

Pronunciation Training Steps for Natural Pronunciation in In-service Training Program

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ABSTRACT

Because the accuracy is essential, in order to get the fluency in speaking, both of them are very important in English education and in-service training programs.

To get the accuracy and the fluency, the causes and phenomena of the unnatural pronunciation have to be surveyed first of all. Therefore, this article surveyed the problematic and unnatural pronunciation of Korean English teachers in elementary and secondary schools using CSL and Multi-speech. And also, tried to pinpoint what the causes of unnatural pronunciation are? Next a procedure or steps were offered for them to speak naturally through in-service training programs.

Through this analysis, it was found that elementary teachers have unnatural pronunciation below, within and beyond word level, and the secondary teacher has unnatural pronunciation within and beyond word level. Therefore, pronunciation training courses have to put emphasis on segment features first, and move to suprasegmental features for elementary teachers. For secondary teachers, pronunciation training courses have to focus on word level and move to suprasegmental features, in other words beyond word level. And these pronunciation training courses have to be run integrated.

I. Introduction

What is more important in speaking, is it the accuracy or the fluency? Maybe nobody can answer this question easily.

In order to obtain the fluency in English speaking, it is essential to speak accurately. But this does not mean that the accuracy is the essence in English speaking. It means that accurate pronunciation is to foster communicative effectiveness.

The accuracy is concerned with segments pronunciation, while the fluency is concerned with suprasegmental pronunciation. The accuracy and the fluency are very important in speaking.

Even though English education in elementary school started in 1997, elementary text books are focused on listening and speaking, and the alphabet is being taught after 5th grade. The trend of English education in Korea focuses mainly on 'fluency' and Korean English teachers are not focusing on 'teaching pronunciation.' But this doesn't mean that pronunciation is not taught. It means that pronunciation is not taught enough.

In the teacher training course, there aren't enough 'teaching pronunciation classes' and in the in-service teacher training course, the situation is the same. Therefore, we can't say that Korean English teachers' pronunciation is natural. Because of that, they have difficulties in speaking accurately and naturally. Therefore, they are hesitating to pronounce in the class.

Because students usually imitates their teacher's pronunciation, the teacher's pronunciation is very important in the class. But, because of the unnatural pronunciation of Korean English teachers, they can't show a good modeling to students. To overcome their weakness, they are using video and cassette tapes. But, students don't pay attention to the video and cassette tapes, they usually pay attention to their teacher's lips.

In order to help Korean English teachers, the Ministry of Education has invited native speakers from 1996 through the KORETTA(Korea English Teaching Training Assistant) and EPIK(English Program in Korea). But these programs have not been effective(KEDI, 1998).

Therefore, this article will survey the problematic and unnatural pronunciation of Korean English teachers in elementary and secondary schools using CSL and Multi-speech. And also, try to pinpoint what the causes of unnatural pronunciation are? Next a procedure or steps will be offered for them to speak naturally through in-service training programs.

II. Methods

To get meaningful results, the sentences were surveyed according to the Prosodic Hierarchy of Nespor & Vogel(1986). Utterances are divided into categories such as syllable, foot, phonological phrase, clitic group, phonological phrase, intonational phrase, and utterance.

The duration, pitch, energy, formant, VOT(Voice Onset Time) and phonological phenomena in syllable, duration and phonological phenomena in foot, and duration and phonological phenomena in words, phonological phrase, intonational phrase and utterance were also examined.

Even though, more than 25 utterances of 4 Korean English teachers who are teaching English in elementary and secondary schools were surveyed, just two utterances were shown. Utterance 1 was "I guess she'd be eating chocolate cake" and utterance 2 was "She must have wanted to talk about moving in with us."

And Multi-speech and Praat were used to analyze these.

From these two utterances, we can get much information about the unnatural pronunciation of Korean English teachers. Segmental features like aspiration, palatalization, flapping below words levels, and suprasegmental features within words and beyond words levels were focused on. An analysis about the resyllabication was focused on below and within word levels.

III. Results and Discussion

3.1 Within and Below Word Level

3.1.1 VOT

Lisker & Abramson(1964), and Klatt presented the VOT of English speakers like below table.

<Table 1> VOT of English speakers

Phoneme Researchers	p ^h	p'	t ^h	t'	k ^h	k'
Lisker & Abramson	78	3	59	15	98	30
Klatt	47	12	65	23	70	30

Lisker & Abramson gave the VOT comparison between English and Korean as follows.

<Table 2> VOT of English and Korean

Phoneme Language	p ^h	p'	t ^h	t'	k ^h	k'
English	78	3	59	15	98	30
Korean	91	7	94	11	126	19

Because their study was carried out with words not sentences, while this survey was carried out based on sentences or utterances, the results would be different. As you know, the duration would be changed according to the speech speed. If words or utterances will be spoken faster, the VOT would be shorter.

The results of VOT in this article are as follows.

<Table 3> VOT of Syllable and Foot

	Native	K1	K2	K3	K4
co	0.018	0.040	0.031	0.021	0.033
cake	0.030	0.072	0.108	0.041	0.056
talk	0.023	0.051	0.072	0.049	0.061

The VOT of English speakers is shorter than that of Korean English teachers.

And the VOT of /c/ in 'co' and 'cake' is different. Because 'co' is syllable but foot, 'cake' is syllable and foot, /c/ of 'co' is pronounced faster.

As stated above, the results are different, the VOT is shorter than Lisker &

Abramson's. And the VOT in the foot is longer than in the syllable. And, in the utterance and discourse level, people are usually speaking faster, therefore, the VOT is shorter than in words spoken separately.

3.1.2 Flapping

Flapping occurred very often in English speaking, specially in North American English. Flapping is not compulsory, but if we don't use flapping, our English seems to be unnatural. And flapping can occur in various level such as Phonological word, Clitic Group, Phonological Phrase, Intonation Phrase, and Utterance.

The flapping occurred more naturally and freely at the low level than the high level.

North Americans are not usually using flapping when they are speaking to foreigners, but when they speak to each other, they always use flapping. Even though they can understand our English pronunciation not using flapping, it would be more natural to use flapping in order to speak more naturally.

Flapping occurs after a vowel or an /r/ and before an unstressed syllable. And in the same environment, the consonant sound /n/ and the consonant sequence /nt/ can both be realized as a nasalized flapping.

In the utterance "I guess she'd be eating chocolate cake," there is just one flapping situation. In the utterance "she must have wanted to talk about moving in with us," there is one nasalized flapping situation.

As a result, three of four changed /t/ to [ɾ] and used the nasalized flapping. One elementary teacher didn't use the flapping and the nasalized flapping. But, the most serious problem is that he/she made /t/ aspirated. In other words, he resyllabified /eating/ like [ea]₆ [ting]₆.

3.2 Beyond Word Level

3.2.1 Resyllabication

The prosodic hierarchy of "I guess she'd be eating chocolate cake" is as follows.

<Table 4> Within and Beyond Word Level

U	I guess she'd be eating chocolate cake.						
I.P.	I guess	she'd be eating chocolate cake					
P.P.	I guess	she'd be eating chocolate cake					
C.G	I guess	she'd be eating				chocolate cake	
Word	I	guess	she'd	be	eating	chocolate	cake

In the Clitic Group 'she'd be eating,' two elementary teachers and one secondary teacher inserted [ɪ] after /d/.

And in the Clitic Group and Phonological Word 'chocolate', two teachers resyllabicated 'chocolate' like [chok]₆ [late]₆. This case is similar to inserting [ɪ]. Some Koreans are deleting [ɪ] in VCɪCV condition.

The prosodic hierarchy of "She must have wanted to talk about moving in with us" is as follows.

<Table 5> Within and Beyond Word Level

U	she must have wanted to talk about moving in with us										
I.P.	she must have wanted to talk about moving in with us										
P.P.	she must have wanted to talk						about moving in with us				
C.G	she must have wanted				to talk		about moving in		with us		
Word	she	must	have	wanted	to	talk	about	moving	in	with	us

In the Clitic Group 'she must have wanted,' one elementary teacher inserted [ɪ] after /t/. As stated above, the resyllabication was caused by the Korean Syllabic organization. As you know, Korean Syllabic organization is (C)V(C). Therefore, some Koreans are inserting [ɪ] after C.

3.2.3 Compound Stress Rule

As you know, English is 'a stress-timed language'. In other words, the stress plays a main role to convey the meaning through conversation. The CSR and NSR are

important rules in English stress rules.

If foreigners don't use the English stress rules appropriately, their speaking seem to be is unnatural. In more serious case, they could not convey their own meaning.

The results of the energy in this article are as follows.

<Table 6> Energy in Syllable and Foot

Syllable Person	Cho	co	late	cake
N	75.60	71.18	72.60	73.85
K1	53.97	39.10	56.66	48.83
K2	65.47	66.44	68.11	66.32
K3	58.21	58.29	70.23	64.05
K4	62.28	49.39	58.46	54.29

One native speaker put stronger stress on 'cho' than 'cake' by CSR. One native speaker and one elementary and secondary teacher put stronger stress on 'cho.' But two other teachers put more stress on 'cake.'

3.2.3 Palatalization

The palatalization like flapping occurred very often in North American English. The palatalization can occur in various level such as Phonological word, Clitic Group, Phonological Phrase, Intonation Phrase, and Utterance.

The palatalization occurred more naturally and freely at the low level than the high level.

Even though, Nespor & Vogel(1986: 209) gave examples of palatalization in the Clitic Group, a palatalization example was found in Intonational Phrase. One elementary teacher, one secondary teacher and a native speaker palatalized /s/ of 'guess.' Two other teachers pronounced /s/ and /ʃ/ separately. Though two teachers palatalized /s/, their duration time of [ɛ] was longer, the pitch was higher and energy was lower than the native speaker's.

3.2.4 Deletion and Reduction

In the Clitic Group 'she must have wanted,' reduction and deletion occurred like [ʃi mʌst hæv wɔnid]→[ʃi mʌst əv wɔnid]. 'Have' is pronounced as a weak form and /h/ is deleted before a lax vowel.

In the Phonological Phrase 'she must have wanted to talk,' reduction, devoicing and deletion occurred like [ʃi mʌst hæv wɔnid tə tɔ:k]→[ʃi mʌst əv wɔnit tə tɔ:k]→[ʃi mʌst əv wɔni tə tɔ:k].

Owing to reduction, devoicing and deletion in the Phonological Phrase, the duration of the two Phonological Phrases is nearly the same.

The duration of the two Phonological phrase in this article are as follows.

<Table 7> Duration in Phonological Phrase

Duration	Native		K1		K2		K3		K4	
	P.P. 1	P.P. 2	P.P. 1	P.P. 2	P.P. 1	P.P. 2	P.P. 1	P.P. 2	P.P. 1	P.P. 2
	1.247	1.221	2.149	1.290	1.586	1.347	1.512	0.994	1.338	1.343

In the Phonological Phrase, three of four elementary English teachers used nasalized flapping. Even though two of them used deletion, they didn't use contraction. And they didn't use reduction at all.

They pronounced 'she must have wanted' like [ʃi mʌst hæv wɔnid tu tɔ:k] or [ʃi mʌst hæv wɔnit tu tɔ:k]. But one teacher didn't use reduction, deletion and contraction, he/she pronounced 'she must have wanted' like [ʃi mʌst hæv wɔntid tu tɔ:k].

Owing to not using reduction or contraction, or both of them, the duration of the two Phonological Phrases is not the same.

3.2.5 Mono Syllables rule

Nespor & Vogel(1986: 179) suggested the Mono Syllable Rule in the Phonological Phrase.

[The sluggers]_ϕ [boxed]_ϕ [in the crowd]_ϕ

[the cops]_ϕ [boxed in]_ϕ [the crowd]_ϕ

In the first example, the preposition *in* is the leftmost node of a Φ and is thus weak with respect to the strong node dominating *crowd*. Hence, *in* may undergo reduction. In the second example, on the other hand, *in* may not be reduced, since it is the rightmost node of the Φ containing *boxed in*, and is thus labeled strong with respect to its sister, which is weak.

Like Nespor & Vogel's example, *in* of 'moving in' will be labeled strong.

The results of the Energy in this article are as follows.

<Table 8> Energy in Phonological Phrase

Syllable Person	move	ing	in	with	us
N	82.96	85.65	87.32	75.56	68.09
K1	71.30	71.70	75.15	67.16	61.74
K2	52.81	63.30	59.60	48.04	54.10
K3	64.28	66.48	65.17	57.30	61.86
K4	63.22	67.23	60.38	59.72	58.83

As you see in the above table, the native speaker put the strongest node on *in* but, the Korean English speakers put the strongest node on other words.

3.3 Discussion

Through this research, some problems on the pronunciation of Korean English teachers could be identified as follows.

First, the VOT of Korean English teachers is longer than the native speaker's.

Second, two elementary teachers and one secondary teacher flapped /t/ as [ɾ]. But one elementary teacher resyllabicated 'eating' as [ea]₆ [ting]₆, and aspirated /t/. And three Korean English teachers used nasalized flapping.

Third, two elementary teachers and one secondary teacher inserted [ɨ] after /d/.

And in the Clitic Group and Phonological Word 'chocolate,' two teachers resyllabicated 'chocolate' like [chok]₆ [late]₆.

Fourth, two elementary teachers put stronger stress on 'cake'.

Fifth, all teachers didn't understand about the Mono Syllable Rule, therefore they put the strongest node on suitable position.

Sixth, teachers understood about devoicing and deletion, but they didn't understand reduction and contraction. Therefore they could make an isochronism.

Finally, one elementary teacher, and one secondary teacher palatalized the /s/ of 'guess.'

In this analysis, it was found that elementary teachers have unnatural pronunciation below, within and beyond word level, and the secondary teacher has unnatural pronunciation within and beyond word level.

IV. Training Steps

Through analysis, it can be said that elementary teachers have difficulties in pronouncing below, within, beyond word level. Even though secondary teachers have unnatural pronunciation below word level, they have more difficulties in pronouncing within and beyond word level.

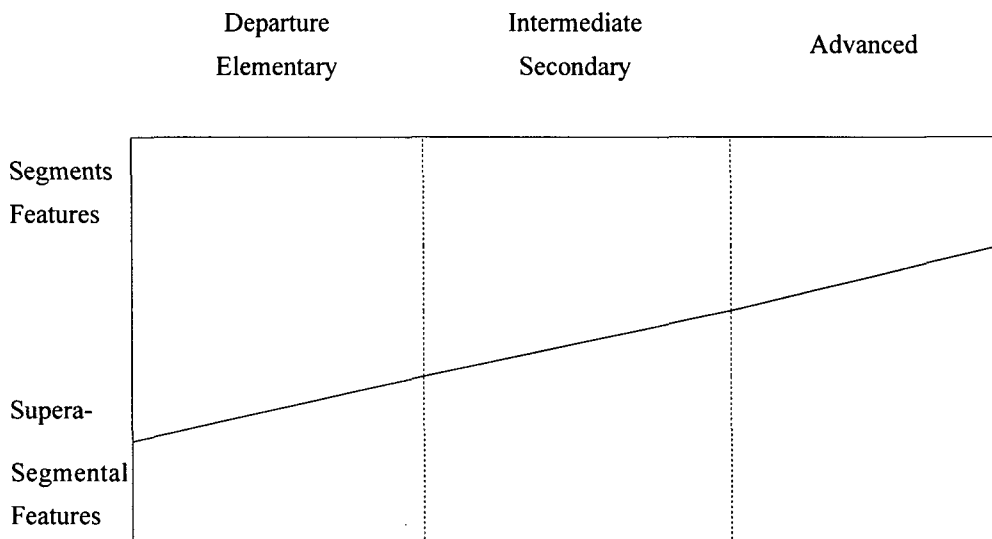
According to the research results, I can say that pronunciation training course should focus mainly on below word level for elementary teachers at first, and then move to within and beyond word level. And the course for secondary teachers should pay some attention to below word level, but pay attention to within and beyond word level to a higher degree. But it does not mean that this course has to be run separately, it should be integrated.

In other words, pronunciation training courses have to put emphasis on segment features first, and move to suprasegmental features for elementary teachers. For secondary teachers, pronunciation training courses have to focus on word level and move to suprasegmental features, in other words beyond word level.

<Table 9> Training Steps by Prosodic Hierarchy

Level	Hierarchy	Specific Target(Phenomena)	Procedure	Grade
Below Word Level	Segments (Syllable, Foot)	Phoneme(Consonants, Vowels, Glides) Allophone Aspiration Voicing Devoicing Phonetics		Elementary Teachers
Within Word Level	Words	Stress Length Syllabication Resyllabication Reduction Duration Lexical Phonology Post-lexical Phonology		Secondary Teachers
Beyond Word Level	Sentence Utterance	Stress(CSR, NSR) Stress Clash Reduction Contraction Deletion Isochronism Resyllabication Rhythm Intonation Length Post-lexical Phonology		Advanced Teachers

<Table 10> Training Steps by Features



V. Suggestion

These results are drawn from two utterances of four Korean English teachers. But the results of another 24 utterances are nearly the same.

The plan is to survey more than 200 Korean English teachers who will attend in-service training programs at different institutions.

Their pronunciation will be recorded before and post an attending in-service training program. Their pronunciation developments will be analyzed.

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<Appendix 1> Below Word Level of "I guess she'd be eating chocolate cake."

Syllable	I										guess									
Speaker	N		K1		K2		K3		K4		N		K1		K2		K3		K4	
Time(D)	0.125		0.161		0.134		0.156		0.160		0.219		0.255		0.330		0.214		0.336	
VOT																				
Pitch	M	S	M	S	M	S	M	S	M	S	M	S	M	S	M	S	M	S	M	S
Energy	74.84	7.40	55.27	7.38	60.46	11.10	70.28	7.89	64.81	8.63	81.88	5.57	55.78	6.70	61.91	7.83	69.95	10.59	60.76	12.25
Formant 1	370		200		300		260		350		500		600		350		320		450	
Formant 2	2150		1700		1600		1900		2000		1800		2150		1780		1600		2000	
Formant 3	2700		2700		2600		2800		2800		2600		2850		2630		2350		2670	

Syllable	she'd										be									
Speaker	N		K1		K2		K3		K4		N		K1		K2		K3		K4	
Time(D)	0.260		0.360		0.354		0.328		0.192		0.179		0.163		0.076		0.139		0.108	
VOT																				
Pitch	116.1	9.99	229.1	22.17	132.7	7.95	132.5	11.58	136.7	5.74	107.5	1.64	202.8	6.22	137.6	49.4	126.2	10.10	121.3	3.12
Energy	75.78	6.65	53.26	4.49	62.56	6.12	62.82	7.19	64.92	7.66	77.85	2.76	57.20	4.14	64.99	6.24	70.40	10.59	60.70	7.86
Formant 1	310		300		300		220		400		250		300		350		300		350	
Formant 2	1920		1320		1300		1750		2050		2150		2650		2400		1890		2200	
Formant 3	2780		2110		2250		2320		2450		2950		3310		2600		2750		2520	

Syllable	eat										ing									
Speaker	N		K1		K2		K3		K4		N		K1		K2		K3		K4	
Time(D)	0.165		0.117		0.276		0.099		0.158		0.160		0.231		0.234		0.406		0.160	
VOT																				
Pitch	10.70	7.45	127.7	9.85	120.8	2.95	113.4	10.08	159.3	11.77	111.3	7.42	234.4	9.44	117.3	1.72	161.5	57.24	135.6	16.51
Energy	79.30	3.39	58.65	2.41	68.89	2.77	63.84	16.60	65.48	10.84	76.48	5.50	60.48	3.58	66.38	12.73	60.91	12.99	65.67	9.34
Formant 1	300		300		350		300		350		380		300		250		300		400	
Formant 2	2200		2400		2400		1870		2500		1650		2300		2300		1300		700	
Formant 3	2800		2910		3300		2700		2720		2400		2850		2800		2300		2600	

Syllable	cho										co									
Speaker	N		K1		K2		K3		K4		N		K1		K2		K3		K4	
Time(D)	0.248		0.193		0.245		0.277		0.839		0.065		0.087		0.089		0.067		0.062	
VOT																				
Pitch	122.98	2.30	294.1	0.000	186.1	73.0	159.7	17.93	145.0	3.59	116.4	16.19	162.9	9.36			150.1	19.83		
Energy	75.60	6.91	53.97	9.97	65.47	9.60	58.21	13.76	62.28	9.67	71.18	8.97	39.10	13.02	66.44	4.31	58.29	15.90	49.39	18.80
Formant 1	1000		110		250		210		700		1000		650				400			
Formant 2	1100		1700		1920		1400		1050		1200		1050				1150			
Formant 3	2400		2500		2750		2200		2700		2600		2350				2300			

Syllable	late										cake									
Speaker	N		K1		K2		K3		K4		N		K1		K2		K3		K4	
Time(D)	0.150		0.119		0.123		0.216		0.141		0.294		0.281		0.522		0.236		0.261	
VOT																				
Pitch	108.3	5.79	254.2	22.75	133.3	0.0	121.3	6.44	126.7	14.81	162.1	15.59	226.3	73.32	130.1	34.07	108.5	14.59	94.63	14.86
Energy	72.60	8.43	56.66	6.16	68.11	5.78	70.23	13.08	58.46	19.93	73.85	13.06	48.83	4.29	66.32	6.10	64.05	15.46	54.29	10.02
Formant 1	450		400		300		300		600		600		150		400		380		410	
Formant 2	1800		1250		1620		1000		2150		2100		2400		2400		1800		1900	
Formant 3	2250		2600		2550		2600		2500		2700		2850		2650		2700		2580	

N: Native Speaker, K1: Elementary Teacher(Male), K2: Elementary Teacher(Female),
K3: Elementary Teacher(Male), K4: Secondary Teacher(Male)

<Appendix 2> Below Word Level of "She must have wanted to talk about moving in with us."

Syllable	she					must														
	N	K1	K2	K3	K4	N	K1	K2	K3	K4										
Speaker																				
Time(D)	0.176	0.516	0.246	0.158	0.196	0.303	0.441	0.406	0.340	0.364										
VOT																				
Pitch	M	S	M	S	M	S	M	S	M	S	M	S	M	S						
Energy	75.36	10.93	59.31	6.61	51.59	6.61	56.50	7.00	59.16	4.65	78.45	13.44	61.55	12.96	54.72	12.99	66.53	8.95	60.49	9.93
Formant 1	350	300	330	300	350	600	200	500	480	550										
Formant 2	1080	2100	2280	1190	1050	2000	1200	1900	1100	1200										
Formant 3	2700	2800	2900	2200	2310	2700	2400	2750	2600	2900										

Syllable	have					want														
	N	K1	K2	K3	K4	N	K1	K2	K3	K4										
Speaker																				
Time(D)	0.098	0.236	0.186	0.167	0.136	0.172	0.209	0.282	0.223	0.192										
VOT																				
Pitch	206.2	3.01	116.8	2.98	206.7	15.07	115.7	4.73	119.5	8.55	247.3	93.22	116.7	3.95	200.1	11.65	105.2	3.97	120.2	14.81
Energy	78.18	7.01	61.52	5.82	55.61	6.50	68.52	6.50	61.96	6.49	84.67	2.62	67.83	3.18	59.91	2.95	66.65	3.07	66.39	3.18
Formant 1	500	700	350	300	300	300	350	280	460	500										
Formant 2	1650	1900	780	850	1100	2150	700	1200	1100	1100										
Formant 3	2500	2400	2350	2150	2600	2500	2300	2500	2200	3060										

Syllable	ed					to														
	N	K1	K2	K3	K4	N	K1	K2	K3	K4										
Speaker																				
Time(D)	0.100	0.186	0.064	0.185	0.172	0.090	0.329	0.112	0.155	0.092										
VOT																				
Pitch	244.6	78.67	116.9	4.42	120.5	1.80	117.0	2.90	138.1	6.73	2619	33.67	149.5	90.13	258.2	38.60	180.3	54.50	185.4	50.45
Energy	77.75	10.05	64.51	12.82	54.08	14.74	58.47	14.47	47.48	15.70	67.11	9.04	57.69	11.53	57.68	12.85	53.24	15.36	53.29	16.98
Formant 1	360	250	700	300	500	350	400	260	300	400										
Formant 2	2200	1200	2000	1350	2100	2250	1500	1600	1400	1400										
Formant 3	3200	2500	2800	2100	3000	3300	2600	2180	2600	2300										

Syllable	talk					a														
	N	K1	K2	K3	K4	N	K1	K2	K3	K4										
Speaker																				
Time(D)	0.226	0.232	0.290	0.284	0.186	0.067	0.037	0.003	0.087	0.093										
VOT	0.023	0.051	0.072	0.049	0.061															
Pitch	174.6	63.00	120.5	2.55	242.4	13.12	181.8	74.99	146.4	1.23	298.6	6.30	151.6	68.52	270.5	32.47	137.6	13.33	140.7	12.44
Energy	76.84	10.40	53.20	12.51	48.46	15.47	53.00	16.88	53.91	16.09	74.30	8.32	59.50	6.73	48.37	12.69	64.35	8.91	59.42	9.19
Formant 1	600	400	480	400	500	330	300	600	480	400										
Formant 2	1510	1100	1050	870	1200	1630	1100	1150	990	1100										
Formant 3	2500	2400	2300	2350	2800	2600	2400	2580	2300	2400										

Syllable	bout					mov														
	N	K1	K2	K3	K4	N	K1	K2	K3	K4										
Speaker																				
Time(D)	0.172	0.130	0.223	0.226	0.379	0.181	0.260	0.286	0.180	0.185										
VOT																				
Pitch	175.9	78.90	114.5	1.99	188.0	3.90	108.7	8.52	97.1	6.31	262.4	14.60	113.9	4.04	204.1	15.85	111.1	4.33	107.8	2.10
Energy	78.98	9.09	67.12	1.10	56.81	3.50	61.59	7.69	63.04	8.32	82.96	5.67	71.30	2.12	52.81	8.60	64.28	4.84	63.22	9.50
Formant 1	1100	600	400	460	700	370	400	330	300	350										
Formant 2	1600	1150	1000	1100	1100	1250	700	970	1000	1400										
Formant 3	2600	2600	2300	2200	2800	2700	2500	2500	2200	2600										

Syllable	ing					in														
	N	K1	K2	K3	K4	N	K1	K2	K3	K4										
Speaker																				
Time(D)	0.126	0.149	0.171	0.106	0.056	0.149	0.129	0.128	0.107	0.130										
VOT																				
Pitch	174.1	65.81	118.2	4.20	235.9	4.84	111.2	8.57	104.7	0.78	203.0	87.68	115.4	0.77	208.9	12.72	106.8	1.75	100.7	2.54
Energy	85.65	3.18	71.70	2.39	63.30	0.53	66.48	3.34	67.23	0.94	87.32	0.49	75.15	2.75	59.60	1.89	65.17	1.54	60.38	7.37
Formant 1	300	350	400	300	350	400	300	350	380	400										
Formant 2	1100	980	2500	1900	2000	1100	1080	500	1050	1800										
Formant 3	2500	2480	2900	2450	2350	2500	2500	2600	1600	2200										

Syllable	with										us									
Speaker	N		K1		K2		K3		K4		N		K1		K2		K3		K4	
Time(D)	0.213		0.344		0.202		0.136		0.193		0.343		0.241		0.334		0.152		0.307	
VOT																				
Pitch	21.9	63.67	117.5	6.15	182.6	5.71	102.3	1.33	129.3	6.93	157.3	15.74	108.4	11.05	186.3	16.46	97.6	5.67	89.3	4.36
Energy	75.55	14.16	67.16	9.77	48.04	10.83	57.3	9.07	59.72	10.92	68.09	8.65	61.74	9.03	54.10	6.48	61.86	8.19	58.83	5.07
Formant 1	400		380		400		300		300		700		700		500		400		500	
Formant 2	1600		1900		1700		1400		1400		1900		1300		1300		1150		1350	
Formant 3	2200		3400		2800		2300		2700		3300		2400		2000		2460		2700	

N: Native Speaker, K1: Elementary Teacher(Male), K2: Elementary Teacher(Female),
 K3: Elementary Teacher(Male), K4: Secondary Teacher(Male)