Chapter V

Subsequent Evaluations

5.1 Initial Student Coda Evaluations

Section 3.6 described the methodology used for evaluation of students, which took place about six months after the informant test. Once the scores were tabulated for student coda production, subsequent evaluation of relative difficulty occurred during review of the test results (shown in Table 7 below) with the students, where the evaluator asked the students to repeat the various complex codas in descending accuracy order. There was a discernable difference with the /dz/ and most subsequent codas. Notably, this is the first voiced coda on the list with a postvocalic stop. This is a barrier for most learners, as was pointed out in section 4.4.4.

TABLE 7: INITIAL EVALUATION OF INTERMEDIATE LEARNERS

Word	St.1	St.2	St.3	St.4	St.5	St.6	St.7	St.8	Mean	Phonemes
content	10	10	10	10	10	10	10	10	10.0	/nt/
once	10	10	10	10	10	6	10	10	9.5	/ns/
steps	6	6	10	10	10	10	10	10	9.0	/ps/
cats	8	10	10	6	6	10	10	10	8.8	/ts/
risk	10	6	6	10	10	10	10	6	8.5	/sk/
adopt	10	6	10	6	10	10	10	6	8.5	/pt/
must	10	10	6	10	6	10	10	6	8.5	/st/
haven't	10	6	10	6	10	10	10	6	8.5	/nt/ unstressed
makes	10	6	10	6	10	10	10	6	8.5	/ks/
thinks	10	6	10	6	6	10	10	8	8.3	/ŋks/
camps	8	6	8	6	6	10	10	10	8.0	/mps/
problems	8	6	8	7	8	8	10	8	7.9	/mz/
beliefs	10	6	6	10	6	7	10	6	7.6	/fs/
chickens	8	8	6	6	6	8	10	6	7.3	/nz/
and	6	6	6	6	10	6	10	6	7.0	/nd/

/Continued

Table 7—Continued										
Word	St.1	St.2	St.3	St.4	St.5	St.6	St.7	St.8	Mean	Phonemes
birds	8	6	6	6	6	7	10	6	6.8	/dz/
watched	7	6	7	7	7	7	7	6	6.8	/tʃt/
washed	7	10	5	6	7	7	7	5	6.7	/ʃt/
eggs	10	6	5	7	7	7	7	5	6.6	/gz/
deaths	10	6	6	7	6	6	6	6	6.6	/θs/
fixed	6	6	4	6	10	7	8	6	6.6	/kst/
results	10	6	6	6	6	6	6	6	6.5	/lts/
linked	7	6	5	6	10	7	7	4	6.5	/ŋkt/
managed	7	6	4	8	7	7	7	5	6.4	/dʒd/
asked	8	6	6	7	10	7	7	6	6.4	/skt/
dragged	7	6	7	7	7	7	6	4	6.3	/gd/
moved	7	6	6	6	6	7	8	5	6.3	/vd/
sold	10	6	4	6	6	6	6	4	6.1	/ld/
changed	6	6	6	4	6	7	7	7	5.9	/ndʒd/
tests	6	6	6	6	6	5	6	6	5.9	/sts/
films	6	6	4	5	6	3	10	6	5.7	/lmz/
solved	7	5	3	4	7	4	7	4	4.9	/lvd/
Mean	8.2	6.7	6.7	6.8	7.6	7.6	8.5	6.4	7.3	

Time spent reading the paragraph from the narrative ranged from 75 seconds for student 2 and 160 seconds for student 6. Mean time was about 2 minutes. As in the informant study, increased speed was associated with more final consonant deletions in codas (students 2, 3, 4). Vowel production did not suffer from increased speed, but rather was associated with learner hesitancy about how to pronounce a word token—which often reduced the speed of production. Student 5 is Japanese, student 6 is Korean, and student 7 is Chinese; their coda accuracy was superior to the other (Thai) students, save student 1, who was second highest overall. The Chinese student #7, who had the highest mean coda accuracy of all (8.5), achieved this at the expense of fluency and vowel

production. Student #8, who is a Thai national of Akha descent, ranked lowest for coda accuracy, fluency, and vowel production.

As in the main study, voiceless doubleton codas were most accurately produced. The /nt/ coda was the easiest coda of all, as it was in the Mano-Im study, and as implied by Contrastive Analysis. Accuracy was higher when the coda syllable was stressed (***content***), than when unstressed (***haven't***), confirming the Natural Phonology studies cited in 2.1.5. The /ns/ coda was the next easiest, as also shown in both the Mano-Im and the main study. The /sk/ and /ks/ codas were pronounced with equivalent mean accuracy. The /lvd/ and /lmz/ codas were at the bottom, as in the main study. Only about 30 of the 50 codas were evaluated, as only one paragraph was recorded, so the /lvz/ coda was not evaluated.

The general level of complex coda pronunciation, particularly with the non-Thai learners, was higher than anticipated, given their lack of fluency in authentic conversation. Perhaps their recent phonetic training helped, as did the fact that the students, unlike the informants, were advised to pronounce inflected words clearly for the test. Some Thai students (#1, 3, and 4) evidenced much more use of epenthesis than is typical for Thai learners in general, and epenthesis was occasionally utilized on inappropriate codas, e.g., /gz/ (informants 5 and 6). This probably reflects the perceived formality of the task, since the students were informed that codas would be assessed. Hence, the student narrative tests might be seen as intermediate in formality between the informant narrative test (less formal) and the informant wordlist test (more formal), and it would seem logical to compare the results of the student tests with the mean of the informant narrative and wordlist, rather than solely with the narrative.

The students were later drilled on the codas with less accurate pronunciation, and those informants who had higher accuracy scores were referred to as guides for the less proficient informants. Improvement was evident from the 45 minutes or so devoted to practice drills, though ultimate retesting would show the extent to which this improvement was permanent.

5.2 Subsequent (Final) Evaluation of the Codas

The follow-up test occurred two months after the first test. Student 7 dropped out of the program a few weeks before the second test, but all other students were able to complete the second test reading aloud the paragraphs of the *Bird Flu* narrative. There was little classroom attention to and review of complex codas or of **–ed** and **–s** grammatical affixes immediately prior to the second test. Table 8 below lists the mean scores for the final evaluation of the complete set of codas tested in the narrative.

TABLE 8: FINAL EVALUATION, ALL CODAS

Word	Coda	St.1	St.2	St.3	St.4	St.5	St.6	St.8	Mean	First test	Change
steps	/ps/	10	10	10	10	10	10	10	**10.0**	8.9	1.1
content	/nt/	10	10	10	10	10	10	10	**10.0**	10.0	0.0
once	/ns/	10	10	10	10	10	10	10	**10.0**	9.4	0.6
picked	/kt/	10	10	10	10	10	10	10	**10.0**		
helped	/lpt/	10	10	10	10	10	7	10	**9.6**		
adopt	/pt/	10	10	10	10	10	10	6	**9.4**	8.3	1.1
haven't	/nt/	10	10	10	10	10	10	6	**9.4**	8.3	1.1
against	/nst/	10	10	10	10	10	10	6	**9.4**		
seems	/mz/	8	8	10	10	10	8	10	**9.1**	7.6	1.5
thinks	/ŋks/	10	8	10	10	10	7	7	**8.9**	8.0	0.9
belonged	/ŋd/	8	10	6	10	10	8	10	**8.9**		

/Continued

TABLE 8 --Continued

Word	Coda	St.1	St.2	St.3	St.4	St.5	St.6	St.8	Mean	First test	Change
lift	/ft/	6	10	10	10	10	10	6	**8.9**		
beliefs	/fs/	6	10	6	10	10	10	10	**8.9**	7.3	1.6
washed	/ʃt/	10	7	10	10	10	7	6	**8.6**	6.7	1.9
risk	/sk/	10	6	10	10	10	8	6	**8.6**	8.3	0.3
camps	/mps/	10	10	6	8	6	10	10	**8.6**	7.7	0.9
watched	/tʃt/	7	7	8	10	10	7	10	**8.4**	6.7	1.7
camped	/mpt/	10	8	8	6	10	7	10	**8.4**		
makes	/ks/	10	10	10	6	10	7	6	**8.4**	8.3	0.1
cats	/ts/	10	8	6	8	10	10	6	**8.3**	8.6	-0.3
must	/st/	10	10	10	6	10	6	6	**8.3**	8.3	0.0
chickens	/nz/	10	8	8	8	8	8	8	**8.3**	6.9	1.4
things	/ŋz/	8	8	10	8	8	8	8	**8.3**		
linked	/ŋkt/	10	10	10	7	10	7	4	**8.3**	6.4	1.9
launched	/ntʃt/	10	6	8	10	10	7	6	**8.1**		
gives	/vz/	10	8	10	6	8	6	8	**8.0**		
seemed	/md/	8	10	8	6	8	8	8	**8.0**		
fixed	/kst/	10	10	6	6	10	7	6	**7.9**	6.4	1.5
besides	/dz/	8	6	10	6	10	8	6	**7.7**		
moved	/vd/	8	7	8	8	8	6	8	**7.6**	6.1	1.5
jobs	/bz/	7	7	7	8	8	8	8	**7.6**		
tells	/lz/	10	7	8	6	7	8	6	**7.4**		
eggs	/gz/	10	7	7	8	8	6	6	**7.4**	6.5	0.9
used	/zd/	7	6	7	8	10	7	5	**7.1**		
results	/lts/	10	8	6	6	6	8	6	**7.1**	6.6	0.5
birds	/dz/	8	7	8	7	6	7	6	**7.0**	6.3	0.7
tests	/sts/	10	6	6	6	6	8	6	**6.9**	5.9	1.0
dragged	/gd/	7	7	5	5	10	7	7	**6.9**	6.4	0.5
managed	/dʒd/	7	8	7	7	7	7	5	**6.9**	6.3	0.6
asked	/skt/	7	6	10	6	6	7	4	**6.6**	6.3	0.3
described	/bd/	8	8	7	6	6	5	6	**6.6**		
films	/lmz/	10	6	4	6	6	5	8	**6.4**	5.1	1.3
changed	/ndʒd/	5	6	7	6	8	6	6	**6.3**	5.9	0.4
sold	/ld/	8	6	6	6	6	6	6	**6.3**	6.1	0.2
deaths	/θs/	6	6	7	6	6	6	6	**6.1**	6.7	-0.6
and	/nd/	6	6	6	6	6	6	6	**6.0**	6.6	-0.6
solves	/lvz/	6	5	6	4	6	5	4	**5.1**		
solved	/lvd/	5	5	5	5	5	4	4	**4.7**	4.6	0.1
Mean		**8.6**	**8.0**	**8.1**	**7.7**	**8.5**	**7.6**	**7.0**	**7.9**	**7.2**	**0.75**

All students but one (#6) improved the mean accuracy of their complex coda pronunciations. The mean degree of improvement was 0.75, or about 3/4 of a point (e.g., the difference between a feature substitution and a deletion). The best students (1, 5) had only moderate improvement, as did the weakest student (8), while some students who were slightly below average on the first test (2, 3) experienced the greatest improvement in accuracy. While most codas showed improvement, a few codas saw slight declines in average scores (0.6 or less). Improvement was seen with the /ps/ (*steps*), /pt/ (*adopt*), /fs/ (*beliefs*), /mz/ (*seems*), /nz/ (*chickens*), /kst/ (*fixed*), /vd/ (*moved*), and particularly with the /tʃt/ (*reached*) and /ʃt/ (*wished*) codas. Much drilling on the differences between /tʃ/ and /ʃ/ occurred during review of the first test and in subsequent classes.

5.3 Comparison of Student and Informant Coda Production

There are notable similarities and differences between the results of this table and Table 5 (Informant Narrative Scores) in the main study (Page 90). Mean scores range from 100 to 37 in Table 5 and from 10.0 to 4.7 in Table 8. The /ns/ and /ps/ codas appear at the top of both tables, and the /lvd/ and /lvz/ codas at the bottom. However, while the top five codas in Table 5 are all /s/ codas (/ns/, /ts/, /ŋks/, /fs/, and /ps/), only two of the top five codas in Table 8 are (/ps/ and /ns/). All but one of the top 10 codas in Table 5 ended in /s/, while codas ending in /t/ account for three of the top five (/nt/, /kt/, and /lpt/) and a further two (/pt/ and /nst/) of the top 10 codas of Table 8.

As the student narrative was more formal than the informant narrative, insofar as the students were instructed to accurately pronounce the inflections and the informants were not, the mean wordlist/narrative scores in Table 6 are used to compare groups of codas between informants and students. Differences are mainly apparent in /t/ codas: the /nt/ coda was evaluated and ranked highest in the student evaluation, but was ignored in the informant evaluation. The /kt/ coda also had a perfect score in the student evaluation, but scored 78 in the informant evaluation. The /ft/ coda scored 8.9 in the student, but only 62 in the informant evaluation. The /mpt/ coda scored 8.4 in the student, but only 57 in the student evaluation. Most remarkably, the /lpt/ tripleton achieved a score of 9.6 in the student, but a low 59 in the informant evaluation. Unfortunately, the first student test did not evaluate these four codas, and so cannot throw light on this anomaly. However, the superior student scores for these /t/ codas relative to the informant scores may be partly due to connected speech elisions, which as section 4.1.1 noted, were utilized more by the more proficient, native-like informants 1 and 3 than by the less proficient informants 2 and 4. As section 1.4.2 illustrated, /t/ codas are much more likely to have the final consonant elided than are /s/ codas in the connected speech of native English speakers, and perhaps the more developed informants of the main study were more inclined to follow this pattern than were the less developed students. Certainly it is notable that virtually all those codas which were pronounced substantially more accurately by the students (had ranking differences of 10 or more) were all /t/ codas, and that only one /t/ coda was pronounced relatively less well—namely, the tripleton, /ntʃt/. Table 9 below shows both informant and student coda scores and coda rankings. Student scores are normalized to the same 100-point scale as used in the Informant scores.

TABLE 9: INFORMANT AND STUDENT CODA RANK DIFFERENCES

WORD	CODA	Informant Score	Informant Rank	Student Score	Student Rank	Rank Difference (Inf.-Stud.)
rubbed	/bd/	54	22	66	17	5
jobs	/bz/	60	18	76	13	5
birds	/dz/	57	20	77	12	8
judged	/dʒd/	50	24	69	16	8
beliefs	/fs/	75	6	89	5	1
laughed	/ft/	62	16	89	5	11
dragged	/gd/	56	21	69	16	5
eggs	/gz/	53	23	74	14	9
makes	/ks/	87	4	84	7	-3
fixed	/kst/	63	15	79	11	4
act	/kt/	78	5	100	1	4
called	/ld/	61	17	63	19	-2
films	/lmz/	44	27	64	18	9
helped	/lpt/	59	19	96	2	17
belts	/lts/	62	16	71	15	1
solved	/lvd/	39	28	47	22	6
solves	/lvz/	37	29	51	21	8
tells	/lz/	66	12	74	14	-2
seemed	/md/	67	11	80	10	1
lamps	/mps/	65	13	86	6	7
camped	/mpt/	57	20	84	7	13
seems	/mz/	70	9	91	4	5
belonged	/ŋd/	69	10	89	5	5
and	/nd/	63	15	60	21	-6
changed	/ndʒd/	48	25	63	19	6
thinks	/ŋks/	90	3	89	5	-2
linked	/ŋkt/	63	15	83	8	7
once	/ns/	100	1	100	1	0
against	/nst/	67	11	94	3	8
launched	/ntʃt/	75	6	81	9	-3

/Continued

TABLE 9 – Continued

Word	Coda	Informant Score	Informant Rank	Student Score	Student Rank	Rank Difference (Inf.-Stud.)
chickens	/nz/	73	7	83	8	-1
sings	/ŋz/	72	8	83	8	0
steps	/ps/	87	4	100	1	3
adopt	/pt/	67	11	94	3	8
risks	/sks/	57	20	69	16	4
asked	/skt/	46	26	66	17	9
must	/st/	70	9	83	8	1
washed	/ʃt/	57	20	86	6	14
cats	/ts/	95	2	83	8	-6
deaths	/θs/	56	21	61	20	-1
reached	/tʃt/	64	14	84	7	7
moved	/vd/	54	22	76	13	9
gives	/vz/	59	19	80	10	9
used	/zd/	62	16	71	15	1

Codas which scored relatively worse in the student evaluation (as compared to the informant evaluation) include the /nd/ and /ts/ codas (-6 rank difference), the /ks/ and /ntʃt/ codas (-3 difference), the /ld/, /lz/, and /ŋks/ codas (-2 difference) coda. Four of these involve –s inflections, and two involve postvocalic /l/. The more proficient informants have likely acquired those phonetic features of English to a higher degree than have the students. As in the main informant study, only the /e/ vowel successfully elicited the postvocalic /l/. /l/ following /ʌ/, /ɒ/, and /o/ was usually deleted or altered with both students and informants.

5.3.1 Phonemic /s/, /t/, /z/, and /d/ Endings

Codas were categorized as in the main study (section 4.4.1) by ending phoneme and the following rank order was found in mean coda scores: /t/, /s/, /z/, /d/. Here the final stop /t/ had a slightly higher mean score (8.7) than the final fricative, /s/ (8.5). The informant study had shown an average rank order of /s/ (score = 79), /t/ (score = 64), /z/ (score = 62), /d/ (score = 58) (Section 4.4.1). The difference between voiced (/z/ and /d/) and voiceless (/s/ and /t/) codas was much more acute than the difference between stops (/t/ and /d/) and fricatives (/s/ and /z/) in final position. While the mean voiced score was 7.15, the mean voiceless score was 8.6, and the difference between them was 1.45. Mean ending stops was 7.75; fricatives, 8.0, and the difference a negligible 0.25. As noted in Section 4.4.1, /d/ was by far the weakest coda ending. Still, the correlation of /s/, /t/, /z/, and /d/ coda mean scores between the informant and student tests was an inconclusive 0.68 with $p > 0.05$ (sample size, 4). There was insufficient similarity in coda production between the two populations to prevent a significant correlation. A more valid comparison would have involved only a single test, and not a follow up test of the students, or would have involved a follow up test given to the informants. Additionally, the student coda evaluation was more formal insofar as the students were instructed to focus on the pronunciation of inflected codas—which was not true of the informants. Hence, a comparison of the two evaluations is perhaps more valid in showing patterns of relative accuracy among codas than it is as an absolute measure of coda accuracy.

Table 10 on the following page shows the coda scores for the final student evaluation with codas sorted by /s/, /t/, /z/, and /d/ endings.

TABLE 10: ENDING PHONEME CATEGORY SCORES

Word	Phonemes	Mean	/s/	/t/	/z/	/d/
steps	/ps/	10.0	10			
content	/nt/	10.0		10		
once	/ns/	10.0	10			
picked	/kt/	10.0	10			
helped	/lpt/	9.6		9.6		
adopt	/pt/	9.4		9.4		
haven't	/nt/	9.4		9.4		
against	/nst/	9.4		9.4		
seems	/mz/	9.1			9.1	
thinks	/ŋks/	8.9	8.9			
belonged	/ŋd/	8.9				8.9
lift	/ft/	8.9		8.9		
beliefs	/fs/	8.9	8.9			
washed	/ʃt/	8.6		8.6		
risk	/sk/	8.6				
camps	/mps/	8.6	8.6			
watched	/tʃt/	8.4		8.4		
camped	/mpt/	8.4		8.4		
makes	/ks/	8.4	8.4			
cats	/ts/	8.3	8.3			
must	/st/	8.3		8.3		
chickens	/nz/	8.3			8.3	
things	/ŋz/	8.3			8.3	
linked	/ŋkt/	8.3		8.3		
launched	/ntʃt/	8.1		8.1		
gives	/vz/	8.0			8.0	
seemed	/md/	8.0				8.0
fixed	/kst/	7.9		7.9		
besides	/dz/	7.7			7.7	
moved	/vd/	7.6				7.6
jobs	/bz/	7.6			7.6	
tells	/lz/	7.4			7.4	
eggs	/gz/	7.4			7.4	
used	/zd/	7.1				7.1
results	/lts/	7.1	7.1			
birds	/dz/	7.0			7.0	
managed	/dʒd/	6.9				6.9
asked	/skt/	6.6		6.6		
described	/bd/	6.6				6.6

/Continued

TABLE 10—Continued						
Word	Phonemes	Mean	/s/	/t/	/z/	/d/
films	/lmz/	6.4			6.4	
changed	/ndʒd/	6.3				6.3
sold	/ld/	6.3				6.3
deaths	/θs/	6.1	6.1			
and	/nd/	6.0				6.0
solves	/lvz/	5.1			5.1	
solved	/lvd/	4.7				4.7
MEAN		7.9	8.5	8.7	7.5	6.8

5.3.2 Revised Feature Permutations

A review of feature permutations was undertaken to further divide the codas into separate groups which could be compared. Section 4.4.7 showed that the difference between the accuracy of various feature permutations in the informant study was mainly explained by voicing: voiceless permutations were nearly always more accurately pronounced than voiced permutations regardless of feature. With voiceless codas postvocalic nasals, fricatives, and stops alike were easy, but with voiced codas this was not the case for postvocalic stops, which were among the hardest—even harder than postvocalic laterals, e.g., /ld/. The voiced affricate, /dʒ/ was of equivalent difficulty to the voiced stops (/b/, /d/, /g/). With the student study the postvocalic nasals remained the easiest—in voiced as well as voiceless codas. The most difficult codas of all were either voiced tripletons or voiced doubleton codas with postvocalic stops or affricate. Ultimately, seven categories of codas (three voiceless, four voiced) were assembled, both for the main study of 4 informants (Table 11), and the subsequent evaluation of 8 students (Table 12). Informant scores are the mean of the wordlist/narrative scores.

1. Voiceless doubleton codas with postvocalic stop, fricative, or nasal.
2. Voiceless doubleton codas with marked postvocalic phonemes.
3. Voiceless tripleton codas.
4. **Voiced** doubleton codas with postvocalic stops or affricates.
5. **Voiced** doubleton codas with postvocalic nasals.
6. **Voiced** doubleton codas with postvocalic laterals or fricatives.
7. **Voiced** tripleton codas.

Scores for codas within these 7 permutations, as well as the means and standard deviations for the permutation groups are given in Table 11. Means and standard deviations are listed near the top of the tables. Permutation means are ranked.

TABLE 11: REVISED FEATURE PERMUTATIONS (INFORMANTS)

		Cat.1	Cat.2	Cat.3	Cat.4	Cat.5	Cat.6	Cat.7
		Voiceless unmarked doubleton	Voiceless marked doubleton	Voiceless tripleton	Voiced stop or affricate doubleton	Voiced nasal doubleton	Voiced lateral or fricative doubleton	Voiced tripleton
	Mean	80	59	64	55	69	60	42
	S.D.	13	4	11	3	4	4	5
	Rank	1	5	3	6	2	4	7
WORD	**CODA**							
once	/ns/	100						
cats	/ts/	95						
steps	/ps/	87						
makes	/ks/	87						
act	/kt/	78						
beliefs	/fs/	75						
must	/st/	70						
adopt	/pt/	67						
laughed	/ft/	62						
reached	/tʃt/		64					
washed	/ʃt/		57					
deaths	/θs/		56					
thinks	/ŋks/			90				

/Continued

TABLE 11 – Continued

WORD	Coda	Cat1	Cat2	Cat3	Cat4	Cat5	Cat6	Cat7
launched	/ntʃt/			75				
against	/nst/			67				
lamps	/mps/			65				
linked	/ŋkt/			63				
fixed	/kst/			63				
belts	/lts/			62				
helped	/lpt/			59				
camped	/mpt/			57				
risks	/sks/			57				
asked	/skt/			46				
jobs	/bz/				60			
birds	/dz/				57			
dragged	/gd/				56			
rubbed	/bd/				54			
eggs	/gz/				53			
judged	/dʒd/				50			
chickens	/nz/					73		
sings	/ŋz/					72		
seems	/mz/					70		
belonged	/ŋd/					69		
seemed	/md/					67		
and	/nd/					63		
tells	/lz/						66	
used	/zd/						62	
called	/ld/						61	
gives	/vz/						59	
moved	/vd/						54	
changed	/ndʒd/							48
films	/lmz/							44
solved	/lvd/							39
solves	/lvz/							37

Categories 2, 4, 5, 6, and 7 had standard deviations of no more than 4, ensuring some degree of homogeneity. Categories 1 and 3 have larger populations and wider score ranges (62-100 and 46-90, respectively). Their further segmentation into smaller categories could create more homogeneity within each category, but 7 categories is already a lot for the evaluator to work with and recall. The differences between the mean accuracy of categories 2, and 6 were small, and the major distinctions were:

- The ease of category 1, and to a lesser extent, category 5.
- The difficulty of category 4, and particularly of category 7.

These same categories are ranked in Table 12 below with informant feature permutation rankings provided for easy comparison with student rankings.

TABLE 12: REVISED FEATURE PERMUTATIONS (STUDENTS)

		Cat1	Cat2	Cat3	Cat4	Cat5	Cat6	Cat7
		Voiceless Unmarked Doubleton	Voiceless Marked doubleton	Voiceless tripleton	Voiced stop or affricate doubleton	Voiced nasal doubleton	Voiced lateral or fricative	Voiced tripleton
	Mean	9.1	7.7	8.2	7.2	8.1	7.3	5.6
	S.D.	0.7	1.4	1.0	0.4	1.1	0.6	0.9
	Rank	1	4	2	6	3	5	7
Informant	*Rank*	*1*	*5*	*3*	*6*	*2*	*4*	*7*
WORD	**CODA**							
once	/ns/	10						
steps	/ps/	10						
act	/kt/	10						
adopt	/pt/	9.4						
beliefs	/fs/	8.9						
laughed	/ft/	8.9						
makes	/ks/	8.4						
cats	/ts/	8.3						
must	/st/	8.3						

/Continued

TABLE 12—Continued

Word	Coda	Cat1	Cat2	Cat3	Cat4	Cat5	Cat6	Cat7
washed	/ʃt/		8.6					
reached	/tʃt/		8.4					
deaths	/θs/		6.1					
helped	/lpt/			9.6				
against	/nst/			9.4				
thinks	/ŋks/			8.9				
lamps	/mps/			8.6				
camped	/mpt/			8.4				
linked	/ŋkt/			8.3				
launched	/ntʃt/			8.1				
fixed	/kst/			7.9				
belts	/lts/			7.1				
costs	/sts/			6.9				
asked	/skt/			6.6				
birds	/dz/				7.7			
jobs	/bz/				7.6			
eggs	/gz/				7.4			
dragged	/gd/				6.9			
judged	/dʒd/				6.9			
rubbed	/bd/				6.6			
seems	/mz/					9.1		
belonged	/ŋd/					8.9		
chickens	/nz/					8.3		
sings	/ŋz/					8.3		
seemed	/md/					8.0		
and	/nd/					6.0		
gives	/vz/						8.0	
moved	/vd/						7.6	
tells	/lz/						7.4	
used	/zd/						7.1	
called	/ld/						6.3	
films	/lmz/							6.4
changed	/ndʒd/							6.3
solves	/lvz/							5.1
solved	/lvd/							4.7

Again categories 1 and 5 are easiest (this time with category 3, also). Again category 4 and particularly 7 are weakest. Category 4 improved relative to its position in the informant study by the attention paid to the voiced postvocalic stops in class in drill activity during review of the first evaluation. Yet, voiced postvocalic stops in doubleton codas remained the second hardest category even after several months of intermittent attention paid to them in class. As Tables 11 and 12 together show, the rankings remained substantially equivalent for these two quite different evaluations. Category 1 remained by far the easiest, and categories 4 and especially 7 the hardest. Categories 2 and 3 moved up a ranking, and categories 4 and 5 moved down one ranking moving from informant to student evaluation. The Pearson correlation coefficient of the 7 permutation mean scores between informant and student populations was 0.97, p=0.0003, which was highly significant.

The standard deviation for category 2 was unacceptably large ($\sigma = 1.4$) for three constituent codas. The /tʃt/ and /ʃt/ codas were drilled in class, and saw the most improvement of any codas tested. The /θs/ coda, on the other hand, did not see much improvement, and at the time of the second evaluation was the only remaining truly 'marked doubleton'.

5.4 Summary

Due to the nature of the equipment used, assessment of student-produced codas was much less time consuming than informant-produced codas even though the number of tokens assessed was approximately the same. As in the main study, voiceless codas

were more accurately pronounced than voiced codas. The relative mean accuracy ranking for coda final consonants was /t/, /s/, /z/, and /d/, although the first two were close in mean scores (8.7 and 8.5). Relative to the informants, the students did better on most /t/ codas, and this may be due to connected speech elisions present with the former group. Conversely, the more proficient informants did better on codas involving postvocalic /l/ and final /s/. As the informant study had one anomalous coda score relationship: /ntʃt/ > / tʃt/ > /ʃt/ (*launched* > *reached* > *wished*), so did the student study: /lpt/ > /pt/ (*helped* > *adopt*). In both cases the MDH would have predicted that the tripleton coda would have had a lower score. Possibly, *adopt* had a lower score because it is bi-syllabic and less familiar than *helped*. All students but one increased their mean scores in subsequent student testing, and the mean coda improvement was 0.75. The marked /tʃt/ (*reached*) and /ʃt/ (*wished*) codas saw the most improvement, perhaps due to their being drilled in class. A revised feature permutation ranking showed that voiceless doubletons were easiest, with voiced nasal doubletons and voiceless tripletons following. Voiced tripletons were hardest, with voiced doubletons containing postvocalic stops and affricates following. These relative feature permutation rankings held true for both informants and students, and overall Pearson correlation of the 7 permutation mean scores between informant and student populations was strong and highly significant.