐ/ɒ	i m f	x 2 x	2	2	i m f	x 2/4 (50) x	2/4 (50)

Ⅲ. Results & Discussion

1. Results of the Study

The following results can be derived from this study.

① Subject 1 completed eighteen sessions; seven for defective consonant speech sounds and eleven for defective vowels. In the first articulation test, he produced thirty-four defective consonant speech sounds and thirty-eight defective vowels. In the second articulation test, he produced three defective consonant speech sounds and five defective vowels.

② Subject 2 completed twenty sessions ; nine for defective consonant speech sounds and eleven for defective vowels. In the first articulation test, he produced twenty-two defective consonant speech sounds and thirty defective vowels. In the second articulation test, he produced no defective consonant speech sounds and three defective vowels.

③ Subject 3 completed fourteen sessions ; three for defective consonant speech sounds and eleven for defective vowels. In the first articulation test, he produced eleven defective consonant speech sounds and thirty-one defective vowels. In the second articulation test, he produced no defective consonant speech sounds and 5 defective vowels.

④ Subject 4 completed twenty sessions ; ten for defective consonant speech sounds and ten for defective vowels. In the first articulation test, he produced thirty-five defective consonant speech sounds and forty-four defective vowels. In the second articulation test, he produced four defective consonant speech sounds and nine defective vowels.

⑤ Subject 5 completed twenty-two sessions ; ten for defective consonant speech sounds and twelve for defective vowels. In the first articulation test, he produced thirty-four defective consonant speech sounds and forty-eight defective vowels. In the second articulation test, he produced one defective consonant speech sounds and six defective vowels.

⑥ Subject 6 completed twenty sessions ; seven for defective consonant

speech sounds and thirteen for defective vowels. In the first articulation test, she produced twenty-six defective consonant speech sounds and forty-nine defective vowels. In the second articulation test, she produced no defective consonant speech sounds and eight defective vowels.

⑦ Subject 7 completed fifteen sessions; four for defective consonant speech sounds and eleven for defective vowels. In the first articulation test, she produced nine defective consonant speech sounds and twenty-three defective vowels. In the second articulation test, she produced no defective consonant speech sounds and six defective vowels.

⑧ Subject 8 completed fourteen sessions; three for defective consonant speech sounds and eleven for defective vowels. In the first articulation test, she produced nine defective consonant speech sounds and twenty-nine defective vowels. In the second articulation test, she produced no defective consonant speech sounds and five defective vowels.

⑨ Subject 9 completed twenty-four sessions; thirteen for defective consonant speech sounds and eleven for defective vowels. In the first articulation test, she produced eighteen defective consonant speech sounds and thirty-eight defective vowels. In the second articulation test, she produced no defective consonant speech sounds and seven defective vowels.

⑩ Subject 10 completed nineteen sessions; nine for defective consonant speech sounds and ten for defective vowels. In the first articulation test, she produced seventeen defective consonant speech sounds and forty-three defective vowels. In the second articulation test, she produced no defective consonant speech sounds and five defective vowels.

⑪ During these sessions, the experimenter carried out games of guessing a speech sound with each subject in order to find out if the subject could perfectly produce and distinguish between the speech sounds. The results of these games revealed that if the number of correct answers in E→S was large, the number in S→E was also large, and if the number of correct answers in E→S was small, the number in S→E was also small. (E→S means the experimenter produces a speech

sound and a subject identifies the sound, and S→E means the opposite.)

⑫ The number of vowel misarticulations surpassed the number of consonant misarticulations, even after speech correction.

2. Discussion

One of the purposes of this study was to measure how much effect the correction of defective English speech sounds by a Japanese teacher of English can have on native Japanese speakers within a limited period of time. Comparing the number of defective speech sounds produced by any subject in the second articulation test with the number in the first articulation test, it would be reasonable to state that the four months of speech correction used in this study succeeded to considerable degree.

A second purpose was to create effective, practical and enjoyable procedures for correction. Through these corrections, the following twelve procedures (1 ~12) were adopted and the experimenter recognized them to be very effective, practical and enjoyable leading to the success of this experiment. Also from ⑪ and ⑫ above in section 1, the experimenter was satisfied that the two principles of the English speech correction (13 and 14 below) are valid and significant. Number 13 was derived from ⑪ above and 14 was derived from ⑫ above.

1) Analyzing the type of substitution errors, and discovering the characteristics of each subject's misarticulation, and correcting them systematically on the basis of their analyses.

2) Moving from easiness to difficulty, such as from sound level to sentence level, from consonant speech sounds to vowels, and from easy speech sounds to difficult ones.

3) Instructing the speech sounds as a pair or a group, such as [l] & [r], [s] & [θ], [b] & [v], [z] & [ð], [f] & [h], [s] & [ʃ], front vowel speech sounds [i] & [ɪ], [ɛ] & [æ] & [a], back vowel speech sounds [u] & [ʊ] & [ɔ] & [ɒ] & [ɑ], and central vowel speech sounds [ɜ]

& [ə] (schwa) & [ə (ʌ)] & [ʌ].

4) The procedure in which the experimenter and subject make a guess at each others' speech sound in order to make sure the subject learned to distinguish the speech sound both aurally and in speech.

5) Using variations, such as easy dialogue and tongue twisters, in order to enable the subject to produce a speech sound naturally and unconsciously.

6) Giving the subject the assignment of practicing speech sounds previously learned in the prior session which are throughly checked by the experimenter in the next session.

7) Having the subject repeat the sentence, including the speech sound to be corrected, three times fluently and accurately without a pause using a metronome tempo of 120.

8) Explaining how to produce the speech sound in detail, comparing it with other speech sounds like [r] & [l], or using easy examples, such as crow's caw for [ɑ], and 掃除 & 障子 [sood ʒ ɪ, ʃood ʒ ɪ]or 隅 & 趣味 [sʊmɪ, ʃʊmɪ], or using easy pronunciation, such as "up, and upoo," for [ʌ] and [ə] sounds.

9) Having subjects enjoy speech correction by using variations and guessing games.

10) Making subjects conscious of their ability to distinguish the speech sound from others by playing guessing games, and giving them confidence and encouragement through the awareness of their ability.

11) Giving subjects a purpose by informing them about the second articulation test in advance, and letting them compete with other subjects.

12) Adopting the practice of abdominal respiration, if necessary.

13) To be able to discriminate the articulation from others is to be able to produce normal articulation, and the converse is also true.

14) Correcting English vowel speech sounds is much more difficult than correcting English consonant speech sounds.

The experimenter could not confirm which was the most effective

procedure, which was the most important procedure, or which was the most practical procedure among them, since all of these procedures were specially adopted for all the subjects in this speech correction experiment, and the number of subjects (ten) was small. Therefore, it would not be prudent to generalize. However, none of the procedures had negative influences on the subjects' speech correction. On the contrary, the procedures were very effective and practical ; a fact proved by the above results.

Surveying the numbers of each student's misarticulations in the analysis of the second articulation test, it may be asked why the differences in numbers occurred? The experimenter thinks the effort and diligence of each subject and their discipline with regard to their own articulation played an important part. One of the subjects said that he wanted to practice some speech sounds at home, even though the experimenter said they were correct. Another subject said that she wanted to play the guessing game again because she did not have confidence in her articulation, though the result of the game indicated that she could already distinguish the speech sound from others. The subjects appeared to make substantial progress. However, a few did not do their homework or did not seem to care about the speech sounds which they had already learned. When they were learning vowel speech sounds, they made considerable consonant articulation errors. With those subjects, the experimenter had to give the same instructions again. Another reson for success is ths talent of the subjects. The subjects who were good at imitating correct speech sounds appeared to enjoy speech correction and their improvement was very rapid. Subjects who were poor at imitating required two or three times as much effort as those with greater talent.

From these results and discussion, the following implications can be stated.

1) Japanese teachers of English language should put stress on English phonetics and correct pronunciation, particularly on English vowel speech sounds, in English class.

2) English phonetics or pronunciation should be taught, not as a temporary correction, but as a systematic part of English instruction.

3) The difference between English vowel speech sounds and Japanese speech sounds should be clearly taught to students.

4) Japanese teachers of English should design more effective and practical procedures for the instruction of English pronunciation in order to make their students take an interest in it.

5) Japanese teachers of English should realize that being able to discriminate particular articulation is to be able to produce normal articulation and the converse is also true.

6) The importance of the abdominal respiration in speaking English should be taught to Japanese students much more clearly.

References

Anderson, Virgil A. (1953) *Improving the Child's Speech.* New York : Oxford University Press, p.51.

Brown, Verson (1965) *Improving Your Pronunciation.* Tokyo : Meirinido Publishing Co.

Jones, Daniel (1960) *An Outline of English Phonetics.* London : Cambridge University Press, Tokyo: Maruzen Company Lit., p.1.

Kawashima, Takehide (1973) "The Procedure and the Cases for the Curative Instruction." *Gengo - shogai - kyoiku no tebiki,* by the Ministry of Education of Japan. Kyoto : Higashiyama Shobo, pp.118 - 166.

Kawashima, Takehide (1975) "A Study of Speech Correction as Applied

Phonetics : Basic Principles in the Way of Analysis and Correction of Defective Speech Sounds." *Eibungakuronso*, ed., vol. 23.

Kawashima, Takehide (1988) "A Study of Functional Articulation Defects: A Comparative Speech Analysis of British, American and Japanese Vowel Sounds as Spoken by Native Japanese Speakers." A Research for the Communication Association of Japan 18th Annual Convention.

Takeda, Kazuku (1975) "A Phonetic Evaluation of General American Consonant Sounds as Spoken by Native Japanese Junior High School Students." M. A. Thesis, Nihon University, Tokyo.

Travis, Lee Edward (1957) *Hand book of Speech Pathology.* N. Y.: Appleton - Century - Crofts Inc., p.65.

Wise, Claude M.(1957) *Applied Phonetics.* Englewood Cliffs, N. J.: Prentice - Hall, Inc., pp.221 - 238.

Wagner, Joseph A., and Kawashima, Takehide (1984) *An Introduction to Modern English Speech Communication.* Tokyo : Gaku Shobo Publishing Co., pp.3 - 73.

Yamagami, Tomiko (1988) "A Comparative Phonetic Evaluation of British and American - General American and Eastern American - Vowel Phonemes as Spoken by Native Japanese Teachers of English." M. A. Thesis, Nihon University, Tokyo.

Abstract

The purpose of this study is to determine if a Japanese teacher of English, given a limited period of time, can effectively correct defective English speech sounds as spoken by native Japanese speakers using practical and enjoyable procedures for correction.

To begin with, each subject was given an articulation test which was

recorded on tape. The experimenter analyzed it, and on the basis of this analysis corrected their defective English speech sounds through one-on-one instruction and by using procedures which were effective for each individual. Subsequently, each subject recorded the same articulation test again. Two native English speakers along with the experimenter analyzed it. They compared the results with those of the first test. Ten students, five male and five female, were chosen as subjects.

Six descriptive classifications were adopted to analyze the articulation of speech sounds : substitution errors, addition errors, omission errore, distortion errors, nasality errors, and inconsistency errors. In the speech correction of this study, however, only substitution errors were dealt with because most of the subjects' errors were those of substitution.

The results of both the first and second articulation tests were presented in tabular form. The number of the subject's misarticulations and where they occurred in a word, in addition to the number of normal articulations within the passage and their respective positions within a word were recorded in this chart.

Through this study twelve procedures were found to be effective, practical and enjoyable leading to the success of this experiment. Within the limits imposed by the research design of this study, the experimenter was satisfied with the appropriateness of two important principles of English speech correction.