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SOCIAL AND LINGUISTIC CONSTRAINTS ON THE ACQUISITION OF AN L2 PHONOLOGY: A CASE STUDY

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

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The Ohio State University
2000

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ABSTRACT

Although the study of the acquisition of an L2 English phonology, specifically the acquisition of English syllable-final codas, has received attention from second language acquisition researchers, the research in this area has been mostly one-time rather than longitudinal, and thus has examined production, rather than the process of acquisition. In addition, research has typically focused only on one linguistic constraint even though more than one process can affect the acquisition and production of a single segment. Furthermore, there has been very little research on how social factors constrain L2 acquisition, and how social factors and linguistic factors interact in the acquisition of a second language.

The overall purpose of this study is three-fold: 1) Describe and analyze Vietnamese learners' acquisition of English syllable-final codas over a longer period of time, examining acquisition orders, and similarities and differences between the learners; 2) Examine the effect of data type (i.e., word list vs. reading passage vs. interview data) on production; and 3) Examine how
different linguistic and social factors constrain the acquisition of L2 syllable-final codas and how these constraints change over the duration of the study for each learner.

Results of the phonological and social data collected via weekly interviews for a duration of ten months indicate that primary linguistic constraints, which include the effects of L1 interference, developmental processes, and markedness, constrain the sequence of development of syllable codas both within and across stages as well as how consonants are modified. Secondary constraints, i.e., data type and linguistic environment, appear to affect production accuracy. Finally, social constraints in terms of the language use environment provides opportunities for and investment in meaningful L2 use, which may be necessary to push learners through the stages of development and minimize L1 retention. Social constraints also provide learners with the rich input necessary for L2 development. Without this input they may not move through the stages of L2 acquisition, as well as potentially increasing the effect and duration of L1 interference effects if the language use environments of the learner are primarily L1.
This dissertation is dedicated to my mother, Birthe M. Hansen, and my sister, Lene G. Hansen
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CHAPTER 1

INTRODUCTION

Problem Description:

Although the study of the acquisition of an L2 English phonology, specifically the acquisition of English syllable-final consonants and consonant clusters (hereafter referred to as syllable-final codas) has received attention from second language acquisition researchers, the research in this area has been mostly one-time rather than longitudinal, and thus has examined production, rather than the process of acquisition. In addition, only linguistic constraints (constraints are defined as positive or negative factors that affect the operation of a rule) have been studied. Furthermore, research has typically been hypothesis-testing, focusing only on one linguistic constraint such as linguistic universals or L1 interference, even though more than one process can affect the acquisition and production of a single segment. Additionally, while SLA researchers have recently begun examining how social constraints such as social identity and social networks affect second language acquisition, i.e., specifically syntax, little research has examined how
social constraints affect the acquisition of an L2 phonology. Yet, it is widely documented that learners need to engage in meaningful interaction in order for second language acquisition to be facilitated (Ellis, 1994). Additionally, work in syntax has shown that social constraints such as contact with target language speakers does facilitate second language acquisition (Heidelberger, 1978; Meisel, Clahsen, & Pienemann, 1981). Researchers have also found that both L1 and L2 social networks can limit learners’ opportunities to engage in meaningful interaction in the target language (Goldstein, 1995; Hansen, 1997, 1998a; Peirce, 1995). However, there has been no research in L2 phonology, and very little in the field of second language acquisition (SLA) as a whole, on how these social factors constrain L2 acquisition, and how social factors and linguistic factors interact in the acquisition of a second language phonology.

The past several decades have yielded important insights into the acquisition of an L2 phonology, specifically with regards to the influence of linguistic processes such as L1 interference, L1 developmental processes, and universals. However, SLA lacks a cohesive theory of L2 phonological acquisition which incorporates the different linguistic constraints as well as social constraints.
Purpose, Objectives, and Research Questions:

The overall purpose of this study is three-fold: One is to describe and analyze Vietnamese learners' acquisition of English syllable-final codas over a longer period of time, i.e., 10 months, examining acquisition orders, and similarities and differences between the learners. The second purpose is to examine the effect of data type (i.e., word list vs. reading passage vs. interview data) on production. Finally, a third purpose is to examine how different linguistic and social factors constrain the acquisition of L2 syllable-final codas and how these constraints change over the duration of the study for each learner.

The objectives are as follows:

1. To describe selected Vietnamese learners' acquisition of English syllable-final codas over 10 months;

2. To determine the effect of data type (word list, reading passage, interview data) on production;

3. To analyze the acquisition of syllable-final codas in terms of acquisition orders, developmental sequences, rate of acquisition, and linguistic and social constraints;

4. To examine the interaction among linguistic and social constraints in learners' production and acquisition of an L2 phonology.
The major research questions include:

1. Is there a developmental sequence in the acquisition of English L2 syllable-final codas?

2. Is there an effect for data type (i.e., reading passage vs. interview data) on the production of syllable codas?

3. How do linguistic constraints such as L1 interference, developmental effects, markedness, and linguistic environment affect the acquisition of English L2 syllable-final codas by speakers of Vietnamese?

4. How do social constraints such as social interactions (i.e., amount and type of contact with speakers of the L1 and the L2), social identity, acculturation, attitude, and motivation affect the acquisition of English L2 syllable-final codas by speakers of Vietnamese?

5. Do these constraints change over time? If so, how?

Rationale for the Study:

My focus in this study is on the acquisition of L2 English syllable-final codas by speakers of Vietnamese. Prior research on the acquisition of an L2 English phonology has shown that second language learners of English, including speakers of Vietnamese, have difficulties acquiring this aspect of English. Learners of English, especially those whose first languages have less complex coda structures, such as Vietnamese, typically modify codas in production, via epenthesis, devoicing, and/or absence in production, in favor
of shorter, and thus simpler, codas. While researchers agree that this is a common process for learners of English, including first language learners of English, there is a lack of agreement over what linguistic processes affect the learners' modifications, and even what types of modification processes learners favor. One reason for the lack of consensus is the fact that the majority of the research in L2 phonology has been one-time, rather than longitudinal, with studies being done with learners of different ages and language levels, making comparisons among studies difficult. Therefore there is a lack of knowledge about how processes interact and change over a longer period of language acquisition. Additionally, there has been little research on the influence that the social context of language learning has on the acquisition on L2 phonology although some one-time research has focused on the effect of the social context on L2 production (cf. Adamson & Regan, 1991; Beebe, 1980; Beebe & Zuengler, 1983; Dowd, Zuengler, & Berkowitz, 1990; Schmidt, 1974, 1983, 1987).

The present study examines the acquisition of English L2 syllable-final codas over ten months, and focuses on two beginning learners of spoken English who have entered the United States within six months of the onset of the study. I have chosen to focus on syllable-final codas because this is an area of difficulty for many learners of English, and especially for speakers of Vietnamese learning English. This is because while English has complex syllable-final codas, i.e., with up to four consonants in a row, Vietnamese
does not allow consonant clusters. Single consonants are allowed in syllable-final position, but they are restricted to stops, nasals, and glides. Consonant coda acquisition and production is an important pedagogical concern in second language teaching since modification of syllable-final codas can affect communicative efficacy, and thereby debilitate communication and comprehension. Prior research (i.e., Beebe, 1980; Dickerson & Dickerson, 1977; Gathbonton, 1975; Major, 1994; Sato, 1985; Tarone, 1983) has shown that task type affects production accuracy, with most researchers concurring that greater accuracy in L2 production occurs in more careful speech styles (i.e., a word list or reading passage) versus a more casual speech style (i.e., interview data). It is therefore necessary to examine the participants' production across tasks, in this case a word list, reading passage, and interview data, in order to gain a fuller picture of the participants' production, and thus, acquisition, across time. Additionally, employing a word list and reading passage enables the examination of the production of specific syllable codas which may not be naturally occurring in the participants' speech.

Speakers of Vietnamese were chosen in part because Vietnamese has relatively restricted syllable-final coda structures in comparison with English, and English syllable-final codas are difficult for these learners to acquire. By focusing on beginning learners, I hope to gain better insight into the processes, patterns, and constraints on the acquisition of an L2 phonology. This insight, especially the understanding of how social constraints affect L2
phonological acquisition, has important theoretical implications for the field of SLA as a whole, as well as pedagogical implications for both foreign and second language education.

Significance of the Study:

In addressing both how linguistic and social constraints affect the acquisition of an L2 phonology, I hope that the results of this study will contribute to a greater understanding of how linguistic and extra-linguistic factors interact in the acquisition of a second language. Additionally, I hope that as a result of this study, greater insights into the processes of SLA will be achieved, with implications both for second language acquisition research as a whole and for both foreign and second language teaching, by examining how different linguistic and social factors individually and simultaneously affect the acquisition of phonological features over a longer period of time.

Methodological Framework:

As this project examines both how linguistic and social constraints affect the acquisition of English L2 syllable-final codas, a variety of data collection and analysis techniques were employed.

Phonological data were gathered via one-on-one interviews between the participants and the researcher in their home, which is viewed as a more relaxing environment, and tape recorded via high quality tapes and recording
equipment. In order to examine acquisition across time, the participants were asked to read the word list and reading passage three times during the 10 month duration of the study, with approximately 3 month intervals between each data collection time. Additionally, interview data were chosen from one interview again spaced three months apart. While the word list, reading task, and interview data were not recorded on the same day, due to time limitations, each data set was recorded within a three-week period spaced over three months apart (see the Timeline in Chapter 3). In all, between three and four hours of data were recorded for each data set, totaling over ten hours of data for phonological analysis.

The analysis of phonological variables was initially conducted via descriptive statistics to determine overall production accuracy, and rates of absence, epenthesis and feature change. These results are outlined in Chapter 4. After that, data analysis of phonological variables was conducted via a Variable Rule Application, or VARBRUL, a linguistic statistical data analysis program which models linguistic variation via probabilistic rules of production of the linguistic variant based on linguistic and social factors. Additionally, descriptive statistics such as frequency counts were employed to ascertain overall production accuracy.

Social data were gathered via the weekly interviews spanning the ten months of the study. In all, from the period of March, 1999 until December, 1999, 28 interviews were held with each of the participants. Each interview
lasted between 1 hour and 1 1/2 hours, culminating in approximately 42
hours of data. During each interview, the participants' social interactions
were probed, along with motivation, attitudes, acculturation, social identity,
and perceptions of language ability, in order to build up a picture of the
participants' social contexts of language use. The data were transcribed word-
for-word, and analyzed via a qualitative framework of grounded theory
(Strauss & Corbin, 1990). Within this framework, data are analyzed for
emerging patterns and trends where theory is "inductively derived from the
study of the phenomenon it represents" (p. 23) rather than being a priori. As
such, as patterns and trends began to emerge from the interviews based on
initial questions about social interactions, language use, identity, motivation,
etc., the patterns were continually probed during successive interviews.

Pilot Research Studies:

Several prior research projects on social and linguistic constraints and
second language acquisition have been conducted prior to this study. Several
of these studies have examined how social interactions affect the language
use patterns of second language learners (i.e., Hansen, 1997, 1998a, 1999b).
Several analyses of the acquisition of English syllable codas, focusing both on
the linguistic constraints on acquisition of syllable codas (Hansen, 1999b) and
both social and linguistic constraints on the acquisition of final consonants
(Hansen, 1999c) were also carried out prior to this research.
In an earlier research project (Hansen, 1997), consisting of a survey project with 65 Chinese graduate students in United States higher education, forty-nine (75%) of the students reported speaking English less than one hour a day. Through interviews with sixteen of the survey participants, it was found that both academic, linguistic, and environmental factors affected the students' opportunities to speak English. The five most prominent factors were: No time to speak English due to academic pressures, having native country friends/roommates, lack of English skills, having native language classmates/officemates, and the fact that students only listened in their content courses. When examined further, it appeared that L1 socio-cultural factors such as cultural expectations of high academic achievement, collectivism over individualism, in-group solidarity and community development, face-saving strategies, and respect for others by not wasting class time asking questions, greatly influenced the students' L2 and L1 behavior in the L2 culture. It was also found that learners often experienced conflicts between their desire to develop networks with speakers of English, and to maintain their L1 social network, and identity, which thus limited their use of English when members of their L1 group were present. Therefore, developing relationships with speakers of English and an L2 identity is not without L1 in-group and community costs, which may far outweigh the benefits gained by interacting with speakers of English. In this study the social factors that played a role in opportunities for students to
speak the target language and develop an L2 identity stemmed not from the
target culture, as in Peirce's research (1995), but rather from the L1 culture, as
Goldstein (1995) also found in her study.

In a later project on the acculturation patterns and English speaking
skills development of three speakers of Mandarin Chinese, (Hansen, 1998a), it
was found that attitudes toward the L2 and members of the L2 culture were
significant factors in L2 development. While the three participants in the
study had similar situations in terms of social dominance and integration
patterns, they differed significantly in their attitudes towards native speakers
of English, American culture, and necessity of understanding American
culture and Americans in order to communicate successfully. The participant
with the fastest rate of language development had a positive attitude towards
the above factors, and actively sought out opportunities to interact with
Americans, which in turn helped to create more opportunities for
meaningful language use.

The resistance to English language use among speakers of Chinese in
US higher education, and how this influenced the acquisition of English final
consonants, was also investigated (Hansen, 1999b). The results indicate that
resistance to second language use can be other-imposed, i.e., when the
opportunities to communicate in the second language are limited because of
economic, environmental, and sociocultural factors. Resistance can also be
self-imposed, especially when the use of a second language implies a
disidentification with the native culture and language as viewed by members
of learners' L1 community. However, the study also found that some
learners, especially when they have received support both from their
academic departments and from within their native language community,
were able to create opportunities for English language use without this being
a threat to their L1 identity. In other words, they were able to create a viable
L2 identity which co-existed with rather than conflicted with their L1 identity.
A statistical analysis of the participants' syllable coda acquisition over a period
of six months from the perspective of the three different reaction patterns to
limited language use opportunities (i.e., other-imposed resistance, self-
imposed resistance, and in effect, resisting the resistance) was conducted. This
analysis indicated that while all three had similar levels of production
accuracy at the onset of the data collection, the learner who made the greatest
gains over the six month period was the learner who 'resisted' the resistance.
This suggests that while learners may experience similar limitations in terms
of opportunities to use the target language even while living in the target
culture, it is how the learners react to the limitations that can make a
difference in terms of language acquisition.

In a recent study (Hansen, 1999a), the linguistic constraints on the
acquisition of English syllable codas by three speakers of Mandarin Chinese
over a period of six months were analyzed. Results showed that overall,
single codas were acquired before two-member codas, and two-member codas
were acquired prior to three-member codas. These results confirm claims by Eckman (1991), Eckman and Iverson (1993) and Major (1987) that shorter codas are produced more correctly and acquired prior to longer, and thus more complex, codas. Production modifications were also examined across coda lengths, and it was found that the production modifications employed differed based on coda length. For example, single codas were typically correctly produced, but if the consonants were modified, it was most commonly via feature change. However, for two-member codas epenthesis was favored and for three-member codas absence was favored. It appeared that one-member codas were more affected by L1 interference as single codas were often modified to conform to those present in the learners' first language. However, markedness appeared to have a greater affect on two- and three-member codas; two-member codas were resyllabified via epenthesis to conform to an open syllable structure, which is universally unmarked. Additionally, the codas with which the learners had the most difficulty were marked in relation to those which the learners produced with less difficulty. For three-member codas, the most commonly modified codas were those which violated sonority constraints, with the element which caused a violation of the Universal Canonical Syllable Structure (UCSS) frequently omitted.
In another study on syllable coda production (Hansen, 1999c), which this time focused only on final alveolar stops (i.e., /t/ and /d/), a VARBRUL analysis was conducted to determine the extent to which second language learners were acquiring the /t, d/ absence patterns of native speakers of English based on similarities of constraint rankings. This analysis included but was not limited to preceding and following segments. A comparison was made between prior research findings for native speakers of English and those of the second language learners in this study, who were also native speakers of Chinese. Data were examined at two intervals, with a distance of six months. Data showed that learners were acquiring similar constraint rankings across time, but that the constraints were acquired at different rates for each learner, based on the type of contact the learner had with native speakers of English. Students with more complex verbal interactions in English with native speakers had more similar ranking constraints to those of native speakers than students with fewer interactions with native speakers.

These studies indicate that the social context of language learning exerts a significant effect on language use opportunities and by implication, language development. Additionally, they also suggest that multiple linguistic and social constraints can operate on a single feature. This indicates that both social and linguistic constraints need to be examined
simultaneously in order to ascertain how different constraints affect the acquisition and production of syllable codas, and how the constraints on acquisition and production change over time.

The Study:

Based on my experience and findings from prior studies, I selected one family from Vietnam who had recently entered the United States. I gained access to this family through my teaching at Pima Community College in Tucson, Arizona, at which one member of the family was a student at the onset of the study. I approached the participant with the question of whether she would be interested in volunteering for this research study. After agreeing to do so, she suggested meeting in her home and the addition of her husband as a participant in the study. I agreed to include her husband in the study as a family provides an ideal opportunity to make comparisons between speakers as the members of the family have similar L1 backgrounds. Additionally, the family provides a unique opportunity to research how the differential social networks and identity formations of the members of the family influence L2 acquisition, as well as what variety of English is targeted for acquisition as based on social (i.e., peer) networks and in-group identification. Communication within the family can also be examined.
Insights into language use, language resistance, and language maintenance within a family are crucial in understanding how social forces affect language acquisition and attrition.

Data on social factors were collected via interviews, and data collection took place approximately once-a-week during the ten months of the study. Interviews were always tape recorded, and field notes were also taken during the interviews. The topic of the interviews were the participants' L1 and L2 language use patterns, social interactions, and daily routines, which were analyzed qualitatively in order to understand the social constraints on the participants' language use and acquisition. Speech samples for phonological data analysis were selected from the one-on-one interviews at three month intervals during the study.

Limitations of the Study:

There are several limitations to this study: First, only data on syllable-final codas were analyzed, which does not represent L2 phonological acquisition as a whole. However, syllable-final codas are an important unit of analysis, and are a problematic area of acquisition for many non-native speakers of English, especially speakers of Vietnamese. Additionally, syllable-final coda production affects communicative efficacy and thus research in this area of phonology has important pedagogical implications.
A second limitation of this study is that it is confined to speakers of Vietnamese. However, many L2 phonological processes are similar cross-linguistically, and thus information gathered on Vietnamese speakers provides important insights into the process of L2 phonological acquisition.

A third limitation of this study is the small sample size of only two participants. This is not seen as a limitation within L2 phonology research, however, where sample sizes are often very small, especially for longitudinal research. A more important consideration in L2 phonological research is the number of tokens gathered from each participant. Since this project was longitudinal, lasting approximately 10 months, approximately 10,000 individual pieces of phonological data were analyzed in this study.
List of Terms

Slant brackets is used to show how a sound(s) is represented phonemically, i.e., how it should be pronounced. For example, the phonemic representation of hot is /hot/.

Square brackets show how the participants actually produce a sound(s), i.e., the actual phonetic realization of a phoneme. Therefore, the word hot has the phonemic representation of /hot/ but the learners may actually pronounced it as [æt], which rhymes with the word pot, if they pronounce the vowel /o/ as [ə].

Absence In this dissertation, absence means that a consonant has been omitted in production. For example, absence of /t/ would mean that the word 'hot' would be pronounced as [ho], or ho, with the final /t/ omitted.

Affricate A type of consonant produced in the following manner: There is an initial closing in the vocal tract followed by a short plosive (as in a stop consonant) as the vocal tract is opened. The opening is narrow, which then results in a audible friction, or hissing sound, as in a fricative consonant.

Examples of English affricates are: /ʃ/ as in the initial consonant in the word check, and /ʒ/, as in the initial consonant in the word jet.

Alveolar This refers to a place in the mouth where a sound is articulated. An alveolar sound is usually made with the tip or blade of the tongue.

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1 A dictionary of linguistics and phonetics (Crystal, 1997) and Longman dictionary of language teaching and applied linguistics (Richards, Platt & Platt, 1993) were the primary sources for the list of terms.
touching the alveolar ridge, which is the bony surface behind the upper front teeth. Stops such as /t/ as in \textit{tip}, /d/ as in \textit{dog}, the nasal /n/ as in \textit{night}, as well as the lateral /l/ as in \textit{light}, are all alveolar sounds.

\textbf{Anaptyxis} \ A type of epenthesis wherein an extra vowel is inserted between two vowels, i.e., /a/ after the final consonant in the word \textit{last} so it is produced as \textit{laste} [læstə].

\textbf{Aspiration} \ The audible breath sound which may occur simultaneously with the production of a sound. It is indicated by a small \textit{h} after the consonant, as in [\textit{thip}] for the word \textit{tip}. In English, voiceless stops such as /t/, /k/, and /p/ are usually aspirated in initial position.

\textbf{Assimilation} \ This refers to the effect one sound has on the pronunciation of another sound. This occurs naturally in connected speech. There are several types of assimilation: 1) In \textbf{regressive assimilation}, a sound changes because of the following sound, i.e., \textit{ten bikes} may be pronounced as \textit{tem bikes}. The final /n/ is produced as [m] due to the influence of the following /b/, which is produced in the same place as /m/. 2) In \textbf{progressive assimilation}, a sound is changed because of the preceding sound, i.e., \textit{lunch score} may be pronounced as \textit{lunch schore}, with the /s/ becoming [ʃ]. This type of assimilation is not very common. 3) In \textbf{reciprocal or coalescent assimilation}, there is a mutual influence of the two sounds on each other. For example, the phrase \textit{don't you} may be pronounced as \textit{don chu} [dounʃə] where the /t/ and /y/ have fused to make the affricate [ʃ].
Backing The process in which consonants which are usually articulated in the front section of the mouth are articulated in the back section of the mouth as in the backing of the front nasal /n/ as in sun to be produced as [ŋ] as in sung.

Back vowels The series of vowels articulated with the back portion of the tongue in the back section of the mouth. English back vowels are as follows: /uw/ as in who, /u/ as in good, /ow/ as in snow, and /o/ as in bought.

Bilabial A place of articulation where a sound is articulated by the coming together of both lips. Stops such as /p/ as in put and /b/ as in but, the nasal /m/ as in moon, and the glide /w/ as in why are bilabial sounds.

Central vowels The vowels articulated with the central portion of the tongue in the central section of the mouth. The vowels /a/ as in pot and /ʌ/ as in but (stressed — /a/ is the unstressed equivalent of /ʌ/) are English central vowels.

Closed syllable A syllable which is 'closed' by a final consonant, such as the word hot.

C Short notation for consonant

Cluster Any sequence of adjacent consonants. They can occur initially or finally in a syllable.

Coda This refers to the sound(s) which follow the nucleus (usually the vowel) of a syllable. This is the closing segment of the syllable. In English, the coda is typically a consonant, such as the consonant /t/ in the word hat.
Connected speech  This refers to spoken language when it is analyzed as a sequence that is continuous rather than word-by-word.

Constraint  A condition which restricts the application of a rule.

Devoicing  This refers to the process where a voiced consonant is produced without voicing. For example, the voiced consonant /d/ has been devoiced if produced as a /t/, as in sat [sæt] for the word sad /saed/.

Diphthong  A diphthong is a vowel sound consisting of two nonadjacent sounds. The articulation of diphthong involves a broad gliding movement from one point of articulation to the second. The three English diphthongs are /ɔy/ as in boy, /aw/ as in how, and /ay/ as in my. For example, the diphthong /ɔy/ involves the gliding movement from /ɔ/ as in law to /ɔɪ/ as in me.

Epenthesis  The modification process of inserting an extra sound in a word. This is a common modification process for second language learners of English in order to break up complex consonant clusters into simpler structures. An example of epenthesis would be the insertion of the vowel /a/ after the final consonant in the word last, i.e., laste [læs.ta], in order to simplify the consonant cluster. The special term for the insertion of a vowel between two consonants is anaptyxis. This is the most common type of epenthesis in this data set.

Flap  This refers to the manner of articulation wherein a sound is produced by a single, quick contact between the two articulatory organs. A flapped
consonant is designated with the symbol [ɾ]. For example, the consonant /t/ is often flapped in American English after a stressed vowel and before an unstressed vowel as in the word letter.

Front Vowels This refers to the series of vowels articulated with the front part of the tongue in the front section of the mouth. The American English front vowels are as follows: /i/ as in me, /u/ as in hit, /ey/ as in may, /e/ as in get, and /æ/ as in sat.

Fronting A process wherein vowels typically articulated in the back section of the mouth come to be articulated in the front part, as in the pronunciation of /r/ in song as /n/ in son. This is a common process in first language acquisition, and often occurs as in second language acquisition as well.

Feature Change This term is employed in this dissertation to describe the articulation of a sound with a change of manner or place. Devoicing, the change in production from a voiced to a voiceless consonant, is one example of a feature change in terms of manner. Fronting and backing are examples of place feature changes.

Fricative A manner of articulation wherein the two articulatory organs (i.e., the tongue and the roof of the mouth, as in /s/) are close together, but with a small opening so that when air is pushed between them, there is an
audible friction sound. The English fricatives are as follows: /ʃ/ as in laugh, /ʒ/ as in leave, /s/ as in hiss, /z/ as in Asia, /θ/ as in bath, and /ð/ as in bathe.

**Glide** A transitional sound as the vocal organs move towards or away from an articulation. English glides include /w/ as in what and /y/ as in yes.

**Interdental** A place of articulation when the tip of the tongue is between the teeth, as in /θ/ as in bath and /ð/ as in bathe.

**L1 interference** First language influences on the second language based on similarities and differences between the two languages.

**Labio-dental** A place of articulation where one lip is in contact with the teeth, usually with the lower lip touching the upper teeth as in /θ/ as in leaf and /ð/ as in leaf.

**Linguistic constraints** In this dissertation, this refers to the linguistic conditions which affect the production and acquisition of English syllable codas. Examples include L1 interference and markedness.

**Manner of Articulation** This refers to how a sound is produced, usually in terms of how the air flow passes through the speech organs.

**Markedness** This refers to "an analytical principle in linguistics wherein pairs of linguistic features, seen as oppositions, are given different values of position (marked) and neutral or negative (unmarked)" (Crystal, 1997, p. 233). Generally, those features which are more basic and frequent are considered unmarked in relation to a less common feature. Researchers have
defined and employed markedness in several ways: 1) In a more global
definition, markedness is based on language universals. For example, in
phonology, a consonant-vowel (CV) syllable structure as in *he* is unmarked
in relation to a consonant-vowel-consonant (CVC) as in *sat* or consonant-
vowel-consonant-consonant (CVCC) syllable structure as in *list* as it is more
basic and more frequently occurring in all the world's languages. Researchers
employing this definition of markedness typically investigate how language
universals affect learners' production and acquisition of L2 syllable structures.
Here syllable structures within a language are compared against language
universals to determine the relative markedness of a particular syllable
structure. 2) A second definition of markedness is language specific, i.e.,
comparing features within one language, and is typically based on length of a
coda margin in L2 phonological research. In this definition, a researcher may
state that the consonant cluster */rst/* as in *first* is marked in relation to */st/* as
in *fist*, as the prior is longer and more complex, and since the two-member
cluster partly comprises the three-member cluster. Researchers employing
this definition of markedness examine how coda length affects production
and acquisition by comparing the production of codas within one language.

**Metathesis** This refers to the alternation of the sequence of elements in a
syllable, word, or sentence. An example of metathesis in would be the
production of *last* as *lats* where the */t/* and */s/* have been switched.
Nasal  
A manner of articulation where the air is pushed through the nasal cavity rather than through the mouth. Examples of nasals are /n/ as in sun, /m/ as in sum, and /ŋ/ as in sung.

Nucleus  
The central segment of a syllable, typically a vowel. For example, in the word pet, the vowel is the nucleus of the syllable.

Obstruent  
A classification of the speech sounds which involve a constriction in the air flow in the nose or mouth. Obstruents are stops as in /p/ and /t/ in tip, nasals as in /n/ and /m/ in name, fricatives as in /s/ and /z/ in seas, and affricates as in /ʃ/ in church.

Onset  
The opening segment of a syllable, as in the /p/ in the word pet.

Open syllable  
A syllable without a final consonant, such as in the word he.

Pause  
An audible break in connected speech.

Palatal  
A place of articulation wherein the front of the tongue is close to or touches the hard palate.

Phonology  
The sound system of a language.

Place of Articulation  
This refers to the position of the speech organs during articulation of a sound.

Post-Alveolar  
A place of articulation for a sound where the sound is articulated immediately behind the alveolar ridge. English /r/ as in the word red is articulated in post-alveolar position.
Resyllabification  When the syllable boundaries are changed, i.e., the word *changed*, consisting of one syllable is often resyllabified to *chan.ged* by second language learners because of the past tense ending. In other words, L2 learners often mispronounce *changed* /ʃeɪnd/ as [ʃeɪn.d] with the period denoting the syllable boundary. The insertion of the vowel /a/ is also an example of epenthesis, or vowel insertion, which is a common resyllabification strategy.

Sibilant  A phonetic sub-classification of the sounds within the fricative and affricate grouping which are produced with a high frequency hiss characteristic such as /s/ as in *hiss*, /z/ as in *his*, /ʃ/ as in *dish*, /ʒ/ as in *Asia*, /ðʒ/ as in *judge*, and /ŋ/ as in *church*.

Single codas  This refers to the closing of a syllable which consists of only one consonant as in the word *tap*.

Social constraints  In this dissertation, this refers to the social factors which influence the production and acquisition of English syllable codas. Examples of social constraints include social interactions, social identity, and acculturation.

Sonority  This refers to "the overall loudness of a sound relative to others of the same pitch, stress, and duration" (Crystal, 1997, p. 354). The sonority hierarchy, from the most sonorous to the least, is as follows: vowels > glides > liquids > nasals > fricatives > stops.
Stop A manner of articulation wherein the air flow is completely closed for a moment, and then released, sometimes with an audible puff of air. Stop consonants are as follows: /n/ as in cat, /d/ as in cad, /b/ as in cab, /p/ as in cap, /k/ as in cake, /g/ as in sag, /m/ as in came, /n/ as in cane, and /ŋ/ as in sang.

Syllable A unit of pronunciation that is usually smaller than or equal to a word but larger than a single sound. English has seventeen syllable structures, such as V (I), VC (up), VCC (old), CV (he), CCV (pry), CCCV (stray), CVC (hat), CCVC (flat), CCCVC (sprain), CVCC (last), CVCCC (smart), CCCVCC (sprained), CVCCC (tests), CCVCCC (prints), CCCVCCC (sprints), CVCCCC (worlds), CCCVCCCC (strengths).

Three-member coda This refers to the closing of a syllable which consists of three consonants in a row, as in the word first.

Two-member coda This refers to the closing of a syllable which consists of two consonants in a row, as in the word last.

Universals This refers to linguistic properties which are common to all languages (absolute universals) or refer to the general tendencies in language (relative universals). Implicational universals refers to statements such as 'if Y, then X' to show how the existence of a feature (Y) in a language implies the existence of a different feature (X) in a language within markedness theory. Feature X would then be said to be relatively unmarked in relation to feature Y.
Universal Canonical Syllable Structure (UCSS) Syllable codas meet UCSS if “there is a continuous rise in sonority from the most peripheral member of both structures through the nucleus of the syllable” (Carlisle, 1997, p. 334).

VARBRUL Variable Rule Application. This is a statistical program based on a loglinear analysis of linguistic variables that computes the input probability of linguistic (i.e., preceding and following phonological environment) and extralinguistic (speaker, time, task type) factors that constrain the production of linguistic variables.

V Short notation for vowel.

Velar The place of articulation where the back of the tongue touches the soft palate or velum. The stops /k/ as in cake and /g/ as in sag as well as the nasal /ŋ/ as in sang are all velar sounds.

Voicing This refers to the manner in which air passes through the vocal cords. If the air passes through the vocal cords when the cords are not vibrating, a voiceless sound is produced. If the vocal cords are vibrating when the air passes through them, a voiced sound results. If a sound that is normally voiced is produced without voicing it is said to be devoiced.
CHAPTER 2

REVIEW OF LITERATURE

Rationale for the Review:

The focus of this dissertation is on the social and linguistic constraints on the acquisition of English L2 syllable-final codas by speakers of Vietnamese. In an effort to provide a concise overview of the prior research findings relevant to this topic, as well as providing a thorough discussion of the nature of linguistic and social constraints, the literature review has been organized as follows: First, research on the acquisition of an English L2 phonology is reviewed. As the focus of this study is on the acquisition of English syllable-final codas by speakers of Vietnamese, the majority of the literature on L2 phonology that is reviewed focuses on syllable-final or word-final consonants, consonant clusters, and syllable structures. Additionally, the reviewed literature is limited to research on the acquisition of an English L2 phonology. Literature on L2 phonology acquisition has been organized according to findings regarding L1 interference, L1 developmental processes, universals, and interlanguage natural phonological rules. How linguistic
environment affects consonant and consonant cluster production is also examined. A summary of findings specific to syllable-final codas and Vietnamese speakers has also been included. A discussion of linguistic constraints such as developmental processes and markedness follows, ending with a overview of Vietnamese consonants and vowels, and a cross-linguistic comparison of Vietnamese and English phonology. Research on the social constraints affecting the acquisition of an L2 are then discussed. Finally, a summary of findings about task variation in L2 phonological production is provided.

Acquisition of an English L2 Phonology:

A. Terminology:

In the research on English L2 consonants and consonant clusters, researchers have used such terms as word-initial, syllable-initial, word-final, syllable-final, onset, and coda to describe the syllable/word position of the segments they are focusing on. Many of these terms overlap, especially when the research is focused on monosyllabic words. Onset refers to the consonants that precede the nucleus (a vowel) in a syllable and/or word. Coda refers to the consonants that follow the nucleus in a syllable and/or word. In describing the prior research, I have tried to be as clear as possible regarding the word and/or syllable position of the consonants the researchers have investigated.
In addition, the term 'deletion' is employed by L2 phonology researchers to describe a modification process wherein production of a segment is absent. However, use of this term is problematic since deletion assumes that the form is in fact present in the learners' underlying grammar. A better term would be absence, which opens up the possibility that the feature has not yet been acquired. However, the term 'deletion' will be employed when discussing studies wherein the researchers themselves use the term.

B. Focus of Prior Research:


C. Findings:

1. Cross-Linguistic Interference:

As Leather and James (1991) explain, “The role of L1 in L2 speech acquisition has formed a major, if not the major, focus of attention almost as long as second language speech has been studied” (p. 321, authors’ emphasis). Interference, as defined by Hammarberg (1997), may result from a psycholinguistic learning strategy in which learners make use of prior linguistic knowledge, or L1 retention (a term coined by Winford) in acquiring and using the L2. Leather and James (1991) state that “Based on the key concept of structuralist phonology, the segmental phoneme, a widely held view has postulated the systematic substitution of L1 sounds for elements of the L2 system” (p. 314). There are two versions of the interference hypothesis. The strong version, the Interference Position, states that “the relative difficulty of phonemes and allophones, the importance of word position for allophonic variation, and any sound substitution which appear will be traceable to the influence of the first language” (Hecht & Mulford, 1982, p. 314). Most researchers, however, dismiss the strong version due to the fact that all errors are not traceable to L1 influences. Additionally, acquisition can be facilitated when there are cross-linguistic similarities. Therefore, in this text, Odlin’s (1989) definition of interference, which he refers to as transfer,
will be employed: “Transfer is the influence resulting from the similarities and differences between the target language and any other language that has been previously (and perhaps imperfectly) acquired” (p. 27).

A major finding in second language acquisition research is that L1 interference is a prominent factor affecting L2 phonological acquisition and production (cf. Altenberg & Vago, 1987; Benson, 1988; Broselow, 1987; Flege & Davidian, 1984; Hancin-Bhatt and Bhatt, 1997; Hodne, 1985; Major, 1987a; Major & Faudree, 1996; Odlin, 1989; Sato, 1984; Skaer, 1976; Tarone, 1976, 1980, 1987; Vago & Altenberg, 1977; Weinberger, 1990). As Skaer (1976) notes, “the point still remains that native language phonology does clearly affect target language acquisition...interference is usually detected through production errors in speech...” (p. 4). Many researchers state that similarity of sounds is a criterion for interference: The substituted sound is often the most acoustically or articulatorily similar sound to the target language sound.

In her work with Korean, Cantonese, and Brazilian learners of English, Tarone (1976, 1980, 1987) found that the majority of the errors in word-final consonants produced by the learners could be attributed to L1 interference effects. Tarone (1980) found evidence that the learners modified one-fifth or 20% of the final consonants they produced. The majority (i.e., 78%) of these modifications could be attributed to L1 interference. Tarone also found that the learners’ language backgrounds affected whether deletion or epenthesis was the favored modification process, with Cantonese and Korean speakers
favoring consonant deletion and Portuguese speakers favoring epenthesis. As Sato (1984) explains, Tarone’s research provides clear evidence of “the predominance of L1 transfer as a force shaping [interlanguage] syllable structure” (p. 45).

Sato’s (1984) study of Vietnamese speakers’ English syllable structure production confirms Tarone’s results. Sato found evidence of L1 interference for syllable structures in Vietnamese interlanguage in the learners’ preference for closed over open syllables (i.e., open would be CV and closed would be CVC) since Vietnamese has closed syllable structures. L1 interference was also demonstrated in the effect of syllable position on consonant cluster production in Vietnamese interlanguage, i.e., word-final consonant clusters were produced with less accuracy than word-initial consonant clusters. In her study of task variation and final consonant and consonant cluster production by a Vietnamese learner of English, Sato (1985) also found L1 interference effects on production accuracy. In their work on the production of English final stops by speakers of Spanish, Polish, and Mandarin Chinese, Flege and Davidian (1984) found that the native language had a significant effect on stop deletion, and that speakers of the languages without final stops, i.e., Mandarin Chinese and Spanish, had higher rates of deletion. Major (1987a), in his study of the production of L2 English final consonants and consonant clusters by native speakers of Japanese, found that both positive and negative interference affected production. Positive interference is
defined as the facilitating effect on L2 acquisition due to cross-linguistic similarities while negative interference refers to debilitating effects due to a cross-linguistic divergence (Odlin, 1989). Positive interference was evident in the learners' higher accuracy rates of voiceless obstruent cluster production while negative interference was evident in the greater difficulty the learners had with consonant clusters containing a liquid over consonant clusters without liquids.

Hodne (1985) collected data from two speakers of Polish learning English as a second language; 66 different production errors were found in the 666 word-finals she collected. Of these errors, 83% were found to be due to L1 interference. In research on the English consonant cluster onset production by native speakers of Arabic, Broselow (1987) found that interference played a significant role in the learners' production of consonant clusters. She also found that certain types of rules are more easily transferred: In the case of Arabic learners of English, the general rule of epenthesis was typically transferred from Arabic into the learners' variety of English since this rule "functions to bring phonological forms into conformity with restrictions on possible phonetic syllable structures" (p. 303). Broselow adds that rules that are morphologically restricted tend not to transfer. Benson (1988) examined the speech of two Vietnamese learners of English, and collected data on 537 closed word-final consonants. Of those, 92 were modified into CV syllables. Almost all of the modifications (81 out of 92) were due to L1 interference.
Osborne (1996), in her research on the English syllable-final consonant production of a native speaker of Vietnamese, also found that L1 interference led to consonant cluster reduction.

In their research on four native speakers of Hungarian learning English, Vago and Altenberg (1977) found that phonetic interference affected the production of the English sounds which did not exist in Hungarian, with all the learners substituting the Hungarian sound /d/ for the English sound /ð/ due to acoustic or articulatory similarity. Altenberg and Vago (1987) examined the English consonant and vowel production by two native speakers of Hungarian and found that both phonetic and phonological interference affected the participants' production of English.

Major and Faudree (1996) examined both positive and negative interference in their research on the development of voicing contrasts in L2 English by native speakers of Korean. They found that positive interference always applied in the production of voicing contrasts (e.g., production of voiceless English obstruents in word-initial and final positions due to their existence in Korean, and production of voiced obstruents in medial position due to the Korean intervocalic voicing rule). In contrast, negative interference only occurred with voiced obstruents in final position, as predicted, but not with voiceless obstruents in medial position and voiced obstruents in initial position.
It has been found that interference effects interact with developmental effects in L2 phonological acquisition (Flege & Davidian, 1984; Hancin-Bhatt & Bhatt, 1997; Hecht & Mulford, 1982; Major, 1987c; Mulford & Hecht, 1980). L1 developmental effects means that L2 adult (and child) learners are subject to similar constraints to those affecting child L1 learners of a particular language. For example, both native speakers and non-native speakers of English would be affected by similar developmental effects in their acquisition of English. In his work on Japanese native speakers' production of English consonant clusters and final consonants, Major (1987c) found that both interference and developmental effects influenced devoicing. Flege and Davidian (1984) also found that both L1 interference and L1 developmental effects influenced Spanish, Chinese, and Polish adult learners' production of English word-final stops in CVC words. L1 interference effects influenced the deletion of final stops while both L1 developmental and L1 interference effects were found to affect learners' devoicing of final stops. Overall, there was a higher frequency of devoicing than deletion for final stops.

Mulford and Hecht (1980) and Hecht and Mulford (1982) researched an 6-year old Icelandic child's acquisition of English and found that while L1 interference effects could predict which sounds may be more difficult to acquire, L1 developmental effects were better predictors of what substitutions were adopted for L2 production. For example, the participant devoiced final stops, an English L1 developmental effect, and then strongly aspirated them,
which is characteristic of stops in Icelandic. Hancin-Bhatt and Bhatt (1997), in their research on the production of English onsets and codas in monosyllabic words by native speakers of Japanese and Spanish, found that L1 interference had a significant effect on L2 syllable structure production, affecting both the error rates and types of errors made. They found that positive interference effects can override developmental effects, as evidenced by Spanish speakers’ production of specific L2 syllable onsets similar to onsets in their L1. In the absence of positive interference, however, developmental effects were evidenced to have an effect on production.

L1 interference has also been shown to be more prominent in the early stages as opposed to the latter stages of acquisition (Major, 1986, 1987a, 1994). Major (1987a) developed the Ontogeny Model to explain how developmental and interference effects interact in L2 phonological acquisition. Interference effects predominate in the early stages of L2 phonological acquisition, and then gradually decrease while developmental effects increase in the middle stages of acquisition, and then gradually decrease. In terms of phonological similarity of the L1 and the L2, Major postulates that for similar phenomena, interference effects will be more common but for phenomena that are dissimilar, developmental effects may play a greater role in acquisition and production. Major further states that production in different speaking styles is affected differently by interference from the L1 and developmental
constraints: As the formality of the style increases, there is a decrease in errors due to interference, whereas errors due to developmental effects increase and then decrease.

Major (1987a) tested his model by examining data from beginning and advanced Brazilian Portuguese speakers' acquisition of final consonants across three tasks designed to elicit different styles (i.e., levels of formality). Results indicate a trend, which was not statistically significant, of advanced learners having more instances errors due to developmental effects and beginning learners more instances of errors due to interference effects. Major's claims regarding stylistic variation also received some support, but again this support is best labeled as a trend as it was not statistically significant.

Major (1994) also tested the Ontogeny Model in his study of native Portuguese speaking Brazilians' production of English L2 double consonant onsets and codas in monosyllabic words over a four week period. His findings provided some support for the model: Interference effects decreased over time, and a higher frequency of correct production was achieved. However developmental effects remained stable instead of increasing when interference effects decreased, and style has no effect. As the duration of this study was only four weeks, it is difficult to determine whether the data is truly able to show change between the effects of interference and developmental constraints.
In summary, L1 interference is a prominent factor affecting L2 phonological acquisition and use (see Altenberg & Vago, 1987; Benson, 1988; Broselow, 1987; Hodne, 1985; Major, 1987a; Major & Faudree, 1996; Sato, 1984, 1985; Tarone, 1976, 1980, 1987; Vago & Altenberg, 1977). As James (1988) states, "the syllable structure of the L1 in question would seem to exert a strong influence in any case on the syllable forms of an IL" (p. 5). L1 interference also may influence whether deletion or epenthesis is favored as a modification process (i.e., Tarone, 1980).

However, there is a strong interaction between interference effects and developmental processes. For example, interference affects which sounds are more difficult to acquire and developmental processes affect the strategies and substitutions adopted for L2 production (Mulford & Hecht, 1980). Interference appears to be more prominent in the early stages of L2 acquisition while developmental effects occur in later stages of L2 acquisition (Major, 1986a, 1987b, 1994).

There also appears to be a constraint on which L1 rules tend to transfer, with those rules that simplify pronunciation transferring more easily than morphologically restricted rules (Altenberg & Vago, 1987; Broselow, 1987; Hammarberg, 1997; Vago & Altenberg, 1977). Summarizing L1 interference research, Hammarberg (1997) concludes that there are three categories of conditions on interference, a) perceived equivalence, b) natural motivation, and c) developmental relevance. As he states, "the condition of perceived
equivalence is met if the learner perceives an element (structure, category, rule etc.) in the target language and one in the native language as sufficiently similar to pass as equivalent” (p. 163). The perception of equivalence is subjective, i.e., each individual learner may perceive equivalence relationships differently, and there may be more than one equivalence classification. The second condition, natural motivation, refers to the tendency of some phonological phenomena to be transferred over others. The preference of interference of some phonological phenomena over other phenomena appears to be related to “the way the phonological regularities function in the learner’s L1, in that the learner cannot easily avoid carrying over those regularities which effectively constrain him as a speaker of L1” (Hammarberg, 1997, p. 167). Transferable phonological phenomena appear to be those that:

- can be broadly characterized as low-level regularities, synchronically motivated by articulatory economy or established articulatory or perceptual routines in the language, not limited by morphological or other extra-phonetic conditions and operating in an unconscious way in normal speech. (Hammarberg, 1997, p. 167)

An example of a easily transferable rule is the devoicing of final obstruents. In contrast, those phenomena that are not easily transferable are those “which are abstract, lack phonetic motivation and rather perform a lexical role in the language, allow morphological or lexical exceptions” (p. 167). An example of
a phenomena that is not easily transferable is the German phonological constraint against the voiceless alveolar fricative in favor of the voiceless palatal fricative, in initial, preconsonantal position. This is a rule which can be considered rare cross-linguistically, and is not motivated by phonetics, but rather is derived from diachronic changes.

The third condition is that interference is a developmental phenomenon. Although this condition will be explored below, in this dissertation I treat L1 interference and developmental effects as separate constraints. As Hammarberg (1997) explains, in this third condition “the application of interference solutions is dependent on the learner’s current state of development in L1 and L2” (p. 171). Equivalence judgments are based on the learner’s current knowledge of the target language. For example, a beginning learner of English may perceive the voiceless interdental fricative as a voiceless fricative if the latter consonant exists in the learner’s L1 because of the auditory similarity between the two sounds in terms of the frication. At this stage of development, the learner may not perceive the interdental articulation of the sound, especially if the learner’s native language does not have interdental consonants. As the learner begins to acquire more knowledge of the target language, he or she may begin approximating the interdental articulation of the interdental fricative.
There are some limitations of interference research. Most importantly, while interference can account for many errors, it cannot predict all errors or explain all errors (Major, 1987b). Additionally, research on the effects of L1 interference on L2 phonological acquisition is also limited in that it cannot explain acquisition orders.

2. L1 Developmental Effects:

The Developmental Position of L2 phonological acquisition states that "acquisition of a given language by second language learners closely parallels its acquisition by first language learners. Language interference is considered a minor factor" (Hecht & Mulford, 1982, p. 313). More specifically, the Developmental Position also holds the prediction that "the rank order of difficulty of segments, the role of word position, and particular error types will be similar for first and second language learners of any given language" (p. 314).

Piper (1984) researched whether L1 and L2 developmental effects would be similar by examining the consonant production of fifteen 5 year-old children of various L1's (Portuguese, Punjabi, Mandarin Chinese, Vietnamese, Serbo-Croatian, and Italian) learning English as a second language (ESL). She found that the L1 developmental effects of substitution (stopping, fronting, and gliding), syllable structure mismatches (final consonant deletion, vowel and consonant epenthesis, and cluster reduction),
and assimilation (voicing, devoicing, and consonant harmony) accounted for 86% of the participants' consonant production errors. However, some discrepancies existed between L1 and L2 developmental effects as indicated by this study. Consonant harmony, the most common assimilation effect in L1 acquisition, was rare in the English L2 production in Piper's study. Additionally, L1 learners commonly reduce consonant clusters, but the L2 learners in Piper's study deleted final consonants more often than they reduced consonant clusters. Piper also did not examine the effect the learners' L1 had on the learners' production of consonants and consonant clusters, which would have shed more insight into the different strategies learners used in producing English sounds. Piper also found beginning evidence of a developmental stage in L2 phonological acquisition. Some of the participants had a U-shaped curve of production, beginning with imitation with few pronunciation errors, then deviation from the norm as the learners began acquiring the feature. Finally, the learners reached a period of resolution where production gradually became more target-like. This sequence corresponds to findings on developmental sequences in morphology (cf. Ellis, 1994, p. 77).

As research on L1 interference has shown, interference and developmental effects frequently interact, and may have a sequential relationship. Leather and James (1991) state that:
it would appear that, as acquisition proceeds, the influence of the L1 and the mechanism of interference give way gradually to other influences that shape developing L2 speech such as the mechanisms (i.e., "developmental processes") associated with the acquisition of the mother tongue. (authors' parenthetical aside, p. 326).

Major (1986) researched L2 English syllable structure production by Brazilian speakers of Portuguese, and found that the vowel epenthesis errors the learners produced stemmed from developmental, and not interference, effects. Similarly, in their research on L2 English word-final stop production by speakers of Mandarin Chinese, Flege and Davidian (1984) found that the phenomena of deletion and devoicing reflected English L1 developmental effects rather than L1 Mandarin interference.

Mulford and Hecht (1980) and Hecht and Mulford (1982) researched the acquisition of L2 English fricatives and affricates by an Icelandic child, and found that both developmental and interference effects influenced production. While interference effects influenced the difficulty order of affricates and fricatives, developmental effects were responsible for the high level of difficulty of the affricates /ʃ/ and /ʒ/, as well as influencing the substitutions the learner made. For example, the most common substitution effects in the learner's production of fricatives were final devoicing and initial tighter closure, both common English L1 developmental constraints.
Hieke (1987) researched the consonant cluster reduction in both native and non-native speech to compare rates of reduction since native speakers typically reduce final three-consonant clusters. One limitation of this study is that it is not clear what the L1 backgrounds of the non-native speakers of English were, and what the syllable position of the consonant clusters Hieke researched was. However, Hieke found that native speakers reduced clusters approximately twice as often as non-native speakers. This research not only illustrates that consonant deletion is variable for both native and non-native speakers, but also that cluster reduction is not just a developmental process, but also a speech phenomenon that is shared cross-linguistically.

In summary, one of the main findings in this line of research is that the L1 developmental process of word-final obstruent devoicing is also common for L2 learners of English whose first languages do not have word-final voiced (or voiceless) obstruents, such as speakers of Mandarin Chinese (Flege & Davidian, 1984), and Icelandic (Hecht & Mulford, 1982; Mulford & Hecht, 1980).

3. Universal Constraints:

Universal constraints have also been found to interact with L1 cross-linguistic interference in the acquisition of an L2 phonology (i.e., Benson, 1988; Hodne, 1985; Sato, 1984; Tarone, 1976, 1980, 1987). Most of the work on the effect of universal constraints in terms of the acquisition of L2 phonology
has focused on syllable structure, especially the universal preference for open syllable types (i.e., Benson, 1988; Hodne, 1985; Sato, 1984; Tarone, 1976, 1980, 1987).

Weak evidence exists for a universal preference for the CV, or open, syllable, and the independence of this preference from L1 interference effects. Tarone (1976, 1980, 1987), in research on Cantonese, Korean, and Portuguese speakers, did not find that universal preferences for the open syllable, or CV structure, overrode L1 interference effects in the learners' production of English syllables. For example, Tarone (1980) found evidence that the learners modified 20% of the syllables they produced. While the majority of these modifications could be attributed to L1 interference, only approximately 22% were considered to be influenced by a preference for a CV syllable structure. Tarone's findings have been confirmed by Sato (1984), who examined the word-final consonants produced by two Vietnamese children in a 10-month longitudinal study. A total of 489 tokens of two-member word-final consonant clusters were collected; of these, 61 were totally deleted and 363 were reduced, with one-member being deleted. CV structures were only produced in 17% of the productions.

Hodne (1985) collected data from two speakers of Polish learning English as a second language; 66 different types of syllable errors were found in the 666 word-final tokens she collected, but only 11(17%) of the errors were non-interference errors, and could be considered to stem from a preference
for a CV syllable structure. Benson (1988) also found limited support for the hypothesis that a preference for open syllables is a shaping force in IL phonology. Benson examined the speech of two Vietnamese learners of English, and collected data on 537 closed syllables. Of those, 92 were modified into CV syllables. However, only 11 of the 92 modifications to open syllables were not due to L1 interference and thus could be inferred to be due to a universal preference for a CV syllable structure. As she states, while the universal preference for CV syllables plays a role, it is "minor" (p. 232). Her study also indicates the importance of preceding vocalic context in L1 interference effects, i.e., single consonants were always deleted after diphthongs, and in Vietnamese, most diphthongs occur only in CV structures.

In summary, there appears to be weak evidence for the independent effect of universal preference for a CV syllable structure over L1 interference effects. The studies each found a small number (i.e., between 11% - 22%) of the syllable structure modifications could be attributed to a preference for a CV syllable structure.

4. Markedness:

Second language acquisition researchers have employed several definitions of markedness in order to explain the acquisition of phonological
segments. Researchers have examined the influence of markedness based on:
a) length of coda, b) length and type of coda, and c) the sonority hierarchy
within a coda segment. Each of these will be examined in turn.

a. Markedness defined by length:

One way researchers have employed markedness in SLA research is to
define markedness in onsets/codas by length. Longer onsets/codas are
viewed as more complex, and thus more difficult, than shorter onsets/codas,
and therefore are viewed as marked in relation to shorter codas. As
Greenberg (1978) states, existence of codas or onsets with a length of A implies
the presence of codas/onsets with a length of A-1.

Research on L2 production has found that learners modify longer, and
thus marked, structures in favor of shorter, less marked, structures by
reducing the length of the margins in word-final codas (cf. Anderson, 1987;
1984; Weinberger, 1987). Weinberger (1987), in his examination of four
Chinese learners of English's production of word-final codas, found that the
number of modifications increased as the length of the codas increased. This
indicates that markedness had an effect on the number of modifications.
Anderson's (1987) research on word-final consonants and consonant clusters
also found that speakers of Egyptian Arabic, and Mandarin and Amoy
Chinese made significantly more modifications on margins based on the
length -- the more complex the consonant clusters were, the more modifications were made. All the participants performed better on unmarked over marked structures. Although Sato's (1984) research, as outlined above, examines the universal preference for open syllable structure, her findings do show that the participants reduced two-member onsets in favor of one-member onsets. Eckman's (1987) research on native speakers of Korean, Japanese, and Cantonese's production of two- and three-member word-final consonant clusters also corroborates both Weinberger's (1987) and Anderson's (1987) findings that longer codas result in more frequent modifications, and that longer codas (i.e., three-member and two-member codas), which are relatively marked, are reduced by one consonant in favor of unmarked codas. Major (1987c) also found that his Japanese participants produced the English less marked word-final obstruents more accurately than the more marked consonant clusters, and the more marked word-final voiceless obstruents more accurately than the less marked voiced. Carlisle (1997) also found that shorter onsets were not modified as frequently as more marked onsets.

b. Length and type of coda structures:

Researchers have also examined to what extent markedness affects acquisition. In this case, researchers are defining markedness both by length and type of cluster: marked clusters are defined as three-member clusters, and
unmarked clusters are defined as two-member clusters. However, a
markedness relationship does not exist between a three-member and a two-
member cluster based on length alone -- the two elements of the two-member
coda must also comprise part of the three-member coda. As such, the
markedness relationship is said to be implicational. Thus, /rl/ would be
unmarked in relation to /rld/ whereas /rn/ would not. Eckman (1991)
examined the acquisition (defined as correct usage 80% of the time) of two-
and three-member onsets and codas by native speakers of Japanese,
Cantonese, and Korean, as well as how markedness relationships influenced
acquisition. Eckman found that for almost all the cases (98%), if the more
marked structure (i.e., three-member codas) were acquired by the learner, the
subsequent less marked structure (i.e., a related two-member coda) had
already been acquired. Carlisle (1998), like Eckman (1991) and Eckman and
Iverson (1993), also used a criterion measure of 80% accuracy in production to
examine the acquisition of English syllable onsets in a markedness
relationship (i.e., based on length of the onsets) by native speakers of Spanish.
His findings support Eckman's in that in almost all the cases (i.e., 90%) the
more marked structure had only been acquired after the corresponding
unmarked structure had been acquired.
c. Markedness defined by sonority

A third definition of markedness is based on the sonority hierarchy within an onset or coda. Broselow and Finer (1991), for example, examined markedness in terms of sonority by focusing on the distance between the members of the consonant cluster. The researchers posit that clusters closer in sonority are more marked than clusters wherein consonants have a wider sonority distance. The sonority hierarchy, from the most sonorous to the least, is as follows: vowels > glides > laterals > nasals > fricatives > stops. Their findings on Japanese and Korean learners of English’s word-initial consonant cluster production supported their hypothesis as the participants in their study produced less marked onsets more accurately than the more marked onsets.

In summary, research has consistently found that L2 learners modify marked syllable structures more frequently than they modify unmarked syllable structures as based on length (i.e., Anderson, 1987; Carlisle, 1997, 1998, Eckman, 1987, 1991; Eckman & Iverson, 1993; Hancin-Bhatt & Bhatt, 1997; Sato, 1984; Weinberger, 1987) and sonority (Broselow & Finer, 1991). In addition, longer, and thus more complex syllable structures are modified in favor of shorter, or less marked, syllable structures and acquired after the acquisition of a related two-member coda (Carlisle, 1998; Eckman, 1991; Eckman & Carlisle, 1993).
5. Interlanguage Rules:

Research on L2 phonological acquisition has examined interlanguages as natural languages, i.e., that interlanguages are independent systems, to some extent, from the native and target languages (i.e., Eckman, 1981a, 1981b; Edge, 1991; Major & Faudree, 1996). Eckman (1981a) in his research on word-final voicing contrasts of Japanese and Cantonese learners of English, found that both groups of learners devoiced final stops. Eckman concluded that the underlying interlanguage representation is the same as the target language underlying representation. For example, interlanguage surface constraints are the same or nearly the same as native language surface phonetic constraints. Additionally, interlanguage rules of terminal devoicing (i.e., all word-final obstruents are voiceless -- typical for Cantonese L1 speakers) and schwa paragoge (a schwa should be inserted after a word-final voiced obstruent -- typical for Japanese L1 speakers) are independent interlanguage rules as they do not appear to be motivated by the grammars of either the native language or the target language. This finding was corroborated by Eckman (1981b) for two other languages, Mandarin Chinese and Spanish (the rule of schwa paragoge existed in the interlanguage of Chinese learners of English and terminal devoicing existed in the IL of native speakers of Spanish). A problem with Eckman’s research is that he did not consider L1 interference effects on Cantonese speakers’ devoicing of final obstruents. As Cantonese only has voiceless obstruents, it seems reasonable to assume that

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the participants' devoicing of final obstruents may in part be affected by L1 interference. Markedness would also appear to influence terminal devoicing as voiceless obstruents are less marked than voiced obstruents. Additionally, as Edge (1991) points out, Hong Kong English, the Cantonese learners' variety of English in Eckman's study, exhibits final consonant devoicing, as well as absence, which problematizes the use of this interlanguage data on two counts: a) the English analyzed is a nativized variety and is therefore questionably categorized as an interlanguage (and the target language in the study); and b) features of the data used to postulate an IL actually are standard features of a nativized variety of English and therefore should not be compared with American English.

Edge (1991) did a partial replication and extension of Eckman (1981a), also focusing on Japanese and Cantonese learners of English. Her study provides only weak support for Eckman's IL rules and faults Eckman's research on IL rules for not taking into consideration spoken English phonology, which may differ from the underlying citation forms. For example, native speakers of English often devoice final obstruents before pauses or before a voiceless sound. Therefore, when a non-native speaker produces these sounds in a similar manner, it should not be considered an IL rule. Contrary to Eckman's (1981a) data, Edge found that Japanese speakers devoiced final obstruents although her findings regarding Cantonese speakers' final obstruent devoicing confirmed Eckman's research.
Additionally, Japanese speakers' vowel epenthesis after affricates and fricatives did diverge from the production of native speakers, and therefore supported Eckman's (1981a) IL rule of schwa paragoge. However, as portions of her data revealed similar processes of vowel epenthesis by both native speakers and Japanese speakers of English, i.e., after word-final voiced stops, Edge further argues for the need to take native speakers' production into account when formulating non-native speakers' IL rules.

In his work on the production of English word-final consonants by native speakers of Cantonese, Korean, and Japanese, Eckman (1987) argued that the interlanguage rule of Cluster Reduction, i.e., the simplification of consonant clusters via deletion of one-member of the cluster, was warranted by his data. This was because this rule was not motivated by either the target language, which allowed final consonant clusters, or the native language, which in all cases did not allow final clusters. Although native speakers of English often reduce final consonant clusters by one member, it is most commonly the medial member in three-member clusters that is deleted. However, the participants in this study often deleted the first or the final member, which native speakers rarely do. It thus appears that while markedness operates to motivate the consonant deletion, the types of deletions are not motivated by either the L2 or the L1, and thus may be a rule peculiar to the IL. While interesting and meriting further study, Eckman's research must also be investigated in terms of L1 interference, both as an
explanation for final consonant cluster reduction and to examine how L1 interference affects which consonants are not being produced, which Eckman fails to consider.

In summary, researchers (Eckman, 1981a; 1981b, 1987; Edge, 1991) have found limited evidence for the independent interlanguage rules of schwa paragoge, terminal devoicing, and cluster reduction. The limitations of interlanguage rules research is the downplaying of the role of L1 interference and markedness in learners' production of final consonants (i.e., Eckman, 1981a, 1981b, 1987), as well as the partial reliance on data from a nativized variety of English (i.e., Eckman, 1981a). Another limitation of this research is the failure to consider spoken English phonological rules (cf. Edge, 1991).

D. A Summary of Syllable-Final Coda Findings:

L1 interference is a predominant factor in shaping English as a second language syllable-final coda production and acquisition, in terms of both errors rates and types of errors made (Altenberg & Vago, 1987; Benson, 1988; Broselow, 1987; Flege & Davidian, 1984; Hancin-Bhatt and Bhatt, 1997; Hodne, 1985; Major, 1987a; Major & Faudree, 1996; Odlin, 1989; Sato, 1984; Skaer, 1976; Tarone, 1976, 1980, 1987; Weinberger, 1990). However, disagreement exists regarding which simplification strategy -- deletion, epenthesis, and devoicing -- is favored, and what affects which modification strategy is employed. To explain the differential results, researchers have proposed such influences as

L1 developmental effects such as substitution, syllable structure mismatches, and assimilation also affect syllable structure production (Piper, 1984). In fact, L1 developmental and L1 interference effects appear to have a sequential interactive relationship in that L1 interference appears more prominent in the early stages of acquisition, and then decreases at a point when the effects of L1 developmental effects begin to increase. L1 developmental effects gradually decrease as the learner acquires more of the target language. The linguistic universal of preference for an open or CV syllable structure, however, has only been found to have a minimal effect on English L2 syllable structure production (Benson, 1988; Hodne, 1985; Sato, 1984, 1985; Tarone, 1976, 1980, 1987).

Markedness research (i.e., Anderson, 1987; Broselow & Finer, 1991; Carlisle, 1997, 1998; Eckman, 1987, 1991; Eckman & Iverson, 1993; Sato, 1984; Weinberger, 1987) has confirmed L1 interference research findings that L2 learners frequently modify syllable-final consonant and consonant clusters, with longer and more marked codas being modified in favor of shorter and
less marked codas. Researchers also found that learners had higher accuracy rates for less marked codas and that less marked codas appear to be acquired before more marked codas (Eckman, 1991; Eckman & Iverson, 1993; Major, 1987a).

E. The Effect of Linguistic Environment:

Very few L2 phonology researchers have examined the effect of linguistic environment on L2 consonant and consonant cluster production. However, the research that has been done indicates that linguistic environment has a significant effect on consonant production, and may interact with other linguistic factors such as L1 interference. Benson (1988), for example, in her research on Vietnamese speakers' production of English syllable structures, found that the preceding vocalic context was a factor in L1 interference processes. For example, single consonants were always deleted after diphthongs, and in Vietnamese, most diphthongs occur only in CV structures. Weinberger (1987) found that Mandarin speakers' modifications of English consonants and consonant clusters occurred most frequently between consonants. Anderson (1987) found that the American English /j/, one of the most commonly deleted consonants by speakers of Mandarin, was most commonly deleted post-vocally in both final clusters and in word-medial sequences. In contrast, /t/ and /d/ were most often deleted when in word-final position in consonant clusters. Carlisle (1997) found that linguistic
environment influenced the type of modification of final consonants and consonant clusters that took place, i.e., epenthesis was found to occur more frequently after consonantal than vocalic environments. Edge (1991) compared non-native speakers' production of final obstruents with the production of native speakers since native speakers of English often devoice final obstruents before pauses or before a voiceless sound. Portions of her data revealed similar processes of vowel epenthesis by both native speakers and Japanese speakers of English, i.e., after word-final voiced stops. Carlisle (1994) reexamined Tarone's (1980) data and found that over 50% of the instances of epenthesis after word-final consonants occurred before a pause, 40% before a word-initial consonants, and less than 5% occurred before a word-initial vowel. In his examination of -t/d production by Chinese learners of English, Bayley (1996) found that -t/d was less likely to be deleted (Bayley's term) following a liquid, over a nasal or obstruent. In terms of following segments, the order of constraints favoring deletion, in higher to lower rates, are: consonant > glide > vowel.

These findings indicate that while the effect of linguistic environment has not received a great deal of attention in L2 phonological research, findings from research in this area can contribute significantly to our understanding of why some consonants and consonant clusters are modified, and how they are modified. Therefore, it is an area of L2 phonology that deserves more research.
F. Research on the Acquisition of English Phonology by Speakers of Vietnamese:

There have been several previous studies on Vietnamese learners' production of syllable codas. Sato (1984), in a longitudinal study of two Vietnamese adolescents, for example, examined whether closed syllables would be preferred in the English interlanguage of Vietnamese learners. She based her hypothesis on the fact that 77% of Vietnamese syllables (i.e., 3437 out of 4467) are closed. Additionally, she hypothesized that syllable-initial clusters would be produced more correctly than syllable-final clusters as clusters are not allowed in final position in Vietnamese. Her results confirmed both hypotheses: Overall, syllable-initial consonant clusters were produced more accurately than syllable-final consonant clusters, and there also appeared to be a preference for a CVC syllable structure over the CV structure due to L1 interference. The preferred modification strategy for the production of cluster was cluster reduction (i.e., one member was omitted), and this modification strategy was favored over deletion, epenthesis, and feature change, and often resulted in a closed syllable. The hypothesis for the universal preference for an open syllable structure was also disconfirmed by Sato's (1985) research. In her study of task variation and final consonant and consonant cluster production by a Vietnamese learner of English, Sato (1985) also found L1 interference affected production accuracy.
Benson (1988) also examined the universal preference for an open syllable structure by Vietnamese speakers. Her data was elicited from two native speakers of Vietnamese, and confined to monosyllabic words ending in voiceless plosives and nasals, as these are the only consonants allowed in syllable-final position in Vietnamese. She found that the universal preference for an open-syllable structured had a lesser effect on production, while native language influence exerted a greater effect. For example, Benson found that native language influence in terms of the effect of a previous vowel affected the deletion of the final consonant: final consonants were deleted after diphthongs and in Vietnamese, diphthongs only exist in open syllables. Furthermore, Benson questioned Sato’s (1984) conclusions that learners’ reductions of clusters by one member is due to L1 interference exclusively since it also is evidence of a universal preference for an open syllable.

Osburne’s (1996) research confirmed previous studies, as she also found that for her Vietnamese speaker (there was only one participant in this study), single syllable-final consonants were mostly produced accurately, but syllable-final consonant clusters were often reduced, with fricatives optionally deleted due to L1 interference effects (fricatives are not allowed in syllable-final position in Vietnamese). Osburne’s research also confirms Benson’s (1988) findings that native language influences on syllable structure production in terms of the effect of the preceding diphthong on consonant deletion played a
Osbourne provides insight into this process by explaining that in Vietnamese, a consonant-diphthong syllable would be considered closed since the diphthong is realized as a vowel + glide, rather than a single segment as it is in English. Therefore, this syllable is closed, and any following consonants would violate Vietnamese syllable structure, and thus be optimally deleted. Additionally, Osbourne found that for her subject, /r/ was never realized in English syllable codas. Either the segment was absent or it was co-articulated with the vowel, and thus considered part of the nucleus rather than the terminus. This indicated that the learner was assigning /r/ to the nucleus of the syllable due to his perceptions of the realization of English /r/ (as Osbourne states, there is some speculation that a postvocalic /r/ should be considered to be a glide). In fact, when /r/ was the initial member of a consonant cluster, it was not deleted even though the following consonant was at times deleted since /r/ was considered part of the nucleus by the Vietnamese speaker.

Osborne (1996) also provides other evidence of the effect of linguistic environment on cluster reduction: clusters were reduced before pauses 80% of the time. In addition, sonority was examined, and it was found that clusters which violated the sonority hierarchy were significantly less likely to be reduced. This could be due to the fact that in English, many final clusters violate the sonority hierarchy due to inflectional endings, and it could be that these types of clusters are more salient to the learners, and thus less likely to
be reduced. This in fact confirms research by Young (1988) on English tense marking by native speakers of English -- redundancy in marking which make the past tense ending more salient were found to increase the likelihood of the past tense endings being produced. Finally, Osbume also found that the final cluster /ks/, when representing the letter x in orthography, was not reduced, possibly due to its orthographic salience.

Overall, the research on Vietnamese learners of English indicates that L1 interference plays a significant role in syllable structure production. Additionally, linguistic environment, in the form of preceding vocalic environment, plays a great role in consonant deletion. This finding provides additional evidence for the primacy of L1 interference in the production of syllable codas for native speakers of Vietnamese (cf. Benson, 1988; Osbume, 1996; Sato, 1984, 1985). Furthermore, salience of past tense marking and orthography may also be a factor in terms of which consonant clusters are typically not reduced (Osbume, 1996).

G. Variable Production of Final Consonant Clusters in Native Varieties of English:

It has been well-documented that there is a variable production of final consonant clusters in native varieties of English. This is especially true of the variable production of /t,d/ in final consonant clusters, which has been found to be systematic for native speakers of English (Roberts, 1997). As
Fasold (1990) states, "there is no doubt that it is a general variable process in anyone's English" (p. 245). Absence of /t,d/ is a process of consonant cluster simplification where the final /t,d/ is omitted in complex clusters of two or more consonants; this is a common phonological process for native speakers both across syllable and word boundaries (Guy, 1980). It is necessary to examine native speakers’ final consonant cluster production patterns since L2 learners may acquire these patterns.

Most of the research on /t,d/ absence has been done with adult native speakers of English as well as how these rules differ for Creole speakers (Patrick, 1991), AAVE speakers (Baugh, 1983), speakers of various Mexican American English varieties, such as Chicano English (Santa Ana, 1991, 1992) and Tejano English (Bayley, 1995). Additionally, there has been a few studies on the language variation of second language learners of English (Bayley, 1996; Wolfram & Hatfield, 1984) in order to investigate L2 learners’ acquisition of native-speaker variation patterns. Each of these lines of research is outlined below.

1. Native Speakers of Pan-English Dialects:

The majority of research on /t,d/ absence has focused on adult native speakers of pan-English dialects. As Labov (1989) states, "For the study of (TD), local origin is not essential, because all constraints are parallel across dialects of English..." (p. 89). The research in this area has found a uniform
pattern of constraints on /t,d/ absence, including linguistic constraints such as grammatical conditioning and phonological environment, and extralinguistic constraints such as gender. In summary, overall constraints which favor /t,d/ absence for adult native speakers as based on Labov (1989) are as follows:

a. **unstressed syllables** so that /t,d/ absence is favored for the unstressed syllable in the word *excellent*, but disfavored for the stressed syllable in the word *pretend*.

b. if a third consonant comprises the consonant cluster as in the word *wouldn’t* in contrast to a single consonant coda as in *hat*.

c. by the phonetic features of *the preceding consonant*, yielding the segmental order /s/ > stops > nasals > other fricatives > liquids. This means that when the consonant /s/ precedes the /t,d/, absence is favored, as in the word *just*. In contrast, if a liquid, such as the consonant /l/, precedes the /t,d/ as in the word *last*, absence is disfavored.

d. by the **grammatical status** of the final /t,d/ with the order: part of - n’t morpheme > part of stem > derivational suffix > past tense or past participial suffix. In other words, absence would be favored for the n’t contraction in *don’t* over part of the stem as in the monomorphemic word *last* over part of the derivational suffix as in *told* where the /d/ functions as a past tense marker for an irregular verb over a past tense/past participial suffix for a regular verb as in *talked*. 

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e. by the phonetic features of the following segment, yielding the order: obstruents > liquids > glides > vowels > pauses. Therefore, if the following word began with an obstruent such as /k/ or /s/, as in the phrase can't speak, absence would be promoted while if the syllable with a /t,d/ were followed by a vowel as in the phrase can't eat or by a break in speech, absence would be inhibited.

f. by agreement in voicing of the segments preceding and following the /t,d/ (homovoiced > heterovoiced). For example, if the voiceless consonant /h/ were preceded by another voiceless consonant such as /s/ and/or followed by another voiceless consonant such as /k/ as in the phrase just come, absence would be promoted. In contrast, if the /h/ were preceded by a voiced consonant such as /l/ and/or followed by a voiced consonant such as /n/ as in the phrase salt needed, absence may be inhibited. (p. 90, author's emphasis)

Labov (1989) also notes the following exclusions: ‘and’ is omitted from analysis because the /d/ is often omitted in speech due to unstressed word reduction rules; /t,d/ are neutralized when following segment is an apical stop (i.e., another /t,d/ as in the phrase just tell), palatal stop, or interdental fricative (i.e., /s/ as in the phrase hit that) because of difficulties in determining whether the /t,d/ was articulated or not due to the articulatory
and/or acoustic similarity of the following consonant and the phonological process of linking; and third, when the token is preceded by a nasal and followed by a vowel, due to nasal flap formation, as in the phrase *can't eat*.

2. **African American Vernacular English:**

While the above rules appear commonplace for most native speakers of pan-English dialects, notable differences have been found for speakers of African American Vernacular English (AAVE). As Labov (1972) states, the simplification of final consonant clusters at the ends of words to single consonants is a common process in AAVE. Final /t,d/ is still absent when it represents a grammatical suffix and in the same pattern of frequency as for monomorphemes. In fact, Baugh (1980) found that speakers of AAVE deleted /t,d/ in final consonant clusters in monomorphemic words even when a suffix with a vowel was added, which is not possible in many other dialects of English (i.e., *testing* was pronounced as *tessing*), leading Baugh to speculate that in AAVE, consonant clusters may not exist in the underlying form or may be acquired relatively late. Baugh (1983) also found that in terms of grammatical conditioning for AAVE, the order was monomorpheme > semi-weak verb > preterit, which is similar to the pattern of other varieties of English.
3. Mexican American English Varieties:

Santa Ana (1991, 1992) examined /l,d/ absence in Los Angeles Chicano English, and found that it followed the pan-English pattern for preceding and following segments. However, syllable stress patterns were related to age, with younger adults reversing the established pan-English pattern by having a pattern of stressed > unstressed although this pattern was not statistically significant. Santa Ana also found age related differences in grammatical conditioning, with younger people having an order of grammatical constraints as follows: semi-weak > monomorphemic > past, rather than monomorphemic before semi-weak verbs, as with older adults.

Bayley (1995) investigated /l,d/ absence in Tejano English, which is spoken in the barrios of south Texas. Overall, speakers of this variety of English followed the pan-English patterns noted elsewhere, and the patterns of speakers of Los Angeles Chicano English (Santa Ana, 1992). As with Santa Ana’s (1991, 1992) research, there were age-related affects in term of grammatical conditioning, with younger speakers (i.e., adolescents) deleting the variable on semi-weak verbs, which rarely occurred for adults. There were also age-related effects for syllable stress, which is similar to the findings of Santa Ana (1991, 1992): older adults follow the established pan-English pattern of unstressed > stressed, while for younger adults the pattern was reversed, stressed > unstressed, though this pattern was not statistically significant. Additionally, there were higher rates of absence on CC over CCC
clusters possibly because of the large percentage of CC clusters (92%) and the therefore uneven distribution of tokens. Voicing agreement and syllable stress followed the pan-English pattern although these factors were not statistically significant.

4. Jamaican Creole:

Patrick (1991) investigated whether the target language pattern of /t,d/ absence extended to urban mesolectal Jamaican Creole. The results indicate that grammatically, Jamaican Creole /t,d/ absence does not fit the pan-English pattern. As in the pan-English pattern, the negative suffix (i.e., n’t) favors absence strongly but unlike the pan-English pattern, there is a higher rate of absence in the past tense than for monomorphemes in Jamaican Creole. In fact, all the speakers had the same pattern of past tense > monomorphemes. Patrick explains this pattern by noting that while many varieties of English mark past tense at the level of syntax, Jamaican Creole does not. In fact, consonant-final regular verbs disfavor past marking so this affects absence of /t,d/; if the results are adjusted to account for this, then there is the same pattern of monomorphemes > past tense as for the pan-English pattern.

In terms of preceding phonological environment, Patrick’s (1991) findings were similar to those of previous studies, but also closely followed the sonority hierarchy, leaving him to state that /t,d/ absence in Jamaican
Creole is governed by sonority. In terms of following phonological environment, Jamaican Creole shares the same pattern as the pan-English pattern.

5. Second Language Learners of English:

In research on Chinese learners of English, Bayley (1996) examined the differences and similarities in the variable production of /t,d/ between L2 learners and native speakers of English in order to discover the extent to which the L2 learners had internalized the native speaker rules of linguistic variation. He found both convergence and divergence with the patterns of native speakers of English. Findings on the effect of phonological environment, including preceding, following, and voicing agreement, were overall similar to findings for native speakers of English. However, several constraints differed from findings for native speakers of English: In terms of syllable stress, there was a tendency for a higher rate of absence in unstressed syllables for the high proficiency group of learners, but this finding was not statistically significant. Additionally, length of consonant cluster had a significant effect on absence in research on native speakers of English; however, this did not appear to be the case for the L2 learners in this study. A third area of divergence was grammatical conditioning: The L2 learners in this study were more likely to reduce inflectional than lexical /t,d/ clusters, which is the opposite of the pattern for native speakers of English. However,
Bayley's finding confirms research by Wolfram and Hatfield (1984) on other non-native speakers of English, in this case, Vietnamese speakers of English, who also had higher /t,d/ absence rates on inflectional rather than lexical /t,d/ clusters. Bayley also found that the effect of the constraints on /t,d/ absence depended on the participants' social interaction patterns: the more interaction the speakers had with native speakers, the higher their rates of omission of /t,d/ from final clusters were versus those who did not interact with native speakers.

6. Summary:

The prior research clearly shows that within language varieties, there are uniform patterns of constraints governing /t,d/ absence. The research also indicates that the strongest constraints are grammatical conditioning, preceding phonological environment, and following phonological environment. The native speakers of English researched appear to exhibit the same rankings in terms of constraints; however, some differences can be noted based on language variety of English spoken, i.e., AAVE, Creole, Chicano and Tejano English, and for second language learners. When a second language or different English variety is spoken, differences from the pan-English pattern can be noted for grammatical conditioning (Bayley, 1996; Patrick, 1997; Wolfram & Hatfield, 1984) as well as phonological environment (Bayley, 1996; Patrick, 1997; Santa Ana, 1991, 1992). It also appears that there
are age-related developmental effects in terms of grammatical conditioning (i.e., Guy & Boyd, 1990; Labov, 1989; Roberts, 1997), and syllable stress (Bayley, 1995; Santa Ana, 1991, 1992).

H. Conclusion:

There are a number of limitations with the prior research on the acquisition of an L2 phonology. First of all, the majority of the research (i.e., Altenberg & Vago, 1987; Anderson, 1987; Benson, 1988; Broselow, 1987; Broselow & Finer, 1991; Broselow, Chen, & Wang, 1998; Carlisle, 1997; Eckman, 1981a, 1981b, 1987, 1991; Eckman & Iverson, 1993; Edge, 1991; Flege & Davidian, 1984; Hodne, 1985; Major, 1986, 1987a, 1987b; Major & Faudree, 1996; Tarone, 1980, 1987; Weinberger, 1987) has focused on L2 use at one point in time, i.e., one-time data collection, which does not examine both developmental sequences and how a L2 phonology is learned and used over a period of time. Only a few researchers have conducted longitudinal research on L2 phonology, i.e., Sato (1984, 1985), whose study on Vietnamese learners’ acquisition of English spanned a period of 10 months; Hecht & Mulford (1982) and Mulford & Hecht (1980), whose study of an Icelandic child’s acquisition of English lasted 8 months; and Carlisle (1998), who collected data on Spanish learners of English over a 10 month period.

Secondly, while the research on L2 phonology acquisition has yielded many similar findings regardless of learners’ first language backgrounds,
methodologies employed, or the researchers' theoretical stances, few researchers have attempted to examine their data from multiple perspectives, which may yield greater insights into the process of second language acquisition. Studies typically focus on linguistic factors such as markedness (Eckman, 1981a, 1981b; Eckman and Iverson, 1993; Major and Faudree, 1996), L1 influence (i.e., Broselow, 1984; Sato, 1984, 1985; Tarone, 1985), or universals (i.e., Benson, 1988), usually focusing on only one, which does not fully account for the acquisition of an L2 phonology. Research examining several constraints is usually limited to the interaction between developmental effects and interference (i.e., Hancin-Bhatt and Bhatt, 1997; Hecht and Mulford, 1982; Mulford & Hecht, 1980). Many researchers' use of a priori hypothesis led them not to consider other explanations for their data whether it supported their hypotheses or not. For example, it is difficult to determine whether Vietnamese learners' syllable-final coda modifications are due to L1 interference or markedness since Vietnamese does not allow syllable-final clusters). This is also true of final obstruent devoicing since Vietnamese does not have final voiced obstruents. This also has the additional complication that native speakers of English often devoice final obstruents, especially before a pause or a voiceless consonant. Many researchers, however, consider only one explanation for their data, i.e., interference, markedness, etc., and do not consider that multiple linguistic constraints, as well as social constraints, can affect the production, and acquisition, of a single segment.
The use of the term deletion when discussing learners' modification processes in consonant production is also problematic since it implies that the consonant being deleted is in fact present in the learners' underlying grammar. Whether this in fact is true has not been investigated. The term 'absence' is more appropriate since it leaves open the possibility that the feature has not yet been acquired. Only if a segment has been acquired can it be said to be deleted in production.

Researchers' lack of agreement over which modification strategies are typically employed, and why, is also a limitation of prior research. This lack of agreement is due in part to differences in methodology, proficiency level and ages of participants, and duration of research. It is difficult to make comparisons across studies, and this limits the generalizability of the findings and makes it difficult to create a cohesive theory of L2 phonological acquisition.

Another limitation of prior research is that very few studies have examined how linguistic environment affects L2 consonant production and acquisition. Findings from researchers such as Anderson (1987), Bayley (1996), Benson (1988), Carlisle (1994; 1997), Edge (1991), and Weinberger (1987) indicate that linguistic environment has an effect on when consonants are modified and which modification processes are favored. This is an area of L2 phonology that is in need of further research.
A further limitation of prior research on the acquisition of L2 phonology is the lack of focus on how social factors such as social identity and social interactions constrain the development and use of specific phonological features. There has been a serious lack of research on how the social context of language learning affects the acquisition of an L2 phonology. Social constraints such as contact with native speakers of the L2 have been examined in the development and usage of syntactic features (i.e., Heidelberger Forschungsprojekt 'Pidgin-Deutsch, 1978; Meisel, Clahsen, Pienemann, 1981), and how community speech norms affect the use of specific phonetic features has also been examined (Adamson and Regan, 1991; Beebe, 1980; 1983; 1985; Dowd, Zuengler, & Berkowitz, 1990). Research indicate that the social context has a major effect not only on the level of L2 proficiency attained (i.e., Heidelberger Forschungsprojekt 'Pidgin-Deutsch, 1978; Meisel, Clahsen, Pienemann, 1981), but also what variety of the L2 is targeted for production (Adamson and Regan, 1991; Beebe, 1980; 1983; 1985; Dowd, Zuengler, & Berkowitz, 1990). However, there has been no research that directly addresses how social identity and social interaction patterns affect L2 phonological acquisition, although there has been a great deal of L1 and L2 sociolinguistic research that has focused on how social identity and social networks affect language use.
Linguistic Constraints:

There are a number of linguistic constraints that can influence the acquisition of an L2 phonology: markedness, developmental processes (universal and English-language specific), and L1 interference. Each of these possible constraints is described below.

A. Markedness:

All languages have a core consonant vowel (CV) syllable structure (James, 1988, p. 5; Spencer, 1996, p. 82). CV syllables are thus the least marked syllable structure in languages, with increasing length increasing the markedness of the syllable structure (Carlisle, 1997). Although the CVC syllable does not occur in all of the world's languages, it does occur frequently and is therefore also considered universally unmarked (Spencer, 1996, p. 82). The existence of codas or onsets with a length of 1 implies the presence of codas/onsets with a length of 1-1. One exception to this rule is the CV syllable, which does not always imply the presence of V (Greenberg, 1978). Codas without C are optimal, and thus least marked (Carlisle, 1997).

The following implication universal can be stated for syllable codas: If a language has a coda with two-members that consists of a stop + stop, then by implication it also has the two-member coda of fricative + stop. Additionally,
languages with codas consisting of a sequence with fricative + fricative will also have the sequence of stop + fricative or fricative + stop (Greenberg, 1978, p. 84).

B. Developmental Processes:

1. Universal Developmental Processes:

Owens (1996) states that it appears that perception of speech sounds precedes production, but the two processes are not parallel. In terms of chronological order of acquisition, Jakobson (1968) states:

Whether it is a question of French or Scandinavian children, of English or Slavic, of Indian or German, or of Estonian, Dutch or Japanese children, every description based on careful observation repeatedly confirms the striking fact that the relative chronological order of phonological acquisitions remains everywhere and at all times the same. (p. 46)

However, the speed of succession is variable and individual.

In the chronological order of consonant acquisition, voiceless consonants are acquired before voiced consonants. Stops are acquired before nasals, and nasals before fricatives. Fricatives cannot be acquired before stops are acquired. When first acquiring fricatives, a child changes the fricative to the corresponding stop, i.e., /f/ to /p/ and /s/ to /t/, a process known as 'stopping', and to palatovelar series insofar as they have been established
before the development of fricatives (i.e., /x/ and /ʃ/ to /k/ and /ʒ/ to /g/).

The acquisition of the back consonants such as the velars and palatovelars presupposes the acquisition of the front consonants such as labials and dentals. Additionally, front oral and nasal stops are acquired before back oral and nasal stops. This is true for fricatives as well: front fricatives are acquired prior to back fricatives and the acquisition of back fricatives also presupposes the acquisition of front fricatives. Therefore, one can say that the acquisition of back consonants presupposes the acquisition of front consonants. Initially, children substitute the back nasal consonants with /n/, and also typically substitute back consonants with their corresponding dentals (i.e., /t/ for /k/ and /c/), which is called ‘fronting.’ The acquisition of /k/ is preceded by mistakes in the use of both /k/ and /t/, and the often hypercorrection of the two phonemes in favor of /k/. Therefore, when acquired, /k/ at first merges with /t/ and only later develops into a separate phoneme. Affricates, also called half-stop consonants, are acquired only after the acquisition of the corresponding fricative, and before acquiring the affricate, a child may substitute with sound with either its corresponding fricative or stop. The latest phonemic acquisitions for the child are those oppositions which rarely occur in the languages of the world, i.e., nasal vowels, the second of one of the two liquids (either /l/ or /r/) (Jakobson, 1968, pp. 47-58).
Other universal developmental processes include assimilation processes such as consonant harmony, wherein consonants within the same word are assimilated. Typically, velars and labials are most resistant to assimilation while dentals are the most frequently assimilated consonants (Macken & Ferguson, 1981). Other assimilation processes include consonant voicing in voiced environments and devoicing in word-final position, as well as denasalization.

In terms of syllable structures, Ingram (1976) states that the general tendency for children acquiring syllable structures is the reduction of all syllables to a CV form via consonant deletion, vowel epenthesis, unstressed vowel deletion, and reduplication of the first CV syllable structure. The first strategy children appear to adopt is the deletion of final consonants, especially in CVC syllable structures. Ingram notes that the first consonants typically acquired in final position are velars. In terms of the deletion of unstressed syllables, in the initial stages of language acquisition the first words acquired are monosyllabic, and when bisyllabic words are used, the unstressed syllable is deleted. When the child is able to produce two syllables, several deletion processes occur: Initially, there is a reduction of the unstressed syllable (i.e., the vowel is reduced to a schwa), and second, all unstressed syllables existing in three syllable words are deleted. In the third stage, medial stressed syllables may be produced but there is a continuation of the deletion of unstressed initial syllables. In the fourth stage, unstressed syllables may be produced in
bisyllabic words although not as frequently in trisyllabic words. In stage five, the child approximates correct adult pronunciation (Ingram, 1976, pp. 30-31).

The reduction of consonant clusters is another process that has several stages and can continue for a longer period of time. Consonant cluster reduction via consonant deletion is not random. The first stage is marked by the deletion of the entire cluster, followed by the reduction of the cluster to one consonant in the second stage. Typically, the marked member of the cluster is deleted (i.e., in clusters with /s/ plus a stop, the /s/ is deleted; in stop + liquid, the liquid is deleted; in fricative + glide/liquid, the glide/liquid is deleted; and in nasal + obstruent, the nasal is deleted) (Ingram, 1976, pp. 32-33). In stage three, the cluster is produced, with the substitution of one of the elements, i.e., a liquid to a glide, for example. Stage four marks the child's correct pronunciation of clusters (Ingram, 1976, pp. 31-33).

2. English L1 Developmental Processes:

Universal markedness considerations and universal developmental processes to some extent account for the acquisition order of English as an L1. Therefore, there will necessarily be overlaps between the above description of universal developmental processes and the description of English L1 developmental processes. However, these processes are not identical, as every language has its own phonetic inventories and phonotactic constraints.
In the development of English as an L1, children often substitute /w/ for /j/. Additionally, obstruent sounds (i.e., plosives, fricatives, and affricates), may be substituted by plosives, a phenomenon called 'stopping' (Owens, 1996, p. 339). Stopping is especially frequent for consonants in word-initial position, and for the fricatives /ʃ/ and /θ/, which are acquired late. Word-final voiced obstruents are also often devoiced. In early acquisition stages, the production of nasals may also be accompanied by stopping, and a plosive from the same position in the oral cavity is often substituted for the nasal (i.e., Sam becomes Sab) (Owens, 1996, p. 339).

Another substitution process is called 'fronting', in which alveolar sounds replace palatals and velars (i.e., /t/ and /d/ for /k/ and /g/, respectively) (Owens, 1996, p. 339). Nasals may also be fronted, and therefore /ŋ/ may be produced as /n/. The phonemes /l/ and /j/ may also be stopped initially, but are gradually replaced by another approximant. The glides /j/ and /w/ are developed late, and are initially replaced by approximants (Owens, 1996). Syllabic nasals and liquids may also be replaced by vowels.

According to Owens (1996), the first syllable structure a child acquires is consonant-vowel (CV), and during early acquisition, a child often reduces words to either a CV or CVCV structure. Often, final consonants are deleted to form the CV structure, or a vowel is inserted (vowel epenthesis) after the final consonant. Other strategies include lengthening of the vowel that precedes the final consonant or substituting a glottal stop or plosive (i.e., /h/)
for the final consonant. These strategies are the first steps in the acquisition of final consonants, of which nasals are typically the first to appear. In this stage, a child may also delete unstressed word-finals or reduplicate a syllable structure (i.e., wawa for water), which is also a stage in the acquisition of final consonants. Consonant clusters are reduced or simplified, typically via consonant deletion. In clusters with /s/ and a plosive, /s/ is typically reduced (i.e., stop becomes top); in clusters with a plosive or a fricative and a liquid/glide, the liquid/glide consonant is typically deleted (i.e., bring becomes bing); in nasal plus plosive/fricative clusters, the nasal is often reduced in early stages of acquisition while in later stages, the plosive will be deleted if it is voiced. Consonant clusters can also be simplified via vowel epenthesis between consonants (Owens, 1996, 337 - 341).

Consonant deletion processes are also present in fluent speech by native speakers. Hieke (1987) states that native speakers typically delete the medial consonant in a final three-consonant cluster. The deleted consonant is typically a /t/ or a /d/. In two-consonant final clusters, stops may be deleted, especially in nasal-stop sequences.
C. L1 interference: A Overview of Vietnamese Phonology:

First, an overview of the potential effects of L1 interference for Vietnamese learners of English will be discussed. Secondly, the consonants that exist in Vietnamese will briefly be described. Finally, a contrastive analysis of Vietnamese and English phonology will be presented.

1. Areas of Difficulty for Vietnamese Learners of English:

As Honey (1987) explains, Vietnamese learners may have difficulty with the following English sounds as they do not exist in Vietnamese: /θ, ð, ʃ, s, ʒ, z/. As final stops are unreleased in Vietnamese, Vietnamese learners may also pronounce English stops as unreleased. As initial /t/ is unaspirated in Vietnamese, it may sound like the learners are producing a /d/ for the /t/.

The phoneme /tʰ/ is an initial plosive that is strongly aspirated, and may be produced as /θ/ or /ð/ by Vietnamese speakers. Finally, initial /g/ may be pronounced in a lax manner, without full closure, which gives it a guttural sound. In terms of consonant clusters, Honey (1987) states that interconsonantal /s/ is often omitted within consonant clusters as well as in final position, following another consonant.
2. Vietnamese Consonants:

There are a total of twenty-two consonant sounds in Vietnamese, not including allophonic variations, which are illustrated in the following table (Table 1) by manner and place of articulation.

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From Santry (1997) and Nguyen (1990)

Table 1.1: An overview of Vietnamese consonants
Each of these sounds will be described in turn below, beginning with the plosives: /b/ is a voiced bilabial plosive in initial position. It has an allophone in final position, /p/, which is a voiceless, unreleased, bilabial plosive. In terms of the dentals, /n/ is a voiceless, unaspirated dental plosive which occurs both initially and finally, while /d/ is a voiced apical-alveolar plosive which only occurs in initial position. However, /th/ is a voiceless, aspirated apical-dental plosive which is released with puff of air, which is very audible. Another plosive, /c/, is a voiceless lamino-palatal plosive, which is unreleased in final position. /k/ is a voiceless, unaspirated, dorsovelar plosive with five allophonic variations, depending on the preceding vowel. In initial position, /k/ is produced as [k]; however, in final position after the vowels /u, w/ it is produced as [kʰ], which means it has a simultaneous bilabial closure; in final position after /ɔ/ it is produced as [kʷ], which means it is produced strongly labialized, i.e., with rounding of the lips. In finals after /ɔ/, it is weakly labialized, and produced as [kʷ]. After all other vowels, it is unreleased and produced as [k].

Vietnamese also has three retroflex sounds, /ɾ/, /r̃/, and /j̃/, the former of which is a voiced alveolar retroflexive in initial position, with three variants: [ɾ], which is typically produced as a series of rapid taps or trills; [ɾ], which is produced as a single tap; and [z], where friction is caused by the stream of air.
The second retroflex, /ɾ/ is a voiceless, apical alveolar retroflex plosive, which occurs in initial position only. It is slightly affricated. The third retroflex, /ʃ/, a voiceless retroflex fricative, also only occurs in initial position.

In terms of fricatives, /θ/ is a voiceless labio-dental fricative which occurs in initial position, while /v/ is a voiced labio-dental fricative which also only occurs initially. /ʃ/ is a voiceless alveolar fricative, also occurring only in initial position, which is the same for the voiceless dorsovelar fricative /χ/.

The phoneme /v/, which is a voiced dorsovelar fricative, may be produced as the stop [g], especially when the preceding syllable ends in either /k/ or /ŋ/.

Another fricative, also occurring only in initial position, is the voiceless glottal fricative /h/.

As for the nasals, /m/ is a voiced bilabial nasal with two variants, [m] in initial position, which is released, and [m'] in final position, weakly released. The voiced alveolar nasal /n/ has similar allophonic variants, as well, [n], released, in initial position, and [n] weakly released in final position. /ŋ/ is a voiced palatal nasal while /ŋ/ is a dorsal nasal. Both of these phonemes can occur both initially and finally. The voiced alveolar lateral /l/ is unreleased (it is released in English) and only occurs initially. There are also two semi-vowels, /w/ and /j/, both of which can occur in initial or final position. The former is a bilabial semi-vowel while /j/ is a palatal semi-vowel (Santry, 1997).

Overall, all the phonemes except for /p/', which is an allophone of /b/, can occur initially, while the phonemes that can occur in final position are
restricted to: /p, t, c, k, m, n, ŋ, ɐ, w, j/, i.e., only plosives, nasals, and semi-vowels. Additionally, all the plosives are voiceless. There is an overall agreement that the final consonants are unreleased or weakly released; in addition, there are no consonant clusters in Vietnamese. For the few consonants with allophones, allophonic variation is caused by vocalic environment (Santry, 1997).

3. Phonological Differences between English and Vietnamese

English consonant structures are complex. Syllable onsets in English may consist of one to three consonants or a vowel (Jensen, 1993, p. 65). As Spencer (1996) states, the most complicated syllable structure in English is CCCVCCC (i.e., the word ‘strengths’). Every consonant in English with the exception of /ŋ/ and /ʒ/ may begin a syllable in English (of course /ŋ/ may begin word-medial unstressed syllable in English) (Jensen, 1993, p. 65). In terms of two-consonant onsets clusters, there are a number of linguistic constraints. Initial clusters must consist of the combinations of plosive plus approximant (either a liquid or glide). The combination of sonorant plus obstruent is not allowed (Spencer, 1996, p. 83). These constraints result in the following 49 syllable onset clusters: /sp/, /st/, /sk/, /sf/, /sm/, /sn/, /sl/, /sw/, /sy/, /sp/ *, /sm/ *, /sn/ *, /sl/ *, /sw/ *, /sy/ *, /pl/, /pr/ *, /py/ *, /bl/, /br/ *, /bw/ *, /by/, /br/, /tw/, /ty/, /dr/, /dw/, /dy/, /kl/, /kr/, /kw/, /ky/, /gl/, /gr/, /gw/, /gy/, /gl/, /gr/, /gw/, /gy/, /fl/, /fj/, /fw/, /rl/, /rl/, /rj/, /ry/, /ly/, and /ly/ (Jensen,
The notation * denotes clusters that are foreign in origin but that have been incorporated into the phonotactics of English (Jensen, 1993, p. 66).

Three-consonant onsets also exist in English, and are formed by adding /s/ (and only /s/ is allowed in the beginning of a three-consonant onset) to already permissible two-consonant onsets, resulting in the following nine three-member onsets: /spl/, /spj/, /su/, /ski/, /skj/, /skw/, /spy/, /stj/, and /sky/ (Jensen, 1993, p. 67). The three-consonant onsets consist of clusters in which the first two and the last two consonants respectively can form two-consonant onsets. Additionally, /l/, /j/, /w/, and /y/, with the exception of /ly/, do not appear as the first consonant in a two- or three-consonant onset.


There are fewer three-consonant codas, namely: /dst/, /kst/, /ksθ/, /mps/, /lpt/, /lkt/, /lks/, /lθθ/, /rl/, /nst/, /gθ/, /gkt/, /gks/, /rmθ/, /rpt/, /rps/ (p. 70). Some rules can be noted: All the three-consonant clusters end in /t/, /s/, or
/θ/, all voiceless coronal obstruents (i.e., stops, nasals, and fricatives). The majority of two-consonant codas also end in coronals; furthermore, vowels occurring before both two- and three-consonant codas are mostly short and lax. In fact, long vowels do not occur before three-consonant codas, although they may occur before two-consonant codas if the two-consonant cluster contains only coronals (Jensen, 1993, p. 70). Four consonant codas also exist; in these cases, the final consonant is a bound morpheme, i.e., either /s/ for plural or third person singular, or /t/ or /d/ for past tense (Defense Language Institute, 1974, p. 24).

Vietnamese is a monosyllabic tone language and the nucleus of the syllable, which can be composed of vowels, diphthongs, and triphthongs, carry one of the five Vietnamese tones (Nguyen, 1970). The five tones are as follows: high-level, high-rising, low-level, low-rising, and mid-rising. The tones are employed to semantically distinguish words from one another. In addition, Vietnamese is very restricted in the consonants that can occur finally (see the description above) and there are no consonant clusters. Syllables in Vietnamese can be reduced to the following formula, which illustrates canonical syllable structure per Santry (1997): ± O [+ C ± W] + N [V] ± T <C, W>, with O representing the Onset, C as Consonant, W as semi-vowel, N as nucleus, V as vowel or diphthong, and T as terminus. This formula states that a syllable in Vietnamese can optionally consist of an onset, which may consist of either a consonant or a consonant plus a semi-vowel,
but must consist of a nucleus, which is composed of a vowel or diphthong, and optionally a terminus, which may be composed of either a consonant or a semi-vowel. This formula produces the following possible syllable structures: V, VW, VC, VWC, VW, CV, CWV, CVC, CWVC, CWVW, CVW.

Social Constraints on the Acquisition of an L2 Phonology:

There are a number of social factors which can also affect the acquisition of an L2 phonology, though the research in this area is scarce. Important social factors are social identity and social interactions, the latter of which incorporates types and amount of contact, as well as with whom the learner is interacting. Additionally, degree of acculturation, as well as motivation and attitudes towards the target culture, are also social constraints which may influence second language acquisition. Research findings for each of these areas is outlined below.

A. Social Identity:

Social identity is comprised of different components (appearance, ethnicity, group memberships, language, culture, etc.), which play out in different ways in different contexts with different interlocutors. Language is one medium through which we express our social identity, but identity construction is not unidirectional. Our interlocutor(s) must recognize our constructed identity (our language markers) as social identity must be
constructed in relation to other individuals. Lum (1982) states it concisely: “identity is a social process in which one balances what s/he thinks oneself to be and what others believe that one has to be …” (p. 386).

Language and identity are inextricably intertwined. Giles and Byrne (1982) state that “Accent serves as a powerful symbol of ethnicity and ‘psychological distinctiveness’” (quoted by Leather & James, 1991, p. 310). In fact, linguistic behavior is “a series of ‘acts of identity’ in which people reveal both their personal identity and their search for social roles” (LePage & Tabouret-Keller, 1985, p. 14). These acts can be both conscious and unconscious, and resisting specific language features is as important in marking one’s social identity as is the use of specific linguistic features, i.e., phonological markers, within one’s linguistic repertoire. As Pennington (1994) states, “A pronunciation of a certain sound that signals membership in a certain group is termed a phonological marker of identity in that group” (p. 103). Research in both L1 and L2 use have shown us that “Speakers adopt various linguistic markers to identify themselves with particular sociocultural groups” (Leather & James, 1991, p. 310). In a summary of research on L2 social markings via phonology, Dowd, Zuengler, and Berkowitz (1990) state that social markings can occur at any age group and level of L2 acquisition, despite a limited repertoire. Additionally, “several sounds marking the same social factor may silt in different directions; a given sound, marking several social factors, may shift in different directions” (p. 22).
One area of second language acquisition in which we need a greater awareness of social identity is learners' acquisition (or lack thereof) and use of specific phonological features. Many SLA researchers and teachers compare learners' language to the standard variety, assuming both that learners are aiming at the standard as their target language and that any deviations from the standard variety on the part of the learner are 'errors.' Beebe (1985), however, suggests that learners' choices of target language variety depend on the social context, and that there are certain input preferences for language learning. For example, peers may be preferred over parents and teachers, in-group over out-group, friends over non-friends, high-contact over low-contact groups, and higher-prestige over lower-prestige groups. Furthermore, learners decide whether to give precedence to solidarity (i.e., peer group,) or prestige (teachers'/parents' variety). However, as Hieke (1987) states, "the systematic variation of spoken English from ideal forms (i.e., underlying representations) has not usually been considered in IL phonology studies, nor have the wide range of variations attributable to dialect within so-called Standard English" (p. 391).

Edge (1991), in her study of Cantonese speakers' production of English obstruents states that the reason why some Cantonese learners exhibit non-target variants in their obstruent production may be because they are targeting a nativized variety of English, namely Hong Kong English, which exhibits these variants. She argues that analyzing this data for IL rules and processes
is "a questionably valid procedure" (p. 391). She further states that, "for many phonetic features, nativized varieties and other non-standard Englishes offer different targets than those of what has been called Standard English" (p. 391).

Hecht and Mulford (1982), in their research on an Icelandic child's acquisition of English fricatives and affricates, found that the learner's tendency to devoice final /z/ was found to be partially affected by the variety of English he was learning from his peers. Other L2 patterns in the learner's speech was also found to be influenced by the typical Boston pronunciations the learner would have been exposed to through school peers.

Adamson and Regan (1991) investigated the acquisition of community speech norms by Vietnamese and Cambodian immigrants to the US. The researchers examined the participants' use of the phonological variable 'ing' specifically focusing on two variants, /iŋ/ and /in/. They hypothesized that greater use of /in/, the non-prestige variant and a variant not present in the participants' L1 phonology (versus /iŋ/, which is present), would indicate a greater integrating of participants into their respective speech communities. The participants were all from either Philadelphia or Washington DC, where /in/ functioned as a non-prestige variant of '-ing'.

The researchers found that both linguistic and social constraints governed the participants' usage of /iŋ/ and /in/. The usage of /iŋ/ was favored in nominal categories, versus verb-like categories for /in/. Monitoring was found to favor /iŋ/, and male participants used /in/ more
frequently than females, i.e., a pattern similar to that found for native speakers in these particular contexts. The researchers state that these findings suggest that the participants are targeting different groups of speakers. For instance, the non-native female speakers are targeting native female speakers, and vice versa, while the male speakers, native and non-native speakers alike, use the nonstandard variant more frequently than either native or non-native females. This data also supports prior L1 and L2 work on gender differences in speech, i.e., that female learners have been found to use more standard forms than men (Ellis, 1994).

Learners may also resist acquiring, and using, specific linguistic forms because it conflicts with their L1 identities. This is extremely important for SLA researchers and teachers to understand, because students' lack of use of certain forms may not always indicate a lack of acquisition of (or ability to acquire) these forms, but rather acts of resistance to the identity the learners perceive the forms portray. As Pennington (1994) states:

the identity signaled by a certain accent sometimes serves as a psychosocial constraint pressuring the nonnative not to speak in a nativelike way in order to avoid any identification with native speakers -- including symbolic identification with their symbolic values. (p. 103)
Beebe (1983) also argues that we need to reconceptualize transfer as being socially motivated; asserting one's ethnic identity, she states, is an important function of transfer. There has been very little research on this area in second language acquisition.

Siegal's (1994) study of white women, all native speakers of English, studying Japanese in Japan, albeit on syntax, provides interesting examples of the strategies several white women adopt in resisting the L2 identity the Japanese language imposed upon them. The study also examines how these women create a new L2 identity for themselves by adopting aspects of both male and female speech. The three women reported on in this study avoided the use of certain linguistic features associated with women's language in Japanese, such as honorifics (used by men as well, but to a lesser extent), and female sentential-final pragmatic particles. Instead, they preferred to develop an L2 linguistic identity by combining elements of both 'male' and 'female' speech rather than the "passive and invisible" identity they associated with Japanese women's language. For example, one of the women's language styles was marked with the overuse of the plain form, which is associated with male speech. She also avoided the use of honorific language and used the polite statement "I think" in place of honorifics. Another woman also avoided the use of honorifics, instead using the modal auxiliary 'desho' to soften her utterances in a more feminine manner. A third woman, who inaccurately believed that sentential-final particles functioned only in
women's language, avoided using pragmatic particles altogether. All three women were conscious of their language choices, but avoided using 'correct' Japanese forms in situations when they knew they should, because it conflicted with their L1 identity.

The studies outlined above indicate the importance of social identity in the process of SLA, especially in terms of learner's language, since what we perceive as deviations from the target language may in fact be learners' targeting of a non-standard language variety. Additionally, learners' underuse or avoidance of certain linguistic forms may not necessarily be due to lack of acquisition of these forms, and therefore may be impervious to instruction. Instead, these deviations may be acts of resistance to elements of the target language as it conflicts with learners' L1 identity.

B. Social Interactions:

Social interactions are also an important area of investigation within SLA although this area of study has not as yet received significant attention from SLA researchers. Social interactions can be investigated through the framework of learners' amount of contact with speakers of both the L1 and the L2, as well as the type of contact that takes places and with whom, in order to better understand how the context of language use affects L2 acquisition as well as L1 maintenance. Within these frameworks, social interactions are intricately connected with social identity since the person one chooses to
associate with typically is a member of the group with which one identifies, or feels solidarity with. As illustrated in the above discussion of social identity, social interactions can affect which language variety is targeted, and so have a direct effect on both L2 acquisition and use. However, while most SLA researchers acknowledge that second language acquisition cannot take place without learners’ engagement in meaningful communication, there are strikingly few studies that investigate the effect of learners’ amount and type of contact with speakers of the L2 on the learners’ L2 acquisition. Of these studies, even fewer focus on phonology, the majority of the research centering on the acquisition of L2 syntax.

Oyama’s (1976) research is one of the few studies that address amount of language use and L2 phonological development. Oyama investigated the effect of length of stay and age of arrival on the degree of accentedness in English of 60 Italian-born immigrants to the US. While age of arrival was a significant variable in degree of accentedness, length of stay had no effect. This led Oyama to state that, “Considering the width of the number of years in the United States intervals, the lack of effect of this variable in the analysis of variance is striking. Amount of use of a language must obviously be an important consideration,” (p. 270, my emphasis). Tahta, Wood, and Loewenthal (1981) researched the transfer of accent from the L1 to the L2, and
found that after age of L2 acquisition, the top predictor of non-accentedness was use of English at home, and exposure to English models outside of school.

In his research on the /t,d/ production of Mandarin speakers, Bayley (1996) included social interactions in the VARBRUL analysis of factors influencing production and absence of /t,d/. Participants were categorized into two types of social networks: a) mixed Chinese and American, and b) exclusively Chinese. Bayley found that social networks had a significant effect on /t,d/ absence, with speakers classified as having an exclusively Chinese social interactions having a .39 (out of 1.00) input probability of /t,d/ deletion, while for participants with mixed American and Chinese social interactions, the input probability was .61. The difference in probability rating was significant at p < .001.

In research on the naturalistic acquisition of an L2 syntax, the Heidelberger Forschungsprojekt 'Pidgin Deutsch' (1978) and the ZISA project (Meisel, Clahsen, & Pienemann, 1981) both found that amount of contact, and thus degree of interaction, with speakers of the L2 was a significant factor in the acquisition of the L2. The Heidelberger Forschungsprojekt found a high correlation between the amount of contact Spanish and Italian migrant workers had with Germans during leisure time and their German L2 proficiency. In fact, this was the primary social factor, more significant even than age of arrival, which was the second most important factor. The third
most important factor was contact with Germans at the place of work. One drawback of the study is that it was correlational and therefore does not show a causal relationship between social factors and language acquisition. However, the correlations do support a significant relationship between one aspect of social interactions, amount of contact with native speakers, and language development.

In research on the effect of living with an American family on the acquisition of English, St. Martin (1980) found that homestay students had significantly higher scores on speaking, grammar, reading, and composition tests at the end of a 14 week period than did non-homestay students. Spada (1986) researched the interaction between naturalistic and classroom second language acquisition and found that learners who had qualitatively better contact with speakers of English did better on speaking tests than those learners with less contact.

SLA researchers have also found that some aspects of social interactions can limit or give learners opportunities to practice the target language. Monshi-Tousi, Hosseine-Fatemi, and Oller (1980), in their research on the relationship between English proficiency and use of English outside the classroom, found that the number of American friends the learners had was one of the best predictors of second language proficiency. Peirce (1995), in her study of the English language acquisition patterns and L2 social identity development of immigrant women in Canada, found that the L2 (i.e.,
Canadian community limited the interactions the L2 learners had with members of that community. In addition, she found that "power relations play a crucial role in social interactions between language learners and target language speakers" (p. 3). Goldstein (1995), in her study of Portuguese female immigrant factory workers in Canada, found that it was the L1 community that limited the opportunities that L2 learners had to interact with speakers of the L2. Use of the L2 was found to be alienating and risk-inducing, since it separated the women from the social interactions and the 'sisterhood', which helped them to get and maintain their jobs in the factory.

Conflicting results regarding the role of contact with native speakers in second language acquisition also exists. In his study of the impact of the self-reported English language use outside the classroom on L2 proficiency, Day (1985) found a rise in sociolinguistic competence and not grammatical or pragmatic competence, as measured by the Bachman-Palmer Oral Interview. However, Day only studied the amount of language use, and did not consider the quality of the language use, which is probably the crucial factor in contact with speakers of the L2.

C. Acculturation:

In his Acculturation Model, Schumann (1986, 1990) discusses eight factors -- social dominance, integration pattern, enclosure, cohesiveness, size, cultural congruence, attitude, and intended length of stay -- as contributing to
the social distance between learners and members of the target culture. He also discusses psychological distance, i.e., language shock, culture shock, motivation, and ego permeability, but believes that social factors are primary in determining the level of acculturation learners have to the target culture and thus level of L2 development. While Schumann's model has been criticized for its attempt to draw similarities between the processes of second language acquisition and pidginization, both the ZISA project and the Heidelberger Forschungsprojekt did find that social distance was a significant factor in L2 proficiency. My own research (Hansen, 1998a) on the acculturation patterns and English speaking skills development of three speakers of Mandarin also found that social distance was a significant factor in L2 development. While the three participants in the study had similar social dominance and integration patterns, they differed significantly in their attitudes towards native speakers of English, American culture, and the necessity of understanding American culture and Americans in order to communicate successfully. The participant with the fastest rate of language development had a positive attitude towards the above factors, and actively sought out opportunities to interact with Americans. This in turn helped to create more opportunities for meaningful language use.
Ethnic group membership and L1 background may be a factor in acculturation patterns. For example, Sodowsky and Plake (1992) studied the acculturation patterns of four international groups, and found that the Asian group was less acculturated and used English significantly less than Europeans.

However, conflicting results also exist. In a test of the Acculturation Model, Schmidt (1983) found that although the participant of the study ('Wes') exhibited low social and psychological distance from the target culture, and was extremely extroverted and a risk-taker in the use of English, Wes's grammatical competence (including pronunciation) did not improve over the three year duration of the study. Wes continued to delete consonants and to reduce consonant clusters. However, Wes had a high level of discourse competence. Schmidt concludes that the Acculturation Model is false since it fails to account for Wes's lack of L2 development. This study does provide evidence that the social context of language use alone may not facilitate L2 grammatical and phonological acquisition for adults.

D. Affective Variables:

The discussion on affective variables will begin with an examination of foreign language anxiety. This is followed by an overview of research on attitudes and motivation. Finally, investment (Peirce, 1995) in second language learning is discussed.
Anxiety in using the second language appears to be a common phenomenon among language learners (Horwitz, Horwitz, & Cope, 1986). Anxiety appears to be mainly restricted to spontaneous communication in the L2, and involve speaking and listening skills (Ellis, 1994). Research on anxiety has found that it is typically caused by either the learners' beliefs about language learning, the interaction between the instructor and the students, as well as the instructor's beliefs about language learning (Samimy, 1994). The effects of anxiety on language learning has been researched via correlational studies in regards to learners' output, even though anxiety is also hypothesized to affect input reception and language processing. Findings indicate that the effect of anxiety can either facilitate (i.e., Horwitz, Horwitz, & Cope, 1986) or debilitate (i.e., Ely, 1986; Saito & Samimy, 1996; Samimy & Tabuse, 1992) learners' performance in the second language based on the learner's developmental stage and by situation-specific learning situations (Ellis, 1994). Additionally, anxiety has also be found to be linked with risk-taking, with learners that had low anxiety exhibiting more risk-taking behavior in the language classroom (Ely, 1986). In summary, as Saito and Samimy (1996) state, anxiety can have a significant influence on second language acquisition.

While the research on attitudes towards the target culture and L2 achievement as well as motivation in L2 language learning and L2 proficiency has been questioned on the basis of methodological shortcomings
(i.e., the majority of the research has been correlational which can not establish cause-and-effect relationships) the overall findings indicate both attitudes and motivation may have an indirect effect on language learning.

In terms of attitudes, research has found that positive attitudes towards the target language groups can enhance learning while negative attitudes may impede learning (i.e., Gardner & Lambert, 1972). In some cases, however, negative attitudes can have a positive effect on learning if the learners have strong reasons for learning (i.e., Lanoue, 1991; Oller, Baca, & Vigil, 1977). It is important to note that the relationship between language learning and attitudes is inherently cyclical in nature, in that positive attitudes may lead to learning which in turn may lead to positive attitudes, and vice versa for negative attitudes and a lack of learning. In addition, the social context of language learning may influence the extent to which attitudes affect language learning, in that attitudes may play a larger role when language learning takes place in the second language context, and a lesser role in foreign language contexts (Gardner, 1980).

Motivation has typically been theorized as being comprised of two separate components: integrative motivation and instrumental motivation. Integrative motivation is defined as the interest in learning an L2 because of a personal interest in the target language culture and people (Lambert, 1974). In contrast, instrumental motivation has been defined as an interest in a learning an L2 due to its practical value and advantages. Motivation is seen
as the effort individuals put into learning a second language. Correlational studies have consistently found a positive relationship between levels of integrative motivation and L2 achievement (i.e., Gardner & Lambert, 1972) although conflicting results exist (i.e., Oller, Baca, & Vigil, 1977). Instrumental motivation may also positively affect language learning, especially in contexts where learners have little or no opportunity to interact with members of the target culture (Gardner & Lambert, 1972; Lukmani, 1972). Research has also indicated that motivation may result from SLA, rather than the other way around (Strong, 1984).

Recently, however, the concept of motivation has come under criticism for not capturing the complex relationship between the language learner and the learning context (Peirce, 1995). As Peirce states, “theorists have not adequately explored why it is that a learner may sometimes be motivated, extroverted, and confident and sometimes unmotivated, introverted, and anxious” (p. 11). Peirce instead proposes the term ‘investment’ to reconceptualize the relationship between the individual and society, which is dynamic and complex rather than a fixed property of the language learner. Peirce defines investment by stating that:

if learners invest in a second language, they do so with the understanding that they will acquire a wider range of symbolic and material resources...I take the position that this return on investment
must be seen as commensurate with the effort expended on learning the second language. (p. 17)

Arguing that investment is not the same as instrumental motivation, Peirce (1995) further states that learners' investment in the target language is changing across time and space, and is intricately linked with their social identity, which is also multiple and dynamic.

Peirce (1995) employed the concept of investment to explain why the immigrant women in her study were unlikely to speak in certain circumstances although all were highly motivated to learn English. She found that the learners' motivation to speak were mediated by investments in being a member of the target culture, i.e., resisting to speak in order not to be identified as an immigrant in the target culture. While interesting and insightful, this construct still needs further investigation.

F. Summary:

In summary, there is a scarcity of research on social constraints on the development of an L2 phonology even though most researchers acknowledge the importance of the social context in language learning (cf. Ellis, 1994). Research about social identity and second language acquisition has focused mostly on language use, rather than acquisition. Findings indicate that learners actively determine their own target language variety, due to social networks and in-group identification and solidarity (i.e., Adamson & Regan,
Learners may also resist learning and using specific linguistic features due to conflicts with their L1 identity (Pennington, 1994; Siegal, 1994). Several aspects of social networks have also been found to affect L2 acquisition. Amount and type of contact with speakers of the target language has been correlated with L2 proficiency (Bayley, 1996; Heidelberger Forschungsprojekt 'Pidgin Deutsch' 1978; Meisel, Clahsen, & Pienemann, 1981; Monshi-Tousi, Hosseine-Fatemi, & Oller, 1980; Oyama, 1976; St. Martin, 1980; Spada, 1986). Social interactions, whether within the L1 or L2 community, have also been found to facilitate or limit the opportunities learners have to use the target language (Goldstein, 1995; Hansen, 1997, 1998a; Peirce, 1995). Positive attitudes towards the target culture may enhance learning (Gardner & Lambert, 1972), but this may differ across learners and learning situations (Gardner, 1980). Both instrumental and integrative motivation have been found to influence language learning (Gardner & Lambert, 1972; Lukmani, 1972) although motivation may need to be reconceptualized as a dynamic investment in the target culture that is mediated by the learners' social identities and opportunities for social interactions in the target culture (Peirce, 1995).
Task Variation:

Finally, it is important to note that task type has a strong influence on learners' production of consonant codas. Second language acquisition researchers (Beebe, 1980; Beebe & Zuengler, 1983; Dickerson & Dickerson, 1977; Gatbonton, 1978; Schmidt, 1987) have long noted that second language learners systematically vary their production of certain variants based on level of formality (i.e., speech style) and task (reading versus conversation). Tarone's (1983) Capability Continuum Paradox, based on Labov's (1969) Observer's Paradox, states that:

1. variation occurs for every speaker as the topic and situation change;
2. there is a continuum of styles, which are defined according to the amount of attention given to speech;
3. the most systematic patterns occur in the vernacular (colloquial style), while more variability occurs in other styles. (Major, 1994, pp. 656-657)

There is some support for the model. Beebe (1980), for example, found a greater accuracy in English for Thai speakers in word-initial /d/ in casual speech. However, in terms of style and correct L2 production, many researchers (i.e., Dickerson and Dickerson, 1977; Gatbonton, 1975; Major, 1987; Sato, 1985) found that learners had a greater accuracy in L2 production as style becomes more formal. Dickerson and Dickerson (1977) for example, found that their Japanese learners of English were twice as accurate in their
production of /ʃ/ when they were reading a word list than in conversation. Sato (1985) also found limited support for the continuum paradigm. In her study of a Vietnamese learner of English in terms of three tasks (free conversation, oral reading of a short text, and elicited imitation of words and short phrases), Sato found that for word-final consonants, task variation is inconsistent. However, her findings regarding task variation and consonant cluster production confirms previous research that production is more accurate in formal styles. Major (1994) found no significance for style variation; however, his style was a difference between a word-list reading and text-reading, which are perhaps too similar in nature to illustrate differences in style. Therefore, his hypothesis that as style becomes more formal, interference decreases and developmental processes stay unchanged, and thereafter increase and then decrease, was not supported. But as Schmidt (1974) demonstrates in his study of Egyptian Arabic learners of English, greater accuracy in formal style may also be due to positive interference of the formal L1 variant which happens to be the target in the L2. Schmidt found that the participants' production of interdental fricatives, sibilant, and stop variants was predictable according to style: interdental fricatives predominated in more formal styles such as reading word lists, while sibilants predominated in a slightly less formal style of a reading passage, and stops predominated in the casual style of informal conversation. Additionally, the interdental fricatives were also a highly developed
sociolinguistic marker, as the more highly educated participants had a greater frequency of use of those features than the working class participants, more than half of whom did not produce the interdental fricative at all. Schmidt's (1987) study of the stylistic and sociolinguistic use of the variants of the English interdental fricatives by native speakers of Arabic confirmed his earlier study that style determined variant — again, the interdental fricatives had a higher frequency of use in more formal styles, and that use of those features could be in part predicted by social class and educational level. Beebe (1980) also found that sociolinguistic patterns of /j/ usage was influenced by the L1 — the formal Thai variant of /j/ is transferred and used in English in formal settings.

In summary, style variation (as dependent on the type of task learners' were required to do, each of which supposedly supported a different style, from formal to vernacular, based on amount of attention to the task) has been seen to depend partly on the linguistic variable examined (i.e., consonants or consonant clusters). Systematic task variation was demonstrated for word-final consonant clusters but not for word-final consonants (i.e., due to L1 interference).

Summary:

The main focus of research on the acquisition of English syllable-final codas has been on linguistic constraints, i.e., L1 interference, L1
developmental effects, universal constraints, and markedness. Findings from each line of research provide clear evidence that learners modify syllable-final codas in favor of shorter and less marked codas. There is strong evidence that L1 interference has an effect on syllable structure production, especially in the early stages of acquisition. L1 interference can also positively affect acquisition, and may determine which sounds the learner substitutes for the English sound. L1 developmental effects interact with L1 interference in a sequential relationship, increasing in the later stages of acquisition after interference effects decrease. Linguistic universals such as a preference for a CV syllable structure do not seem to have a significant effect on English L2 word-final coda acquisition, although markedness in terms of coda length has been shown to have an affect both on acquisition order (less marked codas are acquired prior to more marked codas) and accuracy of production.

While a great deal is known about the linguistic constraints on the acquisition of an L2 phonology, there is a scarcity of research on how social constraints such as social identity and social networks affect the acquisition of English L2 phonology. Research on syntax, however, has shown that the learners' social networks and in-group solidarity and identification affects which language variety a learner targets, and which linguistic features a learner uses. Additionally, research has shown that both the L1 and L2 community can limit or facilitate a language learner's amount and type of language use. Both amount and type of target language use have been
positively correlated with L2 proficiency. The degree of a learner's acculturation in the second language culture, as well as types of attitudes and levels of motivation towards language learning have also been positively correlated with language achievement. However, some questions exists in regards to whether achievement leads to motivation, or vice versa. Finally, the concept of a learner's investment in the target language may help to capture the complex relationship between a language learner and the learning context more effectively than prior notions of motivation.
CHAPTER 3

METHODOLOGY

Design of the Study:

A. Site Selection:

This study was conducted in Tucson, Arizona, as this was the researcher's residence for the duration of the study. One of the participants for this study was selected from one of the researcher's English as a Second Language courses taught at Pima Community College in Tucson, Arizona. After this participant agreed to become involved in the study, she further suggested that her husband, also a native speaker of Vietnamese, participate in the study with her, and that the data would be collected at their home. I agreed to collect data at their home as this would potentially be a more relaxed data collection environment for the participants (in contrast to my own home). Additionally, it allowed to entry into at least one aspect of their participants' lives, their homelives.
B. Sampling:

The selection of participants was based on judgment sampling in which "the researcher identities in advance the types of speakers to be studied and then seeks out a quota of speakers who fit the specified categories" (Milroy, 1987, p. 26). The goals of the research commonly dictate the methods employed to select participants for the study, with these goals translated into criteria which individuals must meet in order to be included in the study. In selecting the participants for the study, I had the following judgment sampling criteria: First of all, participants had to be native speakers of a language such as Vietnamese which had restricted syllable coda structures. Secondly, the participants should have arrived in the United States within one year of the onset of the study (within six months would be optimal), so that the beginning stages of coda acquisition could be observed. A third criterion for participant selection is that the potential participants were planning to reside in the Tucson area for the following twelve months, which would help to decrease the possibility of participant attrition. A final criterion for participant selection was that participants must be willing to engage in weekly to bi-weekly data collection for the duration of the study, which was scheduled for approximately 10 months.

I initially approached students with Japanese, Chinese and Vietnamese language backgrounds in my ESL courses at Pima Community College about participating in my study. Of the five possible participants, four students, one
Vietnamese, one Japanese, and two Chinese, appeared to meet all the criteria. I set up initial meetings with each participant in order to fully explain the nature of the research project and to gather baseline data in order to determine the suitability of each participant. At this time, the Vietnamese student approached me about including her husband in the study. I agreed as this would allow me to study other factors on language learning, such as language maintenance within the family, as well as other social and linguistic factors, while allowing me to make comparisons between these two participants as they came from similar language and cultural backgrounds. While I continued to meet with the other participants for a short while, I quickly narrowed my focus to the Vietnamese couple as they presented a rich case for data analysis due to a number of social and linguistic factors, which are outlined in more detail in Chapter 4.

Data Collection:

The data collection for this study took place on a weekly basis for a duration of ten months from March 21, 1999 until December 19, 1999, except for one or two sessions due to vacation or illness. Data collection took place in the participants' home as they suggested. There were a total of twenty-eight interviews. Each data collection session lasted a minimum of one hour to one and a half hours, for an approximate total of 42 hours of data. Each interview was tape-recorded with the participants' prior consent and I used
high quality tapes and recording equipment. Each tape was transcribed word-for-word after each session. Two types of data were collected, phonological and social, and the process of collection is outlined in the following table. A discussion of each type of data collection, and analysis, follows.

<table>
<thead>
<tr>
<th>Month</th>
<th>Task</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>March</td>
<td>Received approval from Human Subjects Review Committee. Selected 4 participants and conducted baseline interviews with each participant; added a fifth participant and narrowed focus to Vietnamese family. Gathered social constraints data.</td>
<td>7</td>
</tr>
<tr>
<td>April</td>
<td>Gathered word list and reading passage data. Continued to collect social constraints data.</td>
<td>5</td>
</tr>
<tr>
<td>May, June &amp; July</td>
<td>Continued to collect social constraints data.</td>
<td>8</td>
</tr>
<tr>
<td>August</td>
<td>Gathered word list and reading passage data. Continued collecting social constraints data.</td>
<td>5</td>
</tr>
<tr>
<td>Sept., Oct., &amp; Nov.</td>
<td>Continued collecting social constraints data.</td>
<td>12</td>
</tr>
<tr>
<td>Dec.</td>
<td>Gathered word list and reading passage data. Continued to collect social constraints data.</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 2.1: Data Collection Time Line (March - December, 1999)
A. Phonological Data:

Two types of phonological data were gathered, interview data and reading data (comprised of a reading passage and a word list), at three intervals during the duration of the study. These intervals were spaced evenly three months apart. The interview data were selected from one of the interviews held closely to the time each of the word list and reading passage data collection times, and each complete data set (word list, reading passage, and interview data) necessarily took place across three successive interview times. As such, each data set was approximately 3 to 4 hours long, for a total of 10 hours of data for phonological analysis.

Word list and reading passage data (see Appendix E for the reading passage and word list) were collected for a number of reasons: 1) to investigate task variation, 2) to elicit certain coda forms the learners may not freely produce during the interview sessions, 3) and to augment the number of complex codas in the study. The same word list and reading passage were given at each of the three data collection intervals; however, as there was a period of 3 months between each data collection time, there was only a slight likelihood that the prior reading of the passage and word list had an effect on subsequent readings. Word list and reading passage data were collected individually from each participant, with one participant instructed to leave the room while the other read the word list and reading passage, in order to prevent the participants from influencing each others' pronunciation.
The word list was designed to maximize the type of codas the speakers produced. As such, there was at least one word representing each type of coda in English, with some codas represented by several words. The word list was compiled by employing the *English Pronouncing Dictionary*, 5th edition (Jones, 1997) and utilizing the American English pronunciation of words. For the most part, one or two-syllable words were used in order to increase the likelihood that the participants were familiar with all the words and that orthographic representation would not impede pronunciation. Each word was listed on a separate notecard, and each participant was instructed to read each word three times in a row in order to gather more data on each coda type.

The reading passage was selected from the textbook *Accurate English*. The reading passage had been devised as an 'accent inventory' for students studying American English pronunciation. The reading passage was selected on the basis that it has a wide range of codas, from single to two-member and three-member codas. However, the reading passage did not elicit all coda structures and therefore was used to supplement the word list as a type of reading data. After having a few minutes to read the passage silently to themselves, the participants read the reading passage out loud one time on a separate basis.
In terms of the interview data for phonological analysis, I selected a longer interview (1½ to 2 hours) that was collected within 1 to 2 weeks of the word list and reading passage data. The discussion during these data collection times focused on the participants' social interactions, language use, attitudes and motivation, etc. In other words, the interviews probed the participants' social constraints on English language use.

B. Social Constraints Data:

A grounded theory approach (Strauss & Corbin, 1990) was used in social data collection and analysis. A grounded theory is one which is:

inductively derived from the study of the phenomenon it represents. That is, it is discovered, developed, and provisionally verified through systematic data collection and analysis of data pertaining to that phenomenon. Therefore, data collection, analysis, and theory stand in reciprocal relationship with each other. One does not begin with a theory, then prove it. Rather, one begins with an area of study and what is relevant to that area is allowed to emerge. (Strauss & Corbin, 1990, p. 23)

In grounded theory, research questions start out broad and then progressively narrow in focus as concepts and their relationships emerge as relevant. In collecting data, the researcher typically employs interview or observations. As data collection and analysis is cyclical in nature in this
approach, researchers analyse the data after each data collection in order to discover salient themes or patterns which can guide further data collection (Strauss & Corbin, 1990).

A number of data gathering techniques were employed to gather information on social factors and to triangulate data collection in order to better understand how social factors affect language acquisition. My initial research questions were board, i.e., concerning social constraints on language learning, which became narrowed during the study as salient themes, such as identity, acculturation, motivation, and attitudes towards language use and interactants, began to emerge. A questionnaire (see Appendix B) was employed as an initial data gathering instrument. The questionnaire was based in part on Peirce (1993) and Day (1985). The administration of the questionnaire was in an one-on-one oral format, and therefore, the administration of the questionnaire was actually in the form of an interview, and tape-recorded. Information gathered from the questionnaire served as a basis for further probing during subsequent interviews with the participants. Special focus was on the participants' contact with native speakers of English and members of the L1 community, as well as affective reactions to English and Vietnamese language use and the Vietnamese community in Tucson. Additionally, I created a list of follow-up questions based on the participants' answers on the questions about their perceived levels and desired levels of acculturation, identity, motivation in learning English and becoming
American and Americanized, and attitudes towards Americans and other Vietnamese in Tucson, etc. (see Appendix D for examples of follow-up questions). While these questions were discussed throughout the duration of the study, they were a focus for more intensive probing during each of the three phonological data collection times in order to gather a more complete picture of the participants’ language use contexts during each of the three data collection sites. Additionally, I had the participants keep track of their English and Vietnamese language use by employing a ‘language log’ questionnaire which they filled out on a weekly basis (see Appendix F). I then utilized this log as a basis for probing the participants’ social interactions each week.

As the interviews took place in the participants’ home, I also had an opportunity to observe family interactions and home language use, and therefore field notes were taken during all the interviews. In addition, the participants came to my house for social gatherings on a number of occasions, at which point I was able to observe their interactions and their language use patterns in naturalistic communication with others. While these interactions were not tape recorded, I took field-notes immediately after each of these occurrences, and also discussed the participants’ interactions with other individuals who interacted with them. I also took notes during all the phone
conversations I had with the participants, and collected e-mail and other
written communication in order to compare their spoken and written
language.

Data Analysis:

A. Phonological Data:

The speech samples were transcribed using the International Phonetic
Alphabet (IPA). Following Sato (1985) and Hansen (1999b), data were coded
for the following: 1) native-like production, 2) absence of one or more
member; 3) epenthesis, and 4) feature change (i.e., place and manner changes).
For example, if the consonant under study was [t], native-like production
would be /t/, absence would be [Ø] as in [las] for *lots*. Epenthesis would mean
that the speaker has inserted a vowel, typically a schwa, after the consonant,
as in [la:zas] for *lots*. Feature change would mean that the speaker produced
the consonant in an articulatorily different manner or place. For example,
many learners of English produce the voiceless interdental fricative [θ] as a
voiceless alveolar fricative /s/, thereby changing the place of articulation from
interdental to alveolar. A fifth category emerged during the data analysis —
two types of modification on a single coda. For example, one consonant in a
two-member coda may be absent while a vowel is inserted after remaining
consonant as in the production of *dogs* as /dɔ.zə/, which actually occurred in
the data. In this case, the modifications were classified as two types, rather as
separate examples of both absence and epenthesis. I transcribed the phonological data twice with a few days interval between each transcription, in order to ensure that the tokens were transcribed accurately. For the reading passage, I averaged an intra-rater reliability of 93% while for the interview data, intra-rater reliability was 90%. When there were differences between the two transcriptions, I transcribed the word in question a third time.

Descriptive statistics were utilized to examine correct production and production modification based on length and type of codas, for each participant individually and combined, and within and across time. Acquisition was measured by a 80% criterion method, as employed by Cancino, Rosansky, and Schumann (1975), which has been used in L2 phonological research by Eckman (1991), Eckman and Iverson (1993) and Carlisle (1997, 1998). In this method, if the participants use a certain structure correctly 80% of the time, it is considered to be acquired. Correct usage was calculated as number of correct attempts over total number of attempts. The 80% criterion acquisition method was employed rather than measuring acquisition as onset of usage since language acquisition is not necessary a linear process, and one-time usage of a form may not indicate that the form has actually been acquired.

Native speakers also modify final consonants in production at times, i.e., devoicing final voiced stops before pauses and deleting medial consonants in three-member consonant clusters. Native-speaker
modifications were taken into account in the analysis; first, however, an accurate account of the participants' exact production of the codas was taken. Thereafter, the production of these segments were analyzed with respect to native speakers' production processes. Proximity to native-like speech processes were analyzed longitudinally to determine whether modifications that resemble native-like speech processes are stages in the acquisition of the specific segments.

To determine which linguistic environments affected syllable coda production, as well as statistical significance of production and modification based on time, a VARBRUL analysis was conducted on the single coda data. The other coda structures were not subjected to a VARBRUL analysis because of the complexity of coding the production patterns of the longer clusters as VARBRUL necessitates that only one consonant in a cluster is coded for production. This type of analysis would also oversimplify the patterns of variation found for this data as well as ignoring other relevant patterns.

VARBRUL requires that the data must exhibit variation; categorical usage of a segment is not appropriate for VARBRUL analysis. The VARBRUL version used was Goldvarb Version 2: A Variable Rule Application for the Macintosh (Rand & Sankoff, 1990). VARBRUL is a statistical data analysis program developed for linguistics in order to examine probabilities for the use of certain linguistic features, depending on both internal factors (i.e., linguistic factors such as linguistic environment) and
external factors (i.e., social factors such as gender and/or social class). It is being increasingly used in SLA by researchers such as Adamson and Regan (1991), Bayley (1996), Major and Faudree (1996), and Young (1988) in order to examine which linguistic and extralinguistic factors constrain production of certain linguistic features. In VARBRUL analysis, the researcher's question is "not which single factor is associated with variation, but what the relative weight of the different factors associated with variation is" (Young & Bayley, 1996, p. 254). VARBRUL calculates the input probability that a specific variant, i.e., absence rather than /t/, will be produced based on the proposed factors such as following phonological environment and social class. An input probability of 1.00 means that in this context, the variant will be categorically produced. In other words, there is no variation in this particular context. When the input probability is .50, there is an even likelihood of a variant being produced or not in this environment. An input probability between .01 and .49 indicates that a factor inhibits the production of the variant, while the reverse is true of input probabilities ranging from .51 to .99. VARBRUL also subjects the variables and the factors to three tests of statistical significance: Total chi-square, Chi-square/cell, and Log likelihood.

The dependent variable was classified into five categories: 1) accurate production; 2) absence (of one or more members); 3) epenthesis; 4) feature change; 5) two types of modification. Two types of independent factor groups
were investigated: internal (linguistic) factors (based on Bayley, 1996 and Guy, 1980) and external (extralinguistic factors). They are as follows:

**Internal (Linguistic) Factor Groups**:

1. Preceding phonological environment (Diphthong vowel as in *hide*, Monothong vowel as in *hid*);
2. Following phonological environment (Pause as in a noticeable break in connected speech, Vowel as in *tell us* where final [I] is followed by a vowel, Glide as in *tell you* where final [l] is followed by the glide [y], Liquid as in *tell Randy* where final [l] is followed by the liquid [j], and all other consonants such as stops, nasals, and fricatives as in *tell me* where final [l] is followed by the nasal [m]);
3. Grammatical environment (Monomorphemic words as in *tell*; Bimorphemic words as in the past tense ending of *said*);
4. Stress (Unstressed syllable as in *problem*, Stressed syllable as in *Vietnam*);
5. Voicing agreement with the following segment (Homovouching as in *tell us* where both final [l] and the initial vowel are voiced; Heterovouching as in *tell Paul* where [l] is voiced but [p] is voiceless).
August, and December. While the social context and constraints are dynamic and changing across time and space, I wanted to develop a clear representation of the social constraints operating on each learner at each data collection time in order to analyze the phonological data against the social situation of language acquisition and use. Additionally, within each data collection time, the linguistic constraints appearing to operate on the L2 phonology were analyzed with respect to the individual learner. In this analysis, the linguistic constraints were viewed as submerged within the social context as while the linguistic constraints each participant may be affected by may be similar across time, the rate through which the participants pass through the stages may be different due to social constraints such as amount of language use, interactants, etc. The analysis of linguistic and social constraints together is depicted in the following figure (Figure 2.1).

Figure 2.1: Interaction between social and linguistic constraints across time
External (Extralinguistic) Factor Groups:

1. Speech sample (Time 1, Time 2, Time 3)
2. Speaker (Lan or Chinh)
3. Data type (reading or interview data)

B. Social Constraints Data:

Data on the social constraints on language learning were analyzed within a grounded theory framework (Strauss & Corbin, 1990) as described above. Specifically, the social interactions and language use patterns of each participant were probed in more detail through interviews and observations over the duration of the study. Interviews and observations were transcribed and coded for emerging patterns and trends immediately after each interview and observation. These patterns and trends then formed the basis for questions for subsequent interviews. Additionally, I frequently checked the information I had received from the participants and my interpretations of the information with the participants in order to maximize the accuracy of the findings.

C. The Connection between Social and Linguistic Constraints:

My main objective in analyzing the social constraints data was to build a picture of the social context and the social constraints operating on each participant in that context, at each stage of data collection, that is, in March,
As Figure 2.1 shows, within each time, there are a number of linguistic constraints and social constraints that operate on an L2 phonology. Across time, the linguistic constraints overlap while differing to some extent, since the effect of linguistic processes is not stable, but rather dynamic. The same is true for social processes.

In addition to both linguistic and social constraints, there are a number of other factors which affected each data set. First of all, participants (Lan, the female participant and Chinh, the male participant) each have a different L2 phonology which differs across time. The actual production of the phonology also differs across data type (reading or interview). All the factors that affect the L2 phonology are depicted in Figure 2.2.
Figure 2.2: Factors operating on phonological data
Therefore, while linguistic and social constraints were initially analyzed separately for each speaker and each time, the final objective of the analyses was to consider how all the factors separately and combined affected the acquisition of an L2 phonology.

To ensure the trustworthiness of the data, Lincoln and Guba (1985) advocate the criteria of credibility, transferability, dependability, and confirmability. I met these criteria through: a) prolonged engagement; b) persistent introspection and observation; c) progressive subjectivity; d) peer debriefings; e) member-checks; and f) triangulation. As this research project was longitudinal, i.e., lasting for approximately 10 months, I was engaged in the research for a prolonged period of time. Not only did the research have a longer duration, but it was intensive, with weekly data collections within the duration of the study. Throughout the data collection, I was continually analyzing the interview and observation data in order to persistently observe and introspect on the topic under study. These introspections and analyses fed into the data collection by helping to form further interview questions. In terms of progressive subjectivity, I kept a research journal for the duration of the study in order to record my research activities and thoughts/insights about both the linguistic and social data. These notes also helped form subsequent questions for interviews. Frequent member-checks were made with the family. Data collection techniques were triangulated via the use of
questionnaires, and single and group interviews. Additionally, data analysis
techniques were triangulated as phonological data were analyzed via
descriptive statistics, VARBRUL, and chi-square tests.

Ethics:

In order to maintain a high ethical standard in research, I did the following things:

1. An application for approval was filed with the OSU Human Subjects Review Committee in November, 1998. Approval was granted in March, 1999, after which the research project commenced.

2. The participants of this research study have been protected in terms of anonymity. Every effort has been made to keep the identities of the participants private. Additionally, pseudonyms have been used in place of the participants' real names.

3. Before data collection proceeded, the participants were informed of the time commitment, and data collection techniques. They signed a form of consent (see Appendix C).
CHAPTER 4

FINDINGS

This chapter has the following components:

1. Description of the participants. I will first give a brief overview of the Vietnamese in America, followed by a discussion of the Tran family in terms of occupation, personality factors, and overall language ability, including brief language samples to represent each data collection time.

2. Linguistic data analysis. I will present the findings regarding single codas, and two-, three- and four-member codas for Lan and Chinh individually and combined across the three data sets: March, August, and December. The linguistic factors, i.e., L1 interference, markedness, developmental processes, which appear to constrain acquisition at each time will be discussed.

3. Social data analysis. Relevant social factors such as social identity, acculturation, language use opportunities, and interactants will be analyzed and synthesized across time (i.e., how they change for each participant across
the duration of the study) in order to build a complex picture of how social factors constraint the participants' language use and acquisition across the duration of the study.

4. Interaction among social and linguistic factors. In this section, a holistic analysis of factors affecting the acquisition of an L2 phonology will be given by analyzing the interaction among the various social and linguistic factors in order to build a cohesive understanding of how various factors individually and simultaneously affect the acquisition of an L2 phonology.
My data analysis procedure is displayed in the following chart:

![Diagram]

Figure 4.1: Data analysis framework
Description of Participants:

A. The Vietnamese in America:

The settlement of Vietnamese refugees in America can be divided roughly into three waves of immigration, stemming from political conflicts. There were relatively very few Vietnamese living in the United States before the fall of the South Vietnamese government. The first wave, in 1975, occurred after the fall of Saigon on April 30, 1975, and the collapse of the Thieu regime. Many of these immigrants either fought alongside the American forces against the North Vietnamese or served in the South Vietnamese government and therefore feared retaliation from the communist government of North Vietnam, which took over South Vietnam and reunified Vietnam. Approximately 150,000 Vietnamese fled to the United States, aided by the American Armed Forces, who first brought them to refugee centers in Guam, and then to the US mainland. Other countries such as Germany, China, and Japan also took Vietnamese refugees. Of these refugees, most were young, well-educated, and urban dwellers. Many of these refugees spoke English as they had worked with American personnel in the Armed Forces or in American companies in Vietnam. Many had also received some education in the United States. Interestingly, about 55% of these immigrants were Catholic. This first wave of refugees assimilated fairly easily into American society due to their English language skills and in part,
their Christianity, as this served as a point of friendship with some American citizens. Many of this wave of immigrants settled in California, Texas, and Florida (Rutledge, 1992).

The second wave of immigration took place between 1979 and 1983 because of the Vietnamese invasion of Cambodia, military actions against the Laotian hill people, and the anti-Catholic policy of the Vietnamese government. In this wave of immigration, approximately 455,000 Southeastern Asian refugees settled in the United States. This group of refugees was diverse in terms of language, ethnicity, religion, and nationality (Rutledge, 1992). The third wave of immigration took place between 1985 until present as family reunification programs began bringing Vietnamese people to the US.

The overall statistics of the Vietnamese population in the United States is approximately 480,000 immigrants and 107,000 US-born Vietnamese (76% of these are between the ages of 0 - 9). Approximately 54% of the Vietnamese in the US have settled in the West (i.e., California, Texas, Arizona, and Nevada). In terms of the economic situation of the Vietnamese population in the US, in 1979 35% of Vietnamese families were living below the poverty level. This had increased to 50% by 1985.

The state of Arizona has approximately 7,200 Southeast Asian Refugees as of 1989 (Rutledge, 1992). The city of Tucson, Arizona, has a population of
799,375 as of 1997, the latest statistics available. Although there are no official records available, members of the Vietnamese community in Tucson estimate that there are approximately 3,000 Vietnamese in Tucson.

B. The Tran Family:

The Tran family, husband Chinh, wife Lan, and daughter Anh, immigrated to the United States in March of 1998. As such, they were part of the third wave of immigrants, and came in order to be reunited with family members already residing in the US.

The story of how the Tran family ended up in the US begins during the Vietnam war. Both Lan’s and Chinh’s fathers served in the US military -- in fact, Lan’s father died serving the US in the war against North Vietnam. Since both Lan’s and Chinh’s families had been involved in the war and were allies of the Americans, they felt insecure and decided to leave Vietnam after the war ended.

Lan comes from a family of five brothers and sisters, of whom she is the oldest. The family began immigrating in 1975. First, one sister and one brother left Vietnam, and fled to Thailand, where they had to wait for sponsorship. Chinh comes from a family of twelve, of which he is also the oldest. In Chinh’s case, his entire family, with the exception of him, left for Thailand as well. At this time, Chinh’s father was in prison, where he stayed for seven years due to his role in the war as he was a high ranking official in
the South Vietnamese army. As the oldest son, Chinh could not leave Vietnam at this time because he had to take care of his father in prison. Because Lan had married Chinh (in 1979), she could not leave either. However, both of them knew that they would eventually leave Vietnam -- they just had to wait.

In Thailand, many nations were sponsoring the Vietnamese refugees, in effect randomly picking them out of the crowd. As there was a great uncle in Chinh's family who lived in Germany, Chinh's whole family elected to go to Germany. They have now been there for twenty years and are all German citizens. While facing some difficulties in Germany due to racism and language barriers, Chinh's family has been successful in adapting to this new culture. They have all become fluent in German, and many speak English as well. One of Chinh's brothers is a Catholic priest and one of his sisters is a Catholic nun. He has a brother who is a psychiatrist, and another who owns a clothing store.

Lan's brother and sister were sponsored by an American woman who lived in Tucson. Slowly, the brother and sister were able to sponsor the other relatives, and eventually all of Lan's family came to the US, including her mother who has been here for 13 years already. Lan's mom lived in Tucson but eventually moved to San Diego in order to live in a larger Vietnamese community.
Like Chinh’s family, Lan’s family has also integrated into their new life very successfully, attaining college degrees and middle-class incomes. All Lan’s brothers and sisters attended the University of Arizona. The first brother and sister who came to the US became engineers. In fact, both of them work for the government, one as a satellite engineer and the other as an electrical engineer, and live in a small town, though not together, outside Tucson. The sister has a family, having married another Vietnamese, while the brother is still single. Lan’s other brother also went to the University of Arizona, though without finishing his degree in Computer Science, and works as a technician for a weapons factory in Tucson. One of Lan’s sisters went into the Navy after getting a degree in Computer Science from the University of Arizona and finished with the rank of Captain. She worked as a computer trainer in the Navy, and lived in Virginia. A third sister works for IBM and has just built a nice house with a swimming pool in a very exclusive area of Tucson.

Back in Vietnam, Chinh’s father was finally released from jail after being imprisoned for eight years. Due to poor nutrition and health care in jail, he died one month after his release, which was apparently quite common for many released prisoners due to illnesses suffered and left untreated in jail. While their families were adapting to and becoming successful in their new countries, life was very hard for the Trans. Chinh was a high school chemistry teacher and Lan was an elementary school teacher.
In Vietnam, the education system was controlled by the communist
government and the government stipulated that it was the teachers'
responsibility that all their students should pass their courses. If all the
students did not pass, then the teacher would be criticized and lose benefits or
get a lower pay. This resulted in immense pressure for teachers, and also
gave rise to some teachers cheating the system or offering outside tutoring in
order to survive. Teachers had to work very hard and most had students
come to their house for extra tutoring in order to ensure that the students
would pass the exams. After school, Lan normally had 10-12 students at her
house that she took care of and tutored all for no extra pay. Both Chinh and
Lan were under extreme pressure and never felt they could relax. Lan said
she had to take sleeping pills every night in order to finally be able to sleep.
After being a teacher for 22 years in Vietnam, Chinh still only made $500 a
month, and got yearly benefits/bonus of only $5. As college for their
daughter could cost about $500 per semester, life was very hard.

Finally, after waiting for over 14 years, their families were finally able
to sponsor them and the Trans came to the US. There had never been a
choice of whether to go to Germany or to the United States since: 1) the
German immigration policy had changed and only young single Vietnamese
under the age of 18 could obtain permission to immigrate to Germany; and
2) both Trans wanted to live in the United States since they believed it would be easier to adapt to and become successful in this society based on their families' experiences.

The transition to live in the United States has not been easy for the Trans, especially for Lan. While their families initially financially supported the Trans and helped them to find a place to stay (they currently rent a house in a fairly nice area of Tucson), the Trans were surprised when they realized that while their family would help them, they were expected to live on their own, rather than with a member of the family, as was tradition in Vietnam. Lan's brothers and sisters had successfully adapted to the American lifestyle, and they expected the Trans to do the same. However, as the Trans had come at a later age (Lan was 41 when they came and 42 at the time of this study while Chinh was 46 when they came and 47 at the time of this study), they had had a more difficult time adjusting than the younger Trans who also had had the opportunity to attend college in the US.

Initially, Lan found work as an 'inserter' for the local newspaper -- she inserted the ad pages into the daily newspaper before it got delivered. She worked at this for several months before saving enough money to attend a nail technician school. She had decided to study to be a nail technician because it was a relatively easy job to find, and she could get a job after studying for only 3 months. Additionally, in Tucson, the majority of the nail shops were Vietnamese-owned, with almost all Vietnamese employees.
Therefore, language difficulties would not hinder her in seeking employment. While Lan had difficulty in understanding the classes at the nail technician school, she survived by watching videos and watching what the teacher was doing. At night, she would translate the reading word-by-word into Vietnamese until she understood the meaning. After three months, she finished attending the school and easily found a job in a Vietnamese nail salon. Chinh found a job in a factory where he began working as a order filler -- as an invoice for a product came in, he would go and find it and put it on a cart. This was tough work, but as his English became better, he was moved to order taker, where he now interacts with customers who come to the factory. He also worked a second job on the weekends as a dish washer in a Chinese restaurant; however, after six months he quit this job in order to have more time to study English to improve his life.

While they admit that life in the US is hard, they like life here because they feel success can be achieved by working hard. At the nail salon where she works, Lan determines how much she earns by how hard she works -- she is on a commission which means she gets 60% of what her client pays. Lan knows she can work more hours than she currently does, but it is not that important to her in the long run because she wants to take time off to learn more English so eventually she can go to the University of Arizona and get a degree in Computer Science. Her job as a nail technician enables her to
survive financially at the moment while she is learning English, but her end goal is to work in an office as a computer programmer. Right now, Lan makes about $500 a week in the off-season (May through December) and about $600 a week during the winter since it is peak season due to the increase in tourism. She is the main breadwinner in the family.

As for Chinh, he gets paid $1000 a month at the factory and his goal is also to take classes at Pima for two or more years until his English is 'so-so' as he said, and then go to the University of Arizona to get a BA in Chemistry. He is not sure what he wants to do after that, but his dream is to go to school full-time.

Their daughter Anh is currently attending the University of Arizona and double majoring in engineering and computer science. A lover of literature and languages in Vietnam (she studied both Chinese and English in Vietnam), Anh Tran adjusted extremely quickly to her new life in the US. She attended 12th grade in an American high school and quickly realized that in order to make friends and get good grades, she had to practice her English even if she made mistakes. Outgoing, confident, and assertive, Anh quickly made friends and by the time I met her parents and began this study, Anh was almost fluent in English, which precluded her from being a participant in the study. Anh, is very loquacious, and she speaks very well, overall, though she makes some grammar mistakes, but her pronunciation is pretty clear. When together with her mom and dad, she tends to dominate the
conversation because 1) she is very outgoing (this probably contributed to her learning English so quickly and making friends in the US) and 2) because they sometimes defer to her when they can not think of a way to express something, which then tends to reinforce her role as the 'talker' of the family. She may also correct their English which also reinforces her role as the superior English speaker and changes the balance in the family relationships. She is a very responsible person and since Lan and Chinh are hardly home, because they both work full time and take 2 to 3 ESL courses at Pima each, she is the homemaker and generally takes care of the house. In addition, she works as a math grader at Pima Community College, and at times, such as during breaks, works as a waitress at a Chinese restaurant. In her first year at the University of Arizona, she enrolled in 22 credits per semester.

Lan is extremely soft-spoken and initially appears very shy. She is serious most of the time and appears worried about life, her English, and her job. Lan tends to speak quietly, which can make her difficult to understand. She has an extensive vocabulary but she speaks less than Chinh. However, when she speaks she is quite fluent, though she does tend to make more grammar mistakes than Chinh. She speaks more carefully, and in words rather than full sentences. This is probably also a result of interacting primarily with Mexican speakers at work, as she probably communicates word-by-word in order to get her meaning across. In terms of listening
comprehension, Lan’s is actually better than Chinh’s at times, though it is unclear from her facial expression whether she understands. However, once in a while she will respond with a great sentence or word, or she sometimes translates my meaning for Chinh, which makes me believe she does understand me most of the time.

Chinh is very eager to talk, and he is easy-going, and always smiling and happy. He is very eager to learn English and all about American culture, and is more of a risk-taker in using English. Overall, Chinh appears a bit disfluent as he has many hesitations and false starts, repeating the initial word(s) over and over again several times before finishing his idea. However, his ideas are typically expressed in perfect grammatical form. Therefore, while he has a harder time expressing his ideas, he tends to do so with perfect grammar while Lan expresses herself quite easily, but not always in complete and grammatical sentences. In terms of listening comprehension, Chinh tends to jump in more quickly to answer, and he does not always interpret the question correctly, so he does not always respond correctly. So overall, his listening comprehension may not be as good as Lan’s.

When Lan and Chinh talk with me together, there is usually intensive scaffolding between the two of them. For example, they tend to finish each others’ sentences, add words in either Vietnamese or English, and correct
each others’ pronunciation, grammar, and interpretations of my questions. As such, they are very successful in communicating their meaning, and while I had some difficulty understanding them in the beginning, once I adjusted to their speech patterns and pronunciation, and as they began acquiring more English, I understood them most of the time.

C. Language Samples:

The following data samples are brief excerpts from interviews that took place in March, August, December, respectively. The purpose of these excerpts is to provide an overall illustration of the learners’ grammar and vocabulary in order to provide a fuller depiction of the learners’ language abilities at each data set time. The selections from each data set were also chosen to provide further insight into the different personalities of the learners, as well as their different viewpoints and approaches to life in the United States. This transcription is not phonetic, as the goal is to indicate their communication styles and linguistic competence in terms of grammar and vocabulary. In this transcription the following symbols are used: ... means a shorter pauses of a few seconds while // indicates a break in communication.
1. Data set one: March, 21, 1999:

Jette: What did you do yesterday?

Lan: I ... working... yes...and umm... I was no ... eh ... little customer...

Chinh: Few...few....

Lan: Few customer....they are ... um ... spring break... and because I ... I go home early and then and visit visit ehh... a friend ... together in class... yeah...

Jette: A classmate?

Lan: Yeah...yes... yes... this is the Kurnia.

Jette: And what did you do Chinh?

Chinh: I got clean up around house // grass.

Jette: You cut the grass?

Chinh: cut...[laughter].

Jette: It looks very nice. What else?

Chinh: Ehh... visit my ... I ehh... spend ... party... I eh... I stay no I spend... no I go to I went to party ... my eh ...my friend ...birthday party ... birthday .. eh..

birthday party .. eh.. he party ... eh... he party... party yeah ... party yeah...he son ... birthday his son....

Comment:

While this sample is relatively short in word count, the actual time length was several minutes. As the data indicates, both Lan and Chinh struggled with vocabulary, and there were many pauses and hesitancies while
they searched for the appropriate words (more so for Chinh than Lan) and grammatical structures. At this point, it appears that Lan had an easier time communicating than Chinh while Chinh was a perfectionist with grammar, correcting both Lan and himself, repeating his message over and over until he was satisfied with the grammatical accuracy. In fact, Lan’s grammar was actually better than Chinh’s at this point, though Chinh seemed to be monitoring his (and Lan’s) speech more carefully than Lan, judging by his consistently self- and other-corrections.

2. Data Set Two: August 22, 1999:

Jette: So tell me about your week Lan. What did you do?

Lan: With Kumia...in the phone with Kumia // Last Monday I off I off... I ... went to dental... Tuesday... I I work I work after seven PM I met with my friend Kumia and Yan Ma... we are we are we are ... going drink coffee in downtown ...yes... after... we are we are visit ... a Yan Ma house...listen listening her practice //

Jette: Music?

Lan: yeah...this last week... I ... I ... I am watch I watch the movie film TV in English In and Out ... story a man teacher is gay ... funny ... yeah funny yeah ...

Jette: And Chinh.. how was your week?

Chinh: Friday and Saturday I talked with my niece... niece... and //

Jette: What did you talk about?
Chinh: ehhh... watching TV ... and ... I watch TV and I asked they I asked they... I asked you... I asked them... tell me... tell us... tell me... any idea from from film yeah... yeah... and ... I watch... and Saturday... Saturday yesterday yesterday I watched... videotape titled Virus //

Jette: And what will you do today?

Lan: mmm... today I I off yeah...

Jette: So what will you do?

Lan: I ehh... I going to church to church and... and visit my friend ... yeah... because this summer little customer...

Chinh: a few a few customer no little

Lan: a few

Jette: What about you Chinh? What will you do?

Chinh: I and my wife visit will visit ... my ... our friend... yeah ... and maybe maybe ... maybe tonight .. maybe tonight ... we are we are ... we will we will eat Vietnamese restaurant together/ /

Comment:

At this time, both the Trans had a much easier time to communicate their ideas, and were able to speak without as many hesitancies and pauses. Overall, Chinh had greater grammatical accuracy than Lan, and he was also much more aware of his (and Lan's) grammatical errors, as indicated by his intensive self-monitoring and correction. Lan had more difficulties with
verb tense, and communicated more in single words (nouns, main verbs) than in complete sentences, unlike Chinh, who was able to communicate in longer phrases and clauses.

3. Data Set Three: December 19, 1999:

Jette: Is American life stressful compared to Vietnamese life?

Lan: before we are move here... to my brother... visit my family in... in Vietnam... he told me... American life is very stress very stress... and very hard very hard... and and ... we are ... prepare the new new life in here... when when when we are move here... I am worry everything... because I don’t hear don’ t speak and ... I don’t we are no job... but... he... my husband has a job... my daughter have a job and my daughter... begin confident in the ... her school she... I study nail technician... when I ... graduate nail technician I confident... I I feel better I have a job then I ... don’ t stress yeah.

Jette: What do you think Chinh?

Chinh: yeah I like I like... I like the live here

Jette: why?

Chinh: because ... in Vietnam... I always... I always confuse... confuse about communism politics politics yeah always about politics yeah... I I teach... I I taught... always controlled always was controlled... and... don’t have ... free time to ... relax ... and in here... when I have job... I take money ... small amount of money I feel... I feel... my life in here... enough.... don’t worry...

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and ... everybody around in Tucson... always friendly yeah...and always help me... I study... when I want to study what... I can... I can do that ... for future yeah... so I ... I am happy.

**Comment:**

While both Lan and Chinh have improved since August, it is still clear that Lan's grammatical accuracy was much lower than that of Chinh's. She still had a fairly restricted language base in terms of grammatical structures, and while she was beginning to use more function words, she still tended to communicate in words or short phrases, rather than in complete sentences. She still had difficulty with verbs, both tense and aspect. Chinh, on the other hand, spoke in fairly grammatical sentences, though his speech was still slow and full of hesitancies. His grammar was quite good and much more complex than Lan's.

**Linguistic Data Analysis:**

In the following section, the linguistic analysis of the data will be discussed. First, charts describing the overall production of syllable codas is presented. This is followed by detailed discussions of syllable codas based on length, beginning with single codas. Finally, a summary of findings across all coda types is given.
There were a total of 9355 codas in the data. These codas were analyzed across time for Chinh and Lan together as well as separately, across the two data types and the four production modes and absence. The combined results are outlined in Table 4.1, below.

| Time: | Time 1 | | Time 2 | | Time 3 |
|-------|--------|---|--------|---|--------|---|--------|---|--------|---|
|       | Reading | Inter. | Total | Reading | Inter. | Total | Reading | Inter. | Total |
| Data type |        |       |       |        |       |       |        |       |       |
| Accurate  | 602    | 567   | 1169  | 548    | 461   | 1009  | 631    | 739   | 1370  |
|          | 39%    | 38%   | 38%   | 35%    | 36%   | 35%   | 41%    | 39%   | 40%   |
| Absent   | 419    | 568   | 987   | 444    | 479   | 923   | 424    | 542   | 966   |
|          | 27%    | 38%   | 32%   | 28%    | 37%   | 32%   | 27%    | 29%   | 28%   |
| Epenthesis | 113  | 96    | 209   | 86     | 101   | 187   | 63     | 170   | 233   |
|          | 7%     | 6%    | 7%    | 6%     | 8%    | 7%    | 4%     | 9%    | 7%    |
| Feature  | 263    | 197   | 460   | 305    | 162   | 467   | 301    | 318   | 619   |
| Change   | 17%    | 13%   | 15%   | 30%    | 13%   | 16%   | 19%    | 17%   | 18%   |
| Two types | 164   | 82    | 246   | 176    | 88    | 264   | 137    | 109   | 246   |
|          | 11%**  | 5%    | 8%    | 11%    | 7%**  | 9%    | 9%     | 6%    | 7%    |
| Total    | 1561   | 1510  | 3071  | 1559   | 1291  | 2850  | 1556   | 1878  | 3434  |

Table 4.1: Distribution of total tokens by production type across time

As Table 4.1 indicates, overall production is fairly low across time, remaining below or around the 40 percentile for both types of data, though overall production accuracy is higher for the reading data. Additionally, production accuracy decreases at time 2, and then increases by time 3, ending...
in a slightly higher accuracy percentage than at time 1. Absence, as well as the three types of production modifications, remain relatively stable across time.

Lan had a total of 4816 tokens while Chinh had a total of 4539 tokens. The different distribution of these tokens across time for Lan and Chinh are outlined in Table 4.2 below.

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* = 99% ** = 101%

Table 4.2: Distribution of tokens by production type and speaker across time
While Chinh and Lan have similar patterns of development in terms of the decrease in accuracy at time 2, as well as overall low production accuracies across time, there are a number of differences. First of all, Chinh consistently has a higher accuracy percentage than Lan across time. Secondly, while Chinh has a higher accuracy percentage on the reading data over the interview data, the reverse is true for Lan. In other words, Chinh is better able to produce codas when reading while Lan has more difficulties with reading. Finally, Lan has a higher percentage of absence across time than Chinh. Thus, overall, it appears that across time, Chinh is better able to produce syllable codas than Lan, especially on the reading data. However, a more detailed analysis of the data is necessary in order to understand how and to what extent Chinh and Lan are developing English syllable codas. This detailed analysis will begin with a discussion of the single coda data, which accounts for the majority of the codas in the data.

A. Single Codas:

There were a total of 6007 single consonant codas in the data. These codas will discussed in several sections. First, descriptive statistics of overall production accuracy and modifications across time are given for the pooled data, followed by separate analysis of Lan's and Chinh's data, respectively. Second, the overall production accuracy of individual consonants across time
are examined. Finally, the findings from each type of analyses are discussed together in reference to linguistic constraints such as L1 interference, markedness, developmental effects, linguistic environment, as well as data type (reading vs. interview) in an effort to understand how these constraints operate on single codas.

1. Descriptive Statistics:

Table 4.3 provides an overall description of numbers and percentages for the combined tokens of Lan and Chinh across the three data sets.

<table>
<thead>
<tr>
<th>Time:</th>
<th>Time 1</th>
<th>Time 2</th>
<th>Time 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reading</td>
<td>Inter.</td>
<td>Total</td>
</tr>
<tr>
<td>Data type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accurate</td>
<td>452</td>
<td>549</td>
<td>1001</td>
</tr>
<tr>
<td></td>
<td>59%</td>
<td>48%</td>
<td>52%</td>
</tr>
<tr>
<td>Absent</td>
<td>110</td>
<td>299</td>
<td>409</td>
</tr>
<tr>
<td></td>
<td>14%</td>
<td>26%</td>
<td>21%</td>
</tr>
<tr>
<td>Epenthesis</td>
<td>43</td>
<td>91</td>
<td>134</td>
</tr>
<tr>
<td></td>
<td>6%</td>
<td>8%</td>
<td>7%</td>
</tr>
<tr>
<td>Feature</td>
<td>158</td>
<td>190</td>
<td>348</td>
</tr>
<tr>
<td></td>
<td>21%</td>
<td>16%</td>
<td>18%</td>
</tr>
<tr>
<td>Change</td>
<td>2</td>
<td>26</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>0%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>Two types</td>
<td>2</td>
<td>26</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>0%</td>
<td>2%</td>
<td>1%*</td>
</tr>
<tr>
<td>Total</td>
<td>765</td>
<td>1155</td>
<td>1920</td>
</tr>
</tbody>
</table>

* = 99% ** = 101% Total consonants = 6007

Table 4.3: Distribution of single coda tokens by production type across time
As Table 4.3 indicates, the participants did not appear to increase their accuracy of production of single codas across time. In fact, there were only marginal differences in the production of single consonants across time, with percentages for epenthesis, absence, feature change, and two types of production also remaining relatively stable across time. Interestingly, however, there is slight decrease in production accuracy at time 2. This corresponds with a decrease in the number of interview tokens at time two. While the interviews were of approximately the same time length at each data collection time, the number of tokens generated at each time is different. The decrease at time 2 indicates that the participants were actually producing less conversation or perhaps taking more time to compose their ideas. At time three, however, there is a large increase in the number of tokens -- indicating, perhaps, that the participants had an easier time expressing their ideas and needed less ‘thinking’ time. It is also interesting to note that across each data set time, the accuracy of the reading data (i.e., word list and reading passage) is greater than that of the interview data. Another point is of interest: For the most part, at each data set time the most common type of modification strategy is feature change for the reading data and absence for the interview data. Epenthesis and two types of modifications are relatively rare. The exception to this is data set number three, where feature change is the most common type of modification process for both the reading data and
the interview data; however, there is only one percentage point difference overall between absence and feature change for the interview data at data set three.

<table>
<thead>
<tr>
<th>LAN</th>
<th>Time 1</th>
<th>Time 2</th>
<th>Time 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task:</td>
<td>Reading</td>
<td>Inter.</td>
<td>Total</td>
</tr>
<tr>
<td>Accurate</td>
<td>217</td>
<td>282</td>
<td>499</td>
</tr>
<tr>
<td></td>
<td>57%</td>
<td>45%</td>
<td>49%</td>
</tr>
<tr>
<td>Absent</td>
<td>60</td>
<td>173</td>
<td>233</td>
</tr>
<tr>
<td></td>
<td>16%</td>
<td>28%</td>
<td>23%</td>
</tr>
<tr>
<td>Epenthesis</td>
<td>24</td>
<td>57</td>
<td>81</td>
</tr>
<tr>
<td></td>
<td>6%</td>
<td>9%</td>
<td>8%</td>
</tr>
<tr>
<td>Feature Change</td>
<td>79</td>
<td>104</td>
<td>183</td>
</tr>
<tr>
<td></td>
<td>21%</td>
<td>17%</td>
<td>18%</td>
</tr>
<tr>
<td>Two types</td>
<td>2</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>1%**</td>
<td>2%**</td>
<td>1%*</td>
</tr>
<tr>
<td>Total</td>
<td>382</td>
<td>628</td>
<td>1010</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHINH</th>
<th>Time 1</th>
<th>Time 2</th>
<th>Time 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task:</td>
<td>Reading</td>
<td>Inter.</td>
<td>Total</td>
</tr>
<tr>
<td>Accurate</td>
<td>235</td>
<td>267</td>
<td>502</td>
</tr>
<tr>
<td></td>
<td>61%</td>
<td>51%</td>
<td>55%</td>
</tr>
<tr>
<td>Absent</td>
<td>50</td>
<td>126</td>
<td>176</td>
</tr>
<tr>
<td></td>
<td>13%</td>
<td>24%</td>
<td>19%</td>
</tr>
<tr>
<td>Epenthesis</td>
<td>19</td>
<td>34</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>5%</td>
<td>6%</td>
<td>6%</td>
</tr>
<tr>
<td>Feature Change</td>
<td>79</td>
<td>86</td>
<td>165</td>
</tr>
<tr>
<td></td>
<td>21%</td>
<td>16%</td>
<td>18%</td>
</tr>
<tr>
<td>Two types</td>
<td>0</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>3%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>Total</td>
<td>383</td>
<td>527</td>
<td>910</td>
</tr>
</tbody>
</table>

* = 99% ** = 101%

Table 4.4: Distribution of single codas by production type and speaker across time

160
Table 4.4 show separate frequency counts for Lan’s and Chinh’s single codas. Lan had a total of 3122 single coda tokens while Chinh had 2885 tokens of this type. There are a number of similarities between the two participants. Overall, both Lan and Chinh remain around the 50 percentile for accurate production across all three data collection times. In other words, neither of them appears to make a significant change in their production accuracy across time. For both Lan and Chinh, there is a greater production accuracy on the reading data than on the interview data. Within each type of data, feature change is the most common modification process for the reading data while absence is the most common type for the interview data. The exception for this is time three when there is an equal percentage for absence and feature change for Lan, though there is a slightly greater number of tokens for feature change.

There are also a number of interesting differences between Lan and Chinh. First of all, Chinh consistently has a higher accuracy of production of single codas at each time than Lan. Secondly, Chinh and Lan have different patterns of accuracy across time: While Chinh appears to decrease in accuracy from time 1 to time 2, from 55% to 51%, and then remain stable from time 2 to time 3, Lan initially decreases in accuracy from time 1 to 2, falling from 49% to 44%, but eventually increases her accuracy rating to 50%, one percentage point higher than her initial accuracy level at time 1. For Lan, the difference in production from time 2 to 3 is based on the interview data, as
she increases her accuracy by 8 percentage points in this data from time 2 to 3. Chinh, however, has overall decreased his accuracy in terms of interview data, from 51% at time 1 to 48% at time 2 and 47% at time 3. Lan’s accuracy level for interview data follows a U-shaped curve wherein she initially decreases in accuracy across time, falling from 49% at time 1 to 40% at time 2, and increasing her accuracy by time 3 to a 48% accuracy percentage. For the reading data, both Lan’s and Chinh’s data follows a U-shaped curve, with decreases in accuracy by time 2 and increases by time 3. While for time 3, there is only a slight difference between Lan’s accuracy levels for the interview data and the reading data, i.e., at 48% and 52% respectively, there is a large difference in accuracy for Chinh across these two tasks. His accuracy level for the reading data is 11 percentage points higher than his level of accuracy for the interview data, with 58% and 47% accuracy respectively.

In order to examine the statistical significance of these differences as well as what linguistic and extralinguistic constraints affect coda production, a VARBRUL analysis was conducted. It is described below.

2. VARBRUL analysis:

The single coda data was also subjected to a VARBRUL analysis based on the factor groups outlined in Chapter 3. In the analysis of the single coda data, four separate VARBRUL analysis were run via a binomial analysis of each of the four of the production types, accurate production, absence,
epenthesis, and feature change. In this type of analysis, each production type was run against the collapsed tokens of the other three types. Due to insufficient tokens, a separate analysis was not run for two types of modification. The results of the VARBRUL analysis of single codas are outlined in Table 4.5. The chi-square statistics were run for each type of production for each speaker and combined for both speakers. The factor groups were statistically significant (statistical values are given in the discussion below) unless otherwise noted. The results of the analysis for each factor group will be discussed separately below.
<table>
<thead>
<tr>
<th>Production:</th>
<th>Accurate</th>
<th>Absence</th>
<th>Epenthesis</th>
<th>Feature Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lan</td>
<td>Chinh</td>
<td>Both</td>
<td>Lan</td>
</tr>
<tr>
<td>Factor group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Preceding phon. env.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vowel</td>
<td>.56</td>
<td>.55</td>
<td>.56</td>
<td>.43</td>
</tr>
<tr>
<td>Diphthong</td>
<td>.17</td>
<td>.19</td>
<td>.18</td>
<td>.87</td>
</tr>
<tr>
<td>Low back</td>
<td>.24</td>
<td>.27</td>
<td>.26</td>
<td>.77</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Following phon. env.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vowel</td>
<td>.50*</td>
<td>.49</td>
<td>.50</td>
<td>.56*</td>
</tr>
<tr>
<td>Pause</td>
<td>.48*</td>
<td>.44</td>
<td>.45</td>
<td>.45*</td>
</tr>
<tr>
<td>Glide</td>
<td>.44*</td>
<td>.54</td>
<td>.50</td>
<td>.55*</td>
</tr>
<tr>
<td>Consonant</td>
<td>.52*</td>
<td>.58</td>
<td>.56</td>
<td>.53*</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3. Grammat. Category</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monomorph.</td>
<td>.50</td>
<td>.50*</td>
<td>.50*</td>
<td>.49</td>
</tr>
<tr>
<td>Bimorph.</td>
<td>.43*</td>
<td>.44*</td>
<td>.44*</td>
<td>.76</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Stress</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unstressed</td>
<td>.47</td>
<td>.41</td>
<td>.44</td>
<td>.42</td>
</tr>
<tr>
<td>Stressed</td>
<td>.51</td>
<td>.53</td>
<td>.52</td>
<td>.53</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Voicing Agreement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heterov.</td>
<td>.56</td>
<td>.48*</td>
<td>.49*</td>
<td>.54</td>
</tr>
<tr>
<td>Homov.</td>
<td>.50</td>
<td>.52*</td>
<td>.51*</td>
<td>.59</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>.51</td>
<td>.53*</td>
<td>.52</td>
<td>.52</td>
</tr>
<tr>
<td>August</td>
<td>.46</td>
<td>.49*</td>
<td>.47</td>
<td>.56</td>
</tr>
<tr>
<td>December</td>
<td>.52</td>
<td>.49*</td>
<td>.51</td>
<td>.44</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Data type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>.57</td>
<td>.57</td>
<td>.57</td>
<td>.40</td>
</tr>
<tr>
<td>Interview</td>
<td>.46</td>
<td>.46</td>
<td>.46</td>
<td>.56</td>
</tr>
</tbody>
</table>

* not statistically significant

Table 4.5: VARBRUL comparison of factor probabilities for accurate production, absence, epenthesis, and feature change for Lan and Chinh individually and combined
a. Preceding phonological environment:

The first factor group examines the effect of the preceding segment on the production of the final consonant. The data were coded for three factors, vowels, diphthongs, and the low back vowel /α/. This latter vowel was separated out for analysis from all other vowels as I hypothesized that it would promote absence or modification based on my familiarity with the participants' speech patterns.

The results indicate that the overall patterns for Lan and Chinh are similar for each type of production and for absence, with the exception of epenthesis, as a preceding diphthong had a strongly inhibiting effect on epenthesis for Chinh ($p = .36$) while it had a slightly favoring effect ($p = .53$) on epenthesis for Lan. A preceding vowel slightly favored absence ($p = .56$) while a preceding diphthong ($p = .18$) and /α/ ($p = .26$) strongly inhibited accurate production. These probability values were significant at ($p < .01$). Conversely, a preceding vowel inhibited absence ($p = .43$) while both a preceding diphthong ($p = .88$) and low back vowel ($p = .76$) strongly promoted absence ($p < .01$). For both Lan ($p = .54$) and Chinh ($p = .58$), [ə] had a slightly favoring effect on epenthesis, and a preceding vowel appeared to have little effect on epenthesis for either Lan ($p = .49$) or Chinh ($p = .51$). A preceding diphthong strongly disfavored epenthesis for Chinh ($p = .36$) while for Lan it had a slightly favoring effect ($p = .53$), which was not statistically significant. While these probabilities were significant for
Chinh ($p < .05$), they were not statistically significant for Lan. For both Lan and Chinh, a preceding diphthong had a strong inhibiting effect on feature change ($p_i = .38$) while a preceding vowel had little effect ($p_i = .51$) ($p < .001$). A low back vowel had little effect on feature change for Lan ($p_i = .51$) while it had a slightly inhibiting effect on feature change for Chinh ($p_i = .44$).

In summary, a preceding diphthong and low back vowel promoted absence while a preceding vowel promoted accurate production. The preceding phonological environment did not exert a significant effect on epenthesis, and only a slight effect on feature change in the sense that a preceding diphthong disfavored epenthesis for Chinh.

b. Following phonological environment:

Four factors were investigated in this analysis: vowel, pause, glide, and other consonants. There were slight differences between Lan and Chinh in the rankings and probability values of the different following phonological environments. In terms of accurate production, a following consonant had a slightly favoring effect on production for both participants, with a combined value of ($p_i = .56$). A following glide also promoted accurate production for Chinh ($p_i = .54$) while for Lan it inhibited accurate production ($p_i = .44$). For both Lan and Chinh, however, a following vowel had little effect on accurate production ($p_i = .50$ combined) and a following pause slightly inhibited accurate production ($p_i = .45$ overall with a statistical significance of $p < .01$).
The rankings for the effect of the following phonological environment on absence were overall similar, though the strengths of each factor differed between Lan and Chinh. Overall, a following vowel or consonant promoted absence ($p_i = .60$ and $p_i = .58$, respectively), while a following pause or glide inhibited absence ($p_i = .42$ and $p_i = .45$, respectively). These probabilities were significant at $p < .01$.

In terms of epenthesis, for both Lan and Chinh, a following vowel ($p_i = .38$) or consonant ($p_i = .33$) inhibited epenthesis, while a following pause promoted epenthesis ($p_i = .67$) (combined factor probabilities were significant at $p < .001$). However, while a glide inhibited epenthesis for Lan ($p_i = .35$), it promoted epenthesis for Chinh ($p_i = .59$).

The effect of the following phonological environment on feature change were similar for Lan and Chinh: for both, a following glide promoted feature change ($p_i = .59$) as did a following pause ($p_i = .55$). While a following vowel had little effect on feature change ($p_i = .49$), a following consonant inhibited feature change ($p_i = .43$). These probabilities were significant at ($p < .01$).

In summary, pauses promoted epenthesis, following vowels and consonants promoted absence while a following glide promoted feature change.
c. Grammatical category:

The tokens were categorized into either a monomorphemic syllable or a bimorphemic syllable. However, there were only a few bimorphemic tokens in the data, i.e., a total of 128 tokens (2% of the data), which may skew the data to some extent. Grammatical category only proved to be statistically significant for absence and feature change. The effect of grammatical category on accurate production was not statistically significant although overall it appeared that bimorphemes slightly inhibited accurate production \((p_i = .43)\). While monomorphemes also did not appear to significantly affect absence \((p_i = .49)\), bimorphemes strongly promoted absence \((p_i = .75)\) and this effect was significant at \((p < .01)\). While monomorphemes exerted no effect on either epenthesis \((p_i = .50)\) or feature change \((p_i = .51)\), bimorphemes had a strongly inhibiting effect on both feature change \((p_i = .29)\) and epenthesis \((p_i = .35)\), though the latter was not statistically significant as there was little effect of bimorphemes on epenthesis for Chinh \((p_i = .48)\) while there was a strong disfavoring effect for Lan \((p_i = .16)\), and the combined values were neutralized to some extent.

d. Stress:

The syllable with the single coda token was categorized as either stressed or unstressed. Any single syllable word was categorized as stressed as syllable/word level stress was considered rather than sentence stress. Stressed
syllables had only a slightly favoring effect on accurate production \( (p, = .52) \) while unstressed syllables disfavored accurate production \( (p, = .44 \) with statistical significance at \( p < .01 \)). Lan and Chinh had opposite factor weights for stress in terms of absence, which were neutralized in the pooled data. For Lan, a stressed syllable promoted absence \( (p, = .53) \) while an unstressed syllable inhibited absence \( (p, = .42) \). These findings were significant at \( (p < .001) \). For Chinh, the opposite results were found: a stressed syllable slightly inhibited absence \( (p, = .48) \) while an unstressed syllable promoted absence \( (p, = .57) \). These findings were significant at \( (p < .01) \).

The rank orders were similar for Lan and Chinh for the effect of stress on epenthesis and feature change: a stressed syllable promoted epenthesis \( (p, = .61) \) while an unstressed syllable strongly inhibited epenthesis \( (p, = .17) \) \( (p < .001) \). A stressed syllable slightly disfavored feature change \( (p, = .44) \) while an unstressed syllable favored feature change \( (p, = .68) \) \( (p < .01) \).

Overall, stressed syllables appeared to promote epenthesis while having little effect on either accurate production or absence and disfavoring feature change. Unstressed syllables strongly inhibited epenthesis and slightly inhibited accurate production.

e. Voicing agreement with the following segment:

This factor group did not significantly affect any of the four production modes.
f. Time:

There were some differences between Lan and Chinh in terms accurate production and epenthesis. Lan's ranking constraints on accurate production indicate that while the second data set (August) slightly inhibited accurate production \( (p, = .46) \), both the March and December data sets slightly promoted accurate production, at \( (p, = .51) \) and \( (p, = .52) \), respectively \( (p < .05) \). For Chinh, however, accurate production was slightly favored at time 1 \( (p, = .53) \) while there were no real effects of time on accurate production at either August or December. These findings were also not statistically significant for Chinh.

In terms of absence, however, the findings for Chinh and Lan are similar; for both, absence is favored in August \( (p, = .56) \) and slightly favored in March \( (p, = .52) \), while being disfavored in December \( (p, = .44) \) \( (p < .01) \). There were no statistically significant effects of time on epenthesis for Lan; however, for Chinh, both March and August inhibited epenthesis, \( (p, = .46) \) and \( (p, = .47) \), respectively, while December favored epenthesis \( (p, = .56) \) \( (p < .001) \). For both Lan and Chinh, March and August slightly inhibited feature change with \( (p, = .47) \) and \( (p, = .48) \), respectively, while December slightly promoted feature change \( (p, = .54) \) \( (p < .01) \). Overall, it appears that accuracy was promoted in March while absence was promoted in August, and epenthesis in December.
g. Data type:

The results for the effect of data type were similar for Lan and Chinh across all production types and absence. The reading data promoted accurate production \( (p_i = .57) \) while the interview data inhibited accuracy production \( (p_i = .46) \) \((p < .01)\). The reading data also promoted feature change \( (p_i = .56) \) while the interview data inhibited feature change \( (p_i = .47) \) \((p < .01)\).

Conversely, the reading data inhibited absence \( (p_i = .43) \), but the interview data promoted absence \( (p_i = .55) \) \((p < .01)\). A similar pattern was found for epenthesis, with the reading data inhibiting epenthesis \( (p_i = .33) \) while the interview data promoted epenthesis \( (p_i = .61) \) \((p < .001)\).

h. Summary of VARBRUL findings:

The most salient findings from the VARBRUL analysis of the single coda data were that a preceding diphthong and low back vowel strongly promoted absence while other preceding vowels appeared to have little effect. Additionally, a following pause strongly promotes epenthesis. A bimorphemic coda was also more likely to be absent than a monomorphemic coda. Epenthesis was also more common for stressed syllables. In terms of time, accuracy was promoted in March while absence was promoted in August and epenthesis in December. The reading data promoted accurate production and feature change while the interview data promoted absence and epenthesis.
3. An Analysis of Individual Consonants:

In order to examine accuracy orders and to make comparisons between participants, each type of single coda was examined in terms of accuracy of production by participant across time. These results are outlined in Table 4.6.

<table>
<thead>
<tr>
<th>Coda Type</th>
<th>Lan</th>
<th>Chinh</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T1</strong></td>
<td><strong>T2</strong></td>
<td><strong>T3</strong></td>
<td><strong>T1</strong></td>
</tr>
<tr>
<td><strong>Stops</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/t/ #</td>
<td>77</td>
<td>85</td>
<td>99</td>
</tr>
<tr>
<td>%</td>
<td>67%</td>
<td>59%</td>
<td>68%</td>
</tr>
<tr>
<td>Total</td>
<td>115</td>
<td>145</td>
<td>145</td>
</tr>
<tr>
<td>/d/ #</td>
<td>16</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>%</td>
<td>41%</td>
<td>17%</td>
<td>16%</td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>21</td>
<td>38</td>
</tr>
<tr>
<td>/p/ #</td>
<td>13</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>%</td>
<td>65%</td>
<td>78%</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>/b/ #</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>%</td>
<td>20%</td>
<td>0%</td>
<td>40%</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>/k/ #</td>
<td>48</td>
<td>34</td>
<td>30</td>
</tr>
<tr>
<td>%</td>
<td>55%</td>
<td>52%</td>
<td>48%</td>
</tr>
<tr>
<td>Total</td>
<td>88</td>
<td>65</td>
<td>62</td>
</tr>
<tr>
<td>/g/ #</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>%</td>
<td>13%</td>
<td>0%</td>
<td>24%</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>9</td>
<td>17</td>
</tr>
<tr>
<td><strong>Fricatives</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/s/ #</td>
<td>25</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>%</td>
<td>57%</td>
<td>57%</td>
<td>50%</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>44</td>
<td>70</td>
</tr>
<tr>
<td>/z/ #</td>
<td>10</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>%</td>
<td>14%</td>
<td>8%</td>
<td>15%</td>
</tr>
<tr>
<td>Total</td>
<td>74</td>
<td>59%</td>
<td>74%</td>
</tr>
<tr>
<td>/f/ #</td>
<td>5</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>%</td>
<td>71%</td>
<td>78%</td>
<td>62%</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>8</td>
<td>26</td>
</tr>
<tr>
<td>/v/ #</td>
<td>6</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>%</td>
<td>19%</td>
<td>14%</td>
<td>22%</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td>56</td>
<td>41</td>
</tr>
</tbody>
</table>

Table 4.6: Overall accuracy percentages in production of single codas by participants across time
Table 4.6 (continued)

<table>
<thead>
<tr>
<th>Coda Type</th>
<th>Lan</th>
<th>Chinh</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T1</td>
<td>T2</td>
<td>T3</td>
</tr>
<tr>
<td>/ʃ/ #</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>%</td>
<td>7%</td>
<td>18%</td>
<td>57%</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>17</td>
<td>7</td>
</tr>
<tr>
<td>/ʒ/ #</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>%</td>
<td>0%</td>
<td>33%</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>/θ/ #</td>
<td>4</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>%</td>
<td>22%</td>
<td>0%</td>
<td>33%</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>/ð/ #</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Affricates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/ɡ/ #</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>%</td>
<td>20%</td>
<td>10%</td>
<td>22%</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>/ɹ/ #</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Nasals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/n/ #</td>
<td>120</td>
<td>114</td>
<td>185</td>
</tr>
<tr>
<td>%</td>
<td>74%</td>
<td>73%</td>
<td>92%</td>
</tr>
<tr>
<td>Total</td>
<td>163</td>
<td>156</td>
<td>201</td>
</tr>
<tr>
<td>/m/ #</td>
<td>54</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>%</td>
<td>76%</td>
<td>73%</td>
<td>69%</td>
</tr>
<tr>
<td>Total</td>
<td>71</td>
<td>51</td>
<td>54</td>
</tr>
<tr>
<td>/ŋ/ #</td>
<td>35</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td>%</td>
<td>64%</td>
<td>63%</td>
<td>68%</td>
</tr>
<tr>
<td>Total</td>
<td>55</td>
<td>40</td>
<td>38</td>
</tr>
<tr>
<td>Liquids</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/l/ #</td>
<td>27</td>
<td>22</td>
<td>27</td>
</tr>
<tr>
<td>%</td>
<td>35%</td>
<td>37%</td>
<td>36%</td>
</tr>
<tr>
<td>Total</td>
<td>77</td>
<td>60</td>
<td>75</td>
</tr>
<tr>
<td>/ɾ/ #</td>
<td>54</td>
<td>39</td>
<td>54</td>
</tr>
<tr>
<td>%</td>
<td>35%</td>
<td>25%</td>
<td>23%</td>
</tr>
<tr>
<td>Total</td>
<td>154</td>
<td>154</td>
<td>238</td>
</tr>
</tbody>
</table>

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There are a number of interesting patterns that emerged from this analysis. However, before discussing these, it is important to note that these results are limited in the respect that some phonemes are represented by very few tokens. This is due to the fact that these phonemes, i.e., [ð], [ʒ], are relatively rare in final position in English, and therefore, were rarely produced by the participants. Thus, while the participants' number of production of these phonemes may be proportionally similar to the number of these tokens that a native speaker might produce in a similar time frame, it unfortunately yielded few tokens for analysis. However, these tokens, when combined for the participants, do provide insight into possible patterns of language development.

It appears that voiceless stops and nasals are produced with the greatest level of accuracy overall. In fact, the voiceless stop [p] is the only consonant that achieves 100% accuracy from both Lan and Chinh at time 3. At time 3, only a few consonants reached the 80% criterion for acquisition set by Cancino, Rosansky and Schumann (1978). For Chinh, three consonants reached this criterion, /p/ at 100%, /m/ at 80% (though the accuracy of /m/ appears to be decreasing across time), and /n/ at 89%. For Lan, only /p/, like Chinh also at 100% and /n/ at 92% reached the criterion reference point of acquisition.

The U-shaped curve that was established for Lan and partly for Chinh (his reading data only) clearly presents the majority of the consonants for
both Chinh and Lan. For Lan, the following consonants appear to undergo a
U-shaped curve of production, /t, b, g, z, v, n, ʒ, θ, ɣ/, which is a total 9 of the
consonants. For Chinh, this pattern is established for the following
consonants: /d, b, k, s, z, f, n, ɣ/, or 8 of the consonants. For both Lan and
Chinh, /p/ has a straight increase in accuracy across time, while this is also
ture for \(/\) for Lan and \(\tau\) for Chinh. The accuracy of some consonants also
begin to decrease across time. For Lan, the accuracy of /d, k, s, f, m, ʒ, l/ decrease
across time, and with the exception of θ/, these consonants all end with a
lower accuracy percentage at time 3 than they had at time 1. For Chinh, /v, ŋ,
ʒ, ʒ, m, 0/ decrease in accuracy across time, and all end with lower accuracy
ratings at time 3 than at time 1. Finally, some consonants end up with a zero
accuracy percentage at time 3. Both Chinh and Lan have zero accuracy in
production of /θ, θ/ across time; Lan also has a zero percentage in accuracy for
/ɣ/ at time 3 and Chinh has zero accuracy in production for /ŋ, θ/ across time.

Several other patterns emerged as well. For example, there also
appears to be a definite sequence of acquisition of single codas based on
voicing and type of consonant. In every case that there are two phonemes
which only differ by voicing, i.e., θ and /θ/, for example, where θ is voiceless
and /θ/ is voiced, the voiceless consonant has a higher percentage of accuracy
than the corresponding voiced consonant. It also appears that place of
articulation had an effect on accuracy: Overall, front consonants were
produced more accurately than back consonants.
Further insight into the development of single codas across time can be had by examining the type of modification process or absence that each type of coda most frequently underwent. These are outlined in Table 4.7 below.
| Table 4.7: Production type for each single consonant coda |
| Accurate # | 154 | 14 | 23 | 1 | 65 | 0 | 40 | 17 | 9 | 37 | 4 | 4 | 0 | 0 | 1 | 0 | 47 | 84 | 80 | 214 | 58 |
| % | 63% | 18% | 17% | 8% | 55% | 0% | 60% | 16% | 10% | 34% | 8% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Absent # | 67 | 26 | 1 | 1 | 42 | 19 | 56 | 5 | 46 | 1 | 0 | 2 | 0 | 3 | 2 | 20 | 88 | 4 | 65 | 0 |
| % | 27% | 34% | 3% | 8% | 34% | 26% | 46% | 33% | 38% | 9% | 10% | 19% | 18% | 17% | 32% | 22% | 1% | 1% | 1% | 1% |
| Elevation # | 16 | 3 | 3 | 1 | 10 | 3 | 4 | 11 | 0 | 36 | 0 | 2 | 0 | 0 | 1 | 0 | 7 | 3 | 5 | 18 | 1 |
| % | 7% | 4% | 10% | 42% | 8% | 19% | 6% | 9% | 30% | 33% | 6% | 6% | 6% | 1% | 5% | 6% | 1% | 1% | 1% | 1% |
| Feature C. # | 2 | 34 | 1 | 5 | 5 | 6 | 9 | 24 | 1 | 1 | 22 | 0 | 13 | 4 | 9 | 9 | 44 | 102 | 13 | 1 | 26 |
| % | 2% | 44% | 3% | 42% | 42% | 38% | 13% | 20% | 7% | 1% | 67% | 65% | 65% | 56% | 82% | 37% | 37% | 13% | 0% | 31% |
| 2 Types # | 5 | 2 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 6 | 0 | 5 | 2 | 2 | 2 | 0 | 0 | 0 | 0 |
| % | 1% | 2% | 0% | 0% | 0% | 0% | 0% | 11% | 0% | 0% | 18% | 19% | 25% | 33% | 13% | 1% | 1% | 1% | 1% | 1% |
| TOTAL | 224 | 77 | 30 | 12 | 132 | 16 | 72 | 12 | 12 | 33 | 6 | 20 | 6 | 16 | 11 | 120 | 277 | 102 | 20 | 85 |
| Accurate # | 211 | 20 | 30 | 4 | 81 | 4 | 54 | 30 | 34 | 22 | 4 | 1 | 3 | 0 | 6 | 0 | 54 | 89 | 103 | 330 | 61 |
| % | 72% | 23% | 100% | 31% | 57% | 15% | 52% | 18% | 57% | 26% | 19% | 17% | 10% | 38% | 35% | 22% | 76% | 91% | 89% | 68% |
| Absent # | 40 | 16 | 0 | 1 | 35 | 4 | 32 | 73 | 8 | 20 | 0 | 1 | 3 | 1 | 3 | 16 | 127 | 16 | 1 | 16 |
| % | 14% | 19% | 0% | 8% | 24% | 15% | 32% | 43% | 13% | 23% | 17% | 17% | 17% | 6% | 13% | 10% | 31% | 5% | 4% | 1% |
| Elevation # | 23 | 0 | 0 | 0 | 20 | 1 | 4 | 44 | 14 | 33 | 0 | 1 | 0 | 1 | 0 | 18 | 1 | 11 | 17 | 0 |
| % | 8% | 0% | 0% | 0% | 4% | 1% | 4% | 26% | 23% | 38% | 17% | 17% | 17% | 6% | 13% | 10% | 31% | 5% | 4% | 1% |
| Feature C. # | 10 | 43 | 0 | 7 | 5 | 18 | 11 | 13 | 4 | 9 | 17 | 1 | 21 | 4 | 8 | 20 | 67 | 192 | 14 | 1 | 28 |
| % | 3% | 50% | 0% | 54% | 3% | 67% | 11% | 8% | 7% | 10% | 81% | 17% | 66% | 67% | 50% | 87% | 43% | 47% | 10% | 0% | 31% |
| 2 Types # | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % | 8% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| TOTAL | 252 | 86 | 30 | 13 | 143 | 27 | 101 | 120 | 61 | 86 | 21 | 31 | 6 | 16 | 23 | 156 | 411 | 136 | 364 | 90 |
| Total | 758 | 251 | 180 | 49 | 442 | 58 | 242 | 417 | 91 | 298 | 93 | 18 | 77 | 18 | 42 | 49 | 407 | 969 | 366 | 946 | 276 |
It appears that the most common modification process for voiceless stops is absence. The exception for this is the favored process of epenthesis for /p/. For the voiceless stops, for the most part, absence decreases across time as production accuracy increases. For voiced stops, the favored modification process is feature change, in this case, devoicing. For the voiced stops, this type of production appears to increase across time, overall, while absence, overall, decreases by time 3.

The front fricatives /s, z, f, v/ had a greater degree of absence initially, which became epenthesis later, than of any other production type with the exception of accurate production. For /z, f, v/ the same pattern occurred: As absence decreased across time, epenthesis increased. For /s/, however, as absence decreased, feature change increased, in this case voicing took place as /s/ was produced as [z].

In the case of the back fricatives and the affricates, feature change was the most common production modification process. For example, /ʃ/ was produced as [t] for 79% of the modifications and as [θ] 21% of the modifications. This latter modification of devoicing occurred at time 3 by Lan. Additionally, across time, this phoneme begins decrease in terms of feature change and undergoes epenthesis. This suggests that this consonant follows the following pattern of development: initial equivalence classification to [t], followed by devoicing concurrently with /ʃ/ emerging in the learners' linguistic repertoire. Again, this only happened to Lan; Chinh
has not reached this stage yet. Finally, as the voicing characteristic begins to be acquired, epenthesis becomes more common. The last stage, which Lan did not reach by time 3, may be accurate production.

As for the voiceless interdental fricative /θ/, this phoneme also underwent equivalence classification to [t]. This phoneme underwent two types of modification as well, which was the feature change to [t] followed by epenthesis. This pattern was similar to that of both /ʃ/ and /ʒ/. The voiceless fricative /ʃ/ was commonly modified to [s] (37% of the modifications) or [k]. The latter modification occurred for 58% of all the modifications but this was limited only to the word 'English' which was used repeated by both Lan and Chinh in all three interviews. However, by time 3, Lan was accurately producing the word 'English' while Chinh was still modifying the final consonant to [k]. This phoneme was also modified to [t] and [ts], but by Lan only. For /ʃ/, feature change appeared to increase across time, alongside accurate production, which also increased. Absence and two types of modifications decreased across time. For the voiced fricative /ʒ/, both feature change (i.e., devoicing) and two types of modification (change to [ŋ] and epenthesis for Lan, who had begun acquiring /ŋ/ and change to [z] and epenthesis for Chinh, who has not begun acquiring /ŋ/ at this time) appear to be stable across time for Chinh, while Lan appears to begin acquiring the phoneme as there is an instance of epenthesis. However, this data set is very small so it is difficult to establish clear patterns.
In terms of the affricates, both undergo feature change. For the voiceless affricate /ʃ/, absence decreases across as feature change first increases and then decreases. Simultaneously, epenthesis begins to emerge at time 2 and stays consistent across time. In other words, as this phoneme begins to emerge in the participants' language, it first has a higher percentage of absence, which decreases as it emerges but undergoing a feature change. Finally, as it has begun to emerge, absence decreases, and it begins to be produced accurately, but with epenthesis. Eventually, feature change decreases, and accuracy increases. Interesting, the type of feature change that /ʃ/ undergoes is word-specific, though it is similar across participants.

Orthographic cues appear to have an effect: for each instance when this phoneme was realized as [t] it was because the spelling of the sound was 'tch' as in the words match and watch. In all other cases, it was modified to [k], possibly due to perceived auditory similarities to this consonant.

For the voiced affricate /ʒ/, which had a 0% accuracy across all three data sets for both Lan and Chinh, there was an inverse proportional relationship between absence and feature change -- as absence decreased across time, feature change increased. The feature change was mostly devoicing, which increased across time as the voiceless affricate began to be acquired. Prior to this, however, the voiced affricate, like the voiceless affricate, was produced as [k] or [t], and also [d], and again, these changes were word-specific and consistent for both the participants. When the spelling of
the phoneme was ‘g’, it was typically pronounced either as the voiceless affricate or as [k]. However, when it was spelled ‘dge’, the pronunciation was often [k] or [d].

As for the nasals, /ny appears to undergo a high level of absence at time 2, but overall this decreases across time as accuracy increases. The phoneme [m] decreases in accuracy across time. The pattern for this consonant is different for Lan and Chinh, as epenthesis increases for Chinh across time while feature change increase for Lan across time. In actuality, the differences in the participants’ patterns can be explained by the frequency of words with specific phonological environments which promote different modification processes, which are similar for both Lan and Chinh. For example, a preceding diphthong promotes absence of /ml for both; however, as time passed, both Lan and Chinh began acquiring /m/ in final position after a diphthong, often with epenthesis. Therefore, a word such as time /taym/, was produced first as [tay] then as [tay.ma], and finally as [taym]. Lan and Chinh’s percentiles in the absence and epenthesis categories reflect the proportion of these words in the data, rather than different stages of development. The same is true for the process of feature change, which was more common for Lan, but of which Chinh also exhibited examples. For both Lan and Chinh, feature change was due to place assimilation, which occurred frequently when /m/ was followed by an alveolar stop such as /t/. In this case, /m/ was
assimilated with the /\n/ and produced as [n]. Lan had a higher percentage of these tokens in her data, and thus had a higher percentage of feature change overall.

Lan and Chinh also had similar patterns for the velar nasal /\y/. While accuracy decreased over time, neither Lan nor Chinh had significant percentages of either absence or epenthesis. Rather, both Lan and Chinh commonly changed the velar nasal to the alveolar nasal [n], which is also common for native speakers of English, especially in casual conversation, and it is also a standard feature in some dialects.

Finally, in terms of the liquids /\l/ and /\w/, feature change and absence were the most common modification processes, and they increased over time as accurate production decreased. Absence frequently occurred for /\w/ after the low back vowel /\i/. In a breakdown of the production of /\w/ after this vowel, 90% are absent, while 6% undergo feature change and only 4% are produced accurately. There were only 2 samples in the data of [\w] after a diphthong, and one of these was correct while the other was absent so no pattern could be established. After a vowel, 32% are produced correctly, 21% are absent, while 45% undergo feature change and 2% undergo epenthesis or two types of modification. In every instance of feature change, the /\w/ is co-articulated with the vowel. This co-articulation actually increases across time, as accurate production decreases and absence remains fairly stable across time.
Feature change is also the most common type of modification process for /ʌ/, and surpasses accurate production in terms of percentages by time 3. At the same time, absence decreases. Feature change takes two forms for /ʌ/, either change to [n] or to a rounded back vowel, typically [ow] but also occasionally [uw]. These types of modifications are also patterned: /ʌ/ tends to be produced as [n] after back and central vowels or in place of a syllabic /ʌ/, while typically produced as [ow] or [uw] after front vowels and diphthongs.

4. Discussion:

The findings from the analyses outlined above will be examined in light of linguistic constraints.

a. L1 Interference:

First of all, this study confirms prior research (i.e., Benson, 1988; Osburne, 1996; Sato, 1984, 1985) that L1 interference is a primary factor in the development of single codas by speakers of Vietnamese. In fact, L1 interference appears to constrain production accuracies and the order of development of single codas. For example, Vietnamese is restricted compared with English in the consonants that are allowed syllable-finally. In fact, only the voiceless stops /p, t, k/ and nasals are allowed syllable-finally (Nguyen, 1990). While Vietnamese does have some fricatives (i.e., /s, z, f, v, j/), voiced stops (i.e., /b, d, g/), and the rhotic /r/, these consonants are only
allowed syllable-initially. As this data indicates, the consonants which exist syllable-finally in Vietnamese, i.e., the voiceless stops and nasals, are the consonants with which the participants appear to have less difficulty, as evidenced by the higher accuracy percentages for /p, t, k, m, n, g/ across time for both Lan and Chinh and the fact that only /p, m, n/ reach the 80% criterion point of acquisition across time. It is clear that L1 interference has a facilitative effect on the development of these consonants.

The fricatives and voiced stops which do exist in Vietnamese but not in final position, are typically (though not absolutely) produced with greater accuracy than those consonants that do not exist in Vietnamese, such as /ʃ, ç, ð, ðz, ʒ/. This is true for the consonants /f, s, b, v, r, z, f/. Additionally, the devoicing of the voiced stops /d, b, g/ so they are produced as [t, p, k] respectively, which are allowed syllable-finally, may also be affected by L1 interference. By producing these consonants in a voiceless manner, the participants are conforming to Vietnamese phonotactics. Furthermore, the common modification process for /s, z, f, v/, all of which exist in Vietnamese but only syllable-initially, was initially absence, followed by epenthesis, indicating that the participants were resyllabifying the syllable structures by inserting a vowel after the consonant and creating a new syllable boundary in order for these codas to conform to Vietnamese phonotactics. For example, a word such as if /if/ would be pronounced as [i:fa]. This also helps to account for the fact that as absence decreased across time, epenthesis increased: the
phonemes were emerging in the learners’ L2 but initially only in syllable-
initial position, as in Vietnamese. This pattern diverged slightly for /s/',
which had a greater percentage of absence across time, rather than epenthesis.
This consonant also had a higher level of accuracy than the other fricatives,
and thus having begun to be acquired in syllable-final position, epenthesis
may be decreasing across time, as in fact the data indicates.

The participants also appear to be making a number of equivalence
classifications between Vietnamese and English, i.e., comparing consonants
in their L1 repertoire against their perceptions of English consonants, thus
effectively matching L2 consonants to consonants they already can produce.
This helps to account for the feature changes of consonants such as /θ, ʊ, ʃ, ʒ,
ʒ/, all of which do not exist in Vietnamese, and also /j/, which does exist in
Vietnamese though not in final position, to voiceless stops, either /t/ or /k/,
which are allowed syllable-finally in Vietnamese. Both /θ, ʊ/ are produced as
[t], and once /θ/ begins to be accurately produced, /ʊ/ begins to be devoiced and
produced as [θ]. The same pattern exists for the affricates /ʃ, ʒ/. Initially, both
are typically produced as [t] or [k] when modified. However, as /ʃ/ begins to be
accurately produced, the voiced affricate begins to be produced in a voiceless
manner. It is interesting that the phoneme /j/, which does exist in
Vietnamese but only syllable-initially, would undergo reclassification rather
than epenthesis like other consonants that exist in syllable-final position in
Vietnamese. Instead, /j/ is modified and produced as either [k] or [s], which is
word-specific, as described above. However, the participants may have reclassified /j/ based on a perceptual auditory similarity with /s/ and /k/. Its voiced counterpart /g/ was reclassified to /y/ for Lan and to /u/ for Chinh, also possibly on a perceptual auditory similarity with these sounds for each participant.

In terms of the high percentage of feature change for both /j/ and /u/, prior research on the acquisition of English syllable codas by a Vietnamese speaker (Osburne, 1996) found that /u/ was never realized in syllable codas. Either it was absent or it was co-articulated with the vowel. As Osburne suggests, the Vietnamese speaker may have perceived the articulation of /u/ after a vowel as a glide, and producing it as such. In fact, as Osburne states, there is some speculation among linguists about whether /u/ in fact should be classified as a glide in postvocalic position in English. Kahn (1976), for example, classifies the English /u/ as a glide rather than as a sonorant consonant because of the lack of obstruction in the articulation of /u/, the reduction of /u/ in post-vocalic position to a glide in non-rhotic dialects, and similar patterning with other glides in terms of being able to syllabify in the nucleus.

This study confirms Osburne's findings that /u/ was sometimes not realized in syllable codas and further finds that the type of preceding vowel affects whether absence or co-articulation occurs. The fact that feature change
appears to be increasing over time as absence decreases for /u/ may indicate that the participants are not receiving counterevidence and therefore the co-articulation perceptual classification is strengthening.

This analysis can also be tentatively extended to help explain the increase in feature change of /u/ across time as accurate production decreases. As described earlier, the preceding environment appeared to affect how /u/ was modified: After front vowels such as /iy/ and after diphthongs, /u/ was produced as a rounded back vowel. However, after a central or unrounded back vowel, /u/ was produced as [n]. I want to suggest that /u/ is co-articulated with the glide that occurs in diphthongs and American front vowels such as /ay/. However, after lax central and back vowels, which lack the glide characteristic, /u/ is articulated as [n], changing only in manner of articulation from an oral to a nasal consonant.

L1 interference effects also explain why codas are often absent after diphthongs or the low back vowel. Vietnamese consonants can only occur after monothong vowels; Vietnamese does have diphthong vowels, but they only exist in open syllables. In other words, a consonant is not allowed after a diphthong in syllable-final position. Osburne (1996) explains that in Vietnamese, the diphthong is realized as a vowel + glide rather than as a single segment, and the glide would thus be viewed as a final consonant, closing the segment. Both Osburne (1996) and Benson (1988) found that Vietnamese speakers frequently did not produce a final consonant after a
diphthong; this research study confirms these prior results. Additionally, this research project found that these effects do not appear to decrease across time.

This brings up the question of the effect of the low back vowel /o/, which promotes absence. Vietnamese does have this vowel, but it is classified as a short vowel before consonants while often produced as a diphthong in an open syllable. As Santry (1997) states, before consonants, this vowel is actually shorter than its English counterpart. It is therefore possible that relying on perceptual cues, the participants are classifying the English /o/ as a diphthong as it appears to be longer in duration that the Vietnamese /ɔ/ and thus closer in duration to the Vietnamese diphthong. This would then explain the high rate of absence of consonants following /o/ if the learners are classifying it as a diphthong rather than as a monothong vowel, then the high rate of absence of consonants after this consonant is indicative of L1 interference effects.

Overall, it appears that L1 interference exerts a significant effect on the development of single codas in terms of accuracy of production, developmental sequences, and the effect of a preceding diphthong. Prior research studies (i.e., Major, 1986, 1987a, 1994) have suggested that L1 interference effects decrease across time as acquisition proceeds. This study in part confirms this finding. Acquisition does not appear to be proceeding if we examine production percentages only; however, through the examination of types of production modifications and absence, it is clear that the
consonants are slowly emerging in the learners' L2 phonology, and that even though overall accuracy percentages remain stable, and low, across time, the learners' are in fact beginning to acquire all the L2 consonants, in similar stages but in different rates across time. As these consonants do begin to emerge (i.e., the emergence of the interdental fricatives and affricates, for example), the learners do appear to rely more on their existing L2 repertoire, rather than their L1, in modifying and producing these consonants. Rather than classifying /n/ as [t], the learners have begun producing it in a devoiced manner since the voiceless interdental fricative has begun emerging in their L2 phonology. As such, the effects of L1 transfer do appear to be decreasing. In other respects, however, the effects of transfer remain stable across time, in this case in terms of the effect of the preceding diphthong on production.

Even if an L2 consonant has begun emerging in the learners' L2 phonology, it will be absent if preceding by a diphthong, as in the case of the consonant /m/, which is typically produced accurately with the exception of when it is preceded by a diphthong.

This research project also found a U-shaped curve of development across time, especially for Lan on both sets of data (reading and interview) and for Chinh for the reading data only, as his interview data accuracy actually decreases across time. As Kellerman (1985) explains, this 'U-shaped behaviour' can be illustrated as follows: learners may initially pass through a stage of development where they have correct usage of an L2 form if this
form corresponds to one which exists in their L1. As they begin replacing the L1 structure with the L2 one, accuracy may decrease. However over time, as their acquire the L2 feature, accuracy again increases. In fact, Kellerman states this U-shaped behavior is one way of abducting the facilitative effect of L1 interference. Piper (1984) found a U-shaped curve of production for her learners, beginning with imitation with some pronunciation errors, followed by a decrease in accuracy and greater production errors, and ending in increased accuracy and fewer production errors. This same phenomenon occurs in this data for single codas. Therefore, L1 interference effects, which appear to be more predominant in the early stages of acquisition, may initially promote accurate production as similar consonants are 'transferred' into the emerging L2 repertoire.

b. Developmental Effects:

This study also found that a number of developmental effects constrained acquisition, confirming prior findings that L2 learners of English are subject to the same constraints as those for L1 child learners of English (Flege & Davidian, 1984; Hancin-Bhatt & Bhatt, 1997; Hecht & Mulford, 1982; Major, 1986, 1987c; Mulford & Hecht,, 1980; Piper, 1984). First of all, in general, front voiceless stops were produced more accurately than back voiceless stops, i.e., /t/ and /p/ were produced with a higher degree of accuracy than /k/. The same was true for front voiced stops and back voiced stops, /d/
and /b/ were produced with higher degrees of accuracy than /g/. The same pattern existed for fricatives, in that voiceless front fricatives were produced with greater accuracy than back (relatively speaking) voiced fricatives, i.e., /z/ and /v/ were produced more accurately than /g/. Additionally, voiceless front fricatives such as /s/ and /l/ were produced more accurately than the voiceless back fricative /j/. This pattern also extended to nasals: both /m/ and /n/, front nasals, were produced with greater accuracy than the velar nasal /ŋ/. This follows the general developmental sequence of acquisition of consonants described by Jakobson (1968) in that front consonants are acquired before back consonants. Secondly, voiceless consonants appear to be acquired before their voiced counterpart, which is also an effect of developmental processes as this follows the same pattern as for child L1 learners of English (Jakobson, 1968). This is the case across all stops, fricatives, and affricates with the exception of /ʃ/ and /ʒ/ where the voiced consonant has a slightly higher accuracy rating at time 1 and time 2 due to Chinh's fairly accurate production of this phoneme. However, at time 3, the voiceless consonant has a higher overall accurate rating than the voiced consonant. Thirdly, child L1 learners of English also first acquire stops before nasals, and nasals before fricatives, a pattern which the learners in this study follow as well. Fourth, developmental effects may also explain the relatively lateness of acquisition
of the interdental fricatives /θ/ and /ð/ as well as the affricates /ʃt/ and /dʒt/, and the fricative /ʒ/, which are also acquired late in comparison with other consonants by native speakers of English (Owens, 1996).

Developmental effects may also explain the devoicing of some voiced consonants which are not in the L1, which is also a common developmental effect. For example, the learners in this study commonly devoiced the voiced interdental fricative and affricate as they began emerging in their L2. This suggests that while L1 interference effects influence the development of the consonants that already exist in the learners' L1 repertoire, developmental effects may influence the rate of acquisition and devoicing of the English consonants which do not exist in Vietnamese.

c. Markedness:

One area of markedness research is the universal preference for a CV syllable structure, which is considered to be unmarked in relation to other syllable structures such as CVC or CVCC, etc. Prior research (Benson, 1988; Osburne, 1996; Sato, 1984, 1985) on Vietnamese learners of English has found that L1 interference effects exerted a greater influence on the learners' production of English syllable structures. This study confirms these prior findings in terms of the relative accuracy of final consonant production for voiceless stops and nasals, which conforms to the allowable CVC syllable
structures in Vietnamese. This suggests that Vietnamese syllable structure, and thus L1 interference, exerts a greater influence on the English syllable structure production than universal preference for an CV structure.

As noted earlier, there also appears to be a preference for epenthesis as a modification strategy after the fricatives /z, f, v/, all of which exist in Vietnamese but only in initial position. The effect of the epenthesis is to create a new syllable in which the fricative is placed syllable-initially. While this initially appears to indicate a preference for a universal syllable structure as this creates a CV structure, we must note that this preference only exists for the fricatives which exist in Vietnamese in syllable-initial position. Therefore, I suggest that this is an effect of L1 interference, rather than a preference for a universal syllable structure.

d. Linguistic Environment:

Linguistic environment, as outlined in the discussion of the VARBRUL analyses, had a mixed effect on the production of final consonants. The strongest effect of linguistic environment was the effect of a preceding diphthong as this environment consistently promoted absence while inhibiting accurate production. As discussed above, this can be explained as an effect of L1 interference as Vietnamese does not allow final
consonants after a diphthong. As the data indicates, there was an especially strong effect of a preceding phoneme on the production of a liquid, which can also be explained by L1 interference, as discussed above.

In terms of the effect of a following phonological environment, the main finding is that a following pause promotes epenthesis, especially in the interview data. A stressed syllable also promotes epenthesis, while an unstressed syllable strongly inhibits epenthesis.

Another finding from the VARBRUL analysis was that bimorphemic consonants such as past tense endings and plural morphemes tended to be absent more often than monomorphemic consonants. While prior research on the /t, d/ absence in the speech of adult native speakers of English has established that monomorphemic forms were more likely to undergo /t, d/ absence than bimorphemic forms (i.e., Guy, 1980; Labov, 1967; Labov & Cohen, 1967), research on child L1 English language development found that at least for weak verbs, which undergo a root vowel change and /t, d/ affixation in the past tense form, there is a three-stage sequence of development: 1) In stage one (5-8 years), /t, d/ are categorically omitted; 2) in stage two (late adolescence) /t, d/ are variably omitted; and 3) in stage three (adulthood), /t, d/ have a low rate of absence. These findings were confirmed by research by Labov (1989) for derivational suffixes. Speakers of African American Vernacular English also have a high frequency of /t, d/ deletion, even when it represents a past tense suffix (Baugh, 1980). This has also been studied for
second language learners (i.e., Bayley, 1996; Wolfram and Hatfield, 1984).
Findings from this research indicate that L2 learners were more likely to reduce inflectional rather than lexical /t,d/ syllable-final consonants.

While these results can only be applied to these findings in a limited manner, as the data was mostly for weak verbs and for clusters rather than single consonants, they do indicate that the acquisition of derivational suffixes can occur in developmental stages and that L2 learners tend to have higher rates of absence for bimorphemes rather than monomorphemes. This helps to explain the relatively high rates of absence for bimorphemes, and their relatively increase over time. At time 1, bimorphemes were accurately produced 56% of the time, and only absent 28% of the time. The remaining percentages were 5% for epenthesis and 12% for feature change. At time two, this had changed to 38% accuracy, 49% absence, 4% epenthesis, and 8% feature change. At time three, it was 22% accuracy, 56% absence, 3% epenthesis, and 19% feature change. It does appear that the learners are undergoing stage two of the development of bimorphemic markers and that they are in this stage of development at both time 2 and 3. One could hypothesize that in the future, accuracy would once again increase and absence decrease as the learners enter stage 3.
e. Data Type:

Another important finding from the VARBRUL research was the confirmation that data type had an effect on production. Overall, there was a greater accuracy on the reading data compared with the interview data. This confirms prior findings (i.e., Dickerson & Dickerson, 1977; Gathbonton, 1975; Major, 1987; Sato, 1985) that learners have a greater accuracy in more formal speech styles such as found for reading a passage than for more casual styles, which may be the more predominant speech style in a relaxed interview. There were several other interesting findings that emerged from this analysis: First of all, the reading data tended to promote both accurate production and feature change while the interview data promoted absence and epenthesis. As for the former, reading a passage tended to make the participants pay closer attention to their speech, which therefore promoted a greater accuracy in production. However, reading a passage can also create 'reading errors' in the form of orthographic miscues. As English does not have a direct one-on-one correspondence between orthographic and phonetic representation, reading errors are common for second language learners and this explains the greater number of feature change errors for this type of data.

The interview data promoted greater absence and epenthesis than the reading data in part because the participants were producing conversational
speech, with concern for meaning rather than accuracy, for the most part. The many hesitations and pauses in the interview data also promoted epenthesis.

Furthermore, there were differences between Lan and Chinh in production for the two data sets across time. Lan had a U-shaped curve for accuracy for both types of data while Chinh only had a U-shaped curve for the reading data; his interview data accuracy decreases across time. In fact, by time three, Lan had a higher level of accuracy in the interview data, though only by 1 percentage point, than Chinh. I want to tentatively suggest that this indicates two things: First of all, Chinh and Lan are two very different types of language learners, and while Chinh has greater linguistic accuracy overall, he also is more careful in monitoring his speech, to the point that he appears disfluent because of his hesitations and pauses. Lan, on the other hand, speaks in words rather than full sentences. However, she usually has the right vocabulary word and appears to comprehend what others say; therefore, while she in fact speaks with less grammaticality overall than Chinh, she appears much more fluent because she does not hesitate or repeat herself as she speaks and she has a large vocabulary base. When the reading data was taped, Chinh took a while to read through the passage and carefully articulated his sounds; Lan, on the other hand, rushed through it, and I had to ask her to slow down. These two different reading and speaking patterns
give some indication that they approach learning in different ways: While Chinh is more concerned with accuracy, Lan is more concerned with overall understanding.

5. Summary of Single Coda Findings:

It appears that L1 interference exerts a strong effect on the development of single codas in terms of which consonants are initially produced with greater accuracy, leading to an allowable Vietnamese CVC syllable structure and also in terms the effect of a preceding diphthong on the consonant. Additionally, the epenthesis of consonants that exist syllable-initially to conform to L1 phonotactics indicates L1 interference effects.

Developmental effects influence the consonants not in L1 repertoire, which are first changed to conform to allowable syllable-final consonants based on those which transferred into the emerging L2 from the L1. As the consonants which do not exist in the L1 begin emerging in the learners’ L2, the less marked emerges first (i.e., voiceless consonant in a voiceless/voiced pair) and when the voiced consonants emerge, they are devoiced, which may be a developmental effect. Another developmental effect is the relatively late acquisition of the affricates and interdental fricatives.
B. Two-Member Codas:

1. Descriptive statistics:

There were a total of 2545 double consonant codas. Their distribution according to production type and absence across data type and time is illustrated in Table 4.8.

<table>
<thead>
<tr>
<th>Task</th>
<th>Time 1</th>
<th></th>
<th>Total</th>
<th></th>
<th>Time 2</th>
<th></th>
<th>Total</th>
<th></th>
<th>Time 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reading</td>
<td>Inter.</td>
<td>Total</td>
<td>Reading</td>
<td>Inter.</td>
<td>Total</td>
<td>Reading</td>
<td>Inter.</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>Accurate</td>
<td>123</td>
<td>18</td>
<td>141</td>
<td>116</td>
<td>10</td>
<td>126</td>
<td>174</td>
<td>14</td>
<td>188</td>
<td></td>
</tr>
<tr>
<td></td>
<td>22%</td>
<td>6%</td>
<td>16%</td>
<td>20%</td>
<td>5%</td>
<td>17%</td>
<td>31%</td>
<td>4%</td>
<td>21%</td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>193</td>
<td>239</td>
<td>432</td>
<td>189</td>
<td>129</td>
<td>318</td>
<td>183</td>
<td>225</td>
<td>408</td>
<td></td>
</tr>
<tr>
<td></td>
<td>34%</td>
<td>74%</td>
<td>49%</td>
<td>33%</td>
<td>66%</td>
<td>42%</td>
<td>32%</td>
<td>69%</td>
<td>46%</td>
<td></td>
</tr>
<tr>
<td>Epenthesis</td>
<td>69</td>
<td>5</td>
<td>74</td>
<td>49</td>
<td>7</td>
<td>56</td>
<td>32</td>
<td>6</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12%</td>
<td>2%</td>
<td>8%</td>
<td>9%</td>
<td>4%</td>
<td>7%</td>
<td>6%</td>
<td>2%</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>Feature</td>
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<td>7</td>
<td>84</td>
<td>103</td>
<td>3</td>
<td>106</td>
<td>94</td>
<td>13</td>
<td>107</td>
<td></td>
</tr>
<tr>
<td>Change</td>
<td>14%</td>
<td>2%</td>
<td>9%</td>
<td>18%</td>
<td>2%</td>
<td>14%</td>
<td>17%</td>
<td>4%</td>
<td>12%</td>
<td></td>
</tr>
<tr>
<td>Two types</td>
<td>104</td>
<td>55</td>
<td>159</td>
<td>109</td>
<td>46</td>
<td>155</td>
<td>83</td>
<td>70</td>
<td>153</td>
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<tr>
<td></td>
<td>18%</td>
<td>17%*</td>
<td>18%</td>
<td>19%*</td>
<td>24%**</td>
<td>20%</td>
<td>15%**</td>
<td>21%</td>
<td>17%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>566</td>
<td>324</td>
<td>890</td>
<td>566</td>
<td>195</td>
<td>761</td>
<td>566</td>
<td>328</td>
<td>894</td>
<td></td>
</tr>
</tbody>
</table>

* = 99% ** = 101%

Table 4.8: Distribution of two-member codas by production type and absence across time and data type

As Table 4.8 indicates, overall there was an increase in the accuracy of two-member syllable coda production across time. Additionally, while
accuracy increased across time, absence and epenthesis decreased slightly, while feature change increased and two types of modifications increased and then decreased by time 3.

There were a number of interesting differences between the production of codas for the reading and the interview data. First of all, there were significant differences in accuracy between the reading and the interview data, with the reading data consistently 16% to 27% higher in accuracy in percentage points. Conversely, there was a significantly higher ratio of absence for the interview data, with a difference of 33 to 40% at each data collection time. This indicates that while the participants may be able to produce two-member codas correctly in monitored language use, such as reading a text, they have difficulty with these codas when engaging in spontaneous language use.

There is a higher ratio of epenthesis and feature change for the reading data across time in comparison with the interview data. Two types of modifications are almost equally common for the reading and interview data at time 1, but became more common for the interview data at time 2 and 3. There are a number of explanations for these differences: The higher ratio of feature change for the reading data could be caused by reading miscues. In other words, the participants are making reading mistakes, which overall is a common phenomenon for second language learners of English. The higher
ratio of feature change and epenthesis for the interview data may also be indicative of a sequence of development of two-member clusters, which will be examined below.

There were also a number of similarities and differences between Lan and Chinh's production of two-member codas across time, as illustrated in Table 4.9. Lan had 1296 codas while Chinh had 1249 two-member codas.

<table>
<thead>
<tr>
<th>LAN</th>
<th>Time 1</th>
<th>Time 2</th>
<th>Time 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task</td>
<td>Reading</td>
<td>Inter.</td>
<td>Total</td>
</tr>
<tr>
<td>Accurate</td>
<td>42</td>
<td>7</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>15%</td>
<td>4%</td>
<td>11%</td>
</tr>
<tr>
<td>Absent</td>
<td>112</td>
<td>129</td>
<td>241</td>
</tr>
<tr>
<td></td>
<td>40%</td>
<td>78%</td>
<td>54%</td>
</tr>
<tr>
<td>Epenthesis</td>
<td>35</td>
<td>4</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>12%</td>
<td>2%</td>
<td>9%</td>
</tr>
<tr>
<td>Feature Change</td>
<td>30</td>
<td>1</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>11%</td>
<td>1%</td>
<td>7%</td>
</tr>
<tr>
<td>Two types</td>
<td>64</td>
<td>24</td>
<td>88</td>
</tr>
<tr>
<td></td>
<td>23%**</td>
<td>15%</td>
<td>20%**</td>
</tr>
<tr>
<td>Total</td>
<td>283</td>
<td>165</td>
<td>448</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHINH</th>
<th>Time 1</th>
<th>Time 2</th>
<th>Time 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task</td>
<td>Reading</td>
<td>Inter.</td>
<td>Total</td>
</tr>
<tr>
<td>Accurate</td>
<td>81</td>
<td>11</td>
<td>92</td>
</tr>
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</tr>
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<td>Epenthesis</td>
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<td>1</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>12%</td>
<td>1%</td>
<td>8%</td>
</tr>
<tr>
<td>Feature Change</td>
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<td>53</td>
</tr>
<tr>
<td></td>
<td>17%</td>
<td>4%</td>
<td>12%</td>
</tr>
<tr>
<td>Two types</td>
<td>40</td>
<td>31</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>14%**</td>
<td>19%</td>
<td>16%</td>
</tr>
<tr>
<td>Total</td>
<td>283</td>
<td>159</td>
<td>442</td>
</tr>
</tbody>
</table>

*= 99%; **= 101%

Table 4.9: Distribution of two-member codas by production type and speaker across data type and time

201
There were a number of differences between Lan and Chinh. First of all, across all three data sets, Chinh had a higher accuracy rate than Lan. While these differences exist for both the interview and the reading passage data, the differences are more pronounced for the reading passage data. Chinh has a much higher ratio of accuracy for the reading data than Lan does, and only a slightly higher ratio for accuracy for the interview data than Lan. This indicates that overall, Chinh is better able to make sound-symbol correspondences than Lan. Chinh also has a lower ratio of absence for the reading data and interview data across time.

In order to examine the production of each type of two-member consonant cluster in more detail, the two-member codas were categorized into larger groups based on the types of consonants in each coda such as nasal-stop. These categories were further divided by voicing since this was hypothesized to have an effect not only on production accuracy but also modification types. Thus the nasal-stop codas were further divided into nasal-voiceless stop and nasal-voiced stop. Additionally, /nt/ and /nd/ were analyzed separately as they appeared to be subject to different constraints than other clusters. There were a total of 27 cluster types. These were collapsed across participants and data types as some clusters only were elicited in the reading data. The results are outlined in Table 4.10.
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Table 4.10: Production of two-member codas by coda type across time
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<td>10</td>
</tr>
<tr>
<td>Affricate - Stop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voiced #</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>%</td>
<td>0%</td>
<td>17%</td>
<td>0%</td>
</tr>
<tr>
<td>Total 18</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

* = 99%, ** = 101%
The consonant clusters with the highest accuracy ratios are consistent across time: nasal-voiceless affricate and liquid-voiceless affricate. While neither of these codas achieves the 80% criterion for acquisition suggested by Cancino, Rosansky, and Schumann (1978), they do come close at 79% for liquid-voiceless affricate at time 3 and 67% for nasal-voiceless affricate at time 3. Based on the analysis by groups, it is possible to make a number of general claims: First of all, nasal-voiceless consonant clusters have the highest accuracy when [nt] clusters are excluded. Secondly, the consonant clusters with which the participants had the most difficulty were /nd/, voiced affricate-stop, liquid-voiced affricate, and voiced stop-voiceless fricative. Each of these clusters remained at 0% across time.

2. Individual Coda Analysis:

In order to examine this further, each type of cluster is examined separately for Chinh and Lan in terms of production accuracy, and sequence of development across time. In the following discussion, arrows (→) are used to indicate the stages of development of the codas across time -- the arrow is inserted between the phonetic realizations of the coda at each time for Lan and Chinh, respectively. Additionally, if differences exist between the participants' production of the codas in the reading and the interview data, such differences are described.
Liquid-Nasal -- The preceding vowel a mid central, mid front, or high front vowel, which do not appear to promote co-articulation of the liquid with the vowel.

/m/ -- Chinh: 0% → 0% → 57%; [n] → [n] → [n], [mn]. Lan: 25% → 25% → 33%; Lan varied between producing the nasal only and producing the liquid + nasal across time.

/n/ -- Chinh: 0% → 0% → 100%; Chinh produced only the nasal across time 1 and 2 but at time 3 he produced the liquid + nasal. Lan: 0% across time; [m] → [m] → [m], [m].

/l/ -- Chinh: 33% → 33% → 0%; [ln], [n] → [ln], [lm] → [ln]. Lan: 0% → 0% → 33%; [n] → [ln], [n] → [ln], [ln].

/m/ -- Chinh: 0% → 0% → 33%; [m] → [m], [m] → [m], [fm], [fm]. Lan: 0% → 67% → 0%; [m] → [m], [m] → [m].

Liquid-Liquid

/ʌ/ -- Chinh: 67% → 0% → 67%; [ʌ], [l] → [l], [ʌl] → [l], [ʌ]. Lan: 0% across time; [l], [ʌl] → [l] → [l], [ʌ]. In all cases, this clusters was after the vowel /a/ and there was no feature change of the /ʌ/.

Liquid - Voiceless Fricative

/q/ -- Chinh 0% across time; Chinh: /q/ is co-articulated with the vowel and /q/ is produced as [t]. /q/ emerges at time 3, and the cluster is
produced as [x]. Lan: 67% → 50% → 75%; this cluster is produced accurately across time for the reading data, but in the interview data, it is reduced to [j] across time.

\( \lambda \theta / - \) Chinh: 0% → 0% → 100%; /\theta/ produced as [t] but emerges at time 3. Lan: 67% across time; at all three times, she switches between [i8] and [1] (there is only reading passage data).

\( /j/ - \) Chinh: 0% → 67% → 33%; [ls] → [lj], [ls] → [lj], [ls]. Lan: 33% → 33% → 67%; [ls], [lj], [lj] → [ls], [lz], [lj] → [ls], [lj].

\( /\eta/ - \) Chinh: 0% → 33% → 0%; [ks] → [ks], [j], [lz] → [z]. Lan: 0% across time; [lj], [lj] → [s] → [l], [lj].

\( /\lambda/ - \) Chinh: 20% → 20% → 17%; Lan: 40% → 40% → 60%. Both had the same pattern across time: [lf], [l], [lj] → [l], [lf] → [l], [lf].

\( /\eta/ - \) Chinh: 33% → 0% → 83%; [af], [ap], [x] → [af], [p] → [a], [af]. Lan: 33% → 0% → 0%; [x], [a], [af] → [f], [lj], [lj] → [l], [lj].

\( /\lambda/ - \) Chinh: 100% → 67% → 33%; [ls] → [ls], [lj] → [ls], [lj]. Chinh was producing it correctly until he began acquiring /f/ after which he overgeneralized for the /ls/ cluster. Lan: 0% → 0% → 67%; [n], [n] → [s] → [uws], [ls].
/ss/ -- Chinh: 0% across time; at all times, /s/ is co-articulated with the preceding vowel and /s/ is voiced to [z]. Lan: 0% → 0% → 67%; for Lan, /s/ is also co-articulated with the preceding vowel although it emerges at time 3: [z] → [zə] → [z], [s].

Liquid-Voiced Fricative

/z/ -- Chinh: 40% → 50% → 12%; /z/ is a plural marker in all cases. /v is co-articulated with the low front and low central vowels but /z/ is retained.

Lan: 25% → 17% → 0% for bimorphemic clusters where /z/ is a plural marker. /v is co-articulated with the low front and low central vowels but /z/ is retained. Lan: 100% → 100% → 0% for monomorphemic clusters; /v is retained after a mid central vowel while the plural marker is absent at time 3.

/lz/ -- bimorphemic in all cases. Chinh: 100% → 50% → 75%; /lz/ → [lz], [l] → [lz], [l]; Lan: 100% → 0% → 0%; [lz] → [l泽] → [lə], [ləz].

/lv/ -- Chinh 0% across time; [l], [lv] → [l], [lv] → [l]. Lan: 0% → 0% → 100%; [v], [lv] → [lv], [v] → [lv].

Liquid-Voiceless Stop -- All these codas are monomorphemic

/lp/ -- Chinh: 67% → 100% → 40%; [l], [lp] → [lp] → [l], [lp]. Lan: 33% → 67% → 100%; [p], [lp] → [p], [lp] → [lp].
/lt/ -- Chinh: 67% → 67% → 0%; [lt], [l.ə] → [lt], [nt] → [nt], [n]. Lan: 0% across time; [l.ə], [l.ə] → [l.ə], [nt] → [nt], [n]. The preceding vowel is the low back vowel /ə/. Both Lan and Chinh have difficulties with this coda, and as evidenced for the single N, tend to modify the liquid to [n] after the low back vowel. Once this modification has taken place, they also appear to employ /nt/ production rules so that /t/ is optimally absent.

/lk/ -- Chinh: 100% across time; Chinh has no difficulties with this cluster. Lan: 0% across time. Lan retains the stop but modifies the liquid to [uw] after a high front vowel, similar to the modifications for single N after these vowels, resulting in the coda [uwk], which stays stable across time.

/lp/ -- Chinh: 0% across time; Lan: 0% across time. Both retain the stop but co-articulate the liquid with the preceding vowel, which remains stable across time.

/ls/ -- Chinh: 14% → 0% → 0%; Lan: 0% across time. Both co-articulate the liquid with the preceding vowel. For Lan, the stop is initially absent but emerges at time 2 and 3; for Chinh, the stop is retained at time 1 but absent at times 2 and 3.

/lk/ -- Chinh: 43% → 0% → 0%; Lan: 8% → 0% → 9%. For both, preceding vowel is the main factor in absence: The stop is always retained but the liquid is usually absent after /s/ while often retained after other vowels.
**Liquid-Voiced Stop**

/\b/ -- After low front vowel. Chinh: 0% → 0% → 33%; [l.b\a] → [l.b\a] → [l.b\a], [b]. Lan: 0% across time; [l.p\a], [n.b\a] → [n.b\a], [l.b\a] → [n.b\a], [l.b\a].

/\d/ -- 1) Monomorpheme and after high front vowel— Chinh: 0% → 0% → 67%; [l.d\a] → [l.t], [l] → [l.d], [l.d\a]; Lan: 0% across time: [n], [l], [l.d\a] → [l.d\a], [uwd] → [l], [uw.d\a], [l.d\a]. 2) Bimorphemic with the stop as past tense marker and after mid front vowel -- Chinh: 0% → 0% → 25%; same pattern as above. Lan: 0% across time; [l] → [l.d\a] → [l.d\a].

/\b/ -- After a mid central vowel. Chinh 0% across time; [b] → [b\a] → [b\a]. Lan: 0% → 0% → 67%; [b] → [b], [\b\a] → [b], [\b].

/\d/ -- 1) Monomorphemic -- only for Chinh: 0% → 0% → 14%. At all times, the stop was absent. These tokens were also only present in the interview data, which may have promoted final stop absence. 2) Bimorphemic with the stop as a past tense marker -- Chinh: 0% → 0% → 25%; [d], [d\a], [\d\a] → [d], [\d]. Lan: 20% → 0% at both time 2 and 3; [\d\a], [\d], [d] → [\d], [\d\a].

/\g/ -- After a mid central vowel. Chinh: 0% across time; [g], [g\a] → [g\a] → [g\a], [g]. Lan: 0% across time; [g\a] → [g\a] → [g\a].

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Liquid-Voiceless Affricate

/ʃ/ -- Chinh: 0% → 100% → 40%; [ʃ], [ʃə] → [ʃ] → [ʃ] (reading data), [ʃ] (interview data only). Lan: 0% → 50% → 40%; [ʃ], [ʃə] → [ʃə] and [ʃ] (reading data), [ʃə] (interview data) → [ʃ] and [ʃ] (reading data), [ʃ]
(interview data).

/ʧ/ -- Chinh: 100% → 0% → 100%; [ʧ] → [ʃə] → [ʧ]. Lan: 0% → 33% → 100%; [ʃə] → [ʃə], [ʧ] → [ʧ].

Liquid-Voiced Affricate

/ʤ/ -- Chinh and Lan both 0% across time. Chinh: [ʤ], [ʤə] → [ʤə], [ʤə], [z] → [z], [ʤə]. Lan: [ʤə], [ʤə] → [ʧ], [ʤə] → [ʤ], [ʤ], [uə].

/ʤ/ -- Chinh and Lan both 0% across time. Chinh: [n.ʧə], [ʤə] → [l.ʧə], [ʃ] → [uə], [uə]. Lan: [n], [o], [wə] → [nz], [uə], [uə] → [n.gaj], [ʤ].

Voiceless Stop-Voiceless Fricative

/ʤθ/ -- Chinh and Lan: 0% across time. Chinh: [ʤ], [ʤθ] → [ʤθ] → [ʤθ]. Lan: [ʤθ], [ʤθ] → [ʤθ], [ʤθ] → [ʤθ].

Voiceless Stop-Fricative

/ʤs/ -- Bimorphemic only. Chinh: 33% → 0% → 30%; Lan: 100% → 0% → 40%. Chinh and Lan had similar patterns. Both reduced the cluster to [z] after diphthongs -- at time 3, the /ʤs/ had emerged after diphthongs for Chinh but not for Lan. Also, the cluster at the end of the word *its* was also
pronounced as [z] by both Lan and Chinh; at time 3, Chinh had correct production of the coda while Lan did not. For all other codas and codas not preceded by a diphthong, the coda was alternately produced correctly, and most commonly as a single stop.

/ps/ -- 1) Monomorphemic -- Chinh: 100% across time. Lan: 67% → 33% → 100%; [ps], [p.sə] → [ps], [p.sə] → [ps]. 2) Bimorphemic: Chinh and Lan both 100% across time.

/ks/ -- 1) Monomorphemic -- 22% → 0% → 50%; Lan: 0% across time. Both Lan and Chinh produced this cluster either correctly or as a single stop across time. There were a few cases of epenthesis by Chinh at time 1 and 3 along with absence, so the stop was syllable initial. 2) Bimorphemic -- Chinh: 40% → 50% → 50%; Lan: 0% across time. Both produced the clusters as [z] alternatively with the correct pronunciation after a diphthong and this was consistent across time. While both were able to produce the cluster correctly on the reading passage data, except sometimes after a diphthong, they consistently produced a single stop in the interview data.

/tθ/ -- Chinh: 0% across time and consistently produced as [t] across time. Lan: 33% → 0% at time 2 and 3; [t], [ts], [tθ] → [t] (time 2 and 3).

Voiced Stop-Fricative

All codas are bimorphemic. The patterns for the three codas are very similar. Overall, it appears that the plural marker is usually retained, while
the stop may be absent. Lan employs epenthesis to resyllabify the fricative to syllable-initially, especially at time 2, while Chinh typically has both consonants. At time 3, Lan may retain the fricative but devoices it.

\[ /gz/ \] -- Chinh: 100% \( \rightarrow \) 0% \( \rightarrow \) 100%; \( [gz] \rightarrow [z] \rightarrow [gz] \). Lan: 0% across time; \( [z] \rightarrow [z] \), \( [.za] \rightarrow [s] \).

\[ /bz/ \] -- Chinh: 33% \( \rightarrow \) 100% \( \rightarrow \) 100%; \( [bz], [ps] \rightarrow [bz] \rightarrow [bz] \). Lan: 33% \( \rightarrow \) 0% \( \rightarrow \) 33%; \( [bz], [ps], [z] \rightarrow [z], [b.za] \rightarrow [s], [ps]. [bz] \).

\[ /dz/ \] -- Chinh: 40% \( \rightarrow \) 0% \( \rightarrow \) 40%; \( [dz], [z] \rightarrow [ts] \rightarrow [dz], [z] \). Lan: 0% across time; \( [z] \rightarrow [.za], [z] \rightarrow [s] \).

**Voiceless Stop-Stop** -- \( \forall \) is retained in monomorphemic clusters, while the initial stop in the cluster is absent. In bimorphemic clusters, the \( \forall \) is absent while the initial consonant in the cluster is retained. Epenthesis is also common between the two consonants in bimorphemic clusters. The bimorphemic tokens are mainly from the reading list, and it is quite common for second language learners to pronounce a past tense ending by inserting a vowel between the two consonants because of the spelling of the cluster.

\[ /pt/ \] -- 1) Monomorphemic -- Chinh and Lan both have 0% across time. 2) Bimorphemic where the stop is a past tense marker -- 25% at time 1 and then 0% at time 2 and 3.
/k/ -- 1) Monomorphemic -- Chinh and Lan both have 0% across time.

2) Bimorphemic where the stop is a past tense marker -- Chinh has 0% at time 1 and 2 and 25% at time 3 while Lan has 0% across time.

Voiced Stop-Stop -- All codas are bimorphemic. Overall, devoicing appears to be a common production strategy. The past tense marker is typically absent; epenthesis does not appear to be related to orthography, as it occurs coda-finally rather than medially.

/bd/ -- Chinh: 0% → 0% → 67%; [pt], [b.da] → [b], [pt] → [bd], [pt]. Lan: 0% → 33% → 0%; [pt] → [b.da], [bd] → [.ba].

/gd/ -- Both Chinh and Lan are 0% across time. Chinh: [k] → [k] → [kt].

Lan: [.gə] → [d], [.da] → [k], [kt], [∫].

Voiceless Fricative-Stop

/st/ -- 1) Monomorphemic -- Chinh: 20% → 25% → 30%; Lan: 18% → 14% → 14%. Both Lan and Chinh had 100% across time on the reading passage only; on the interview data, however, /t/ was typically absent across time for both Lan and Chinh, while /s/ was always retained. 2) Bimorphemic -- Chinh: 100% → 100% → 0%; Lan: 0% across time. There were relatively few tokens but /t/ was typically absent while /s/ was always retained.

/sk/ -- Chinh: 0% → 60% → 67%; [s], [st] → [sk], [s.ka] → [sk]. Lan: 33% → 50% → 20%; [k], [s], [sk] → [sk], [k] → [sk], [ks], [s].
/sp/ -- Chinh: 0% → 67% → 67%; [p] → [sp], [p] → [sp], [p]. Lan: 0% across time; [s], [p] → [s], [p] → [s], [p].

/ft/ -- All codas are monomorphemic. Chinh: 0% → 67% → 100%; [f] → [ft], [pt] → [ft]. Lan: 0% across time; [f] → [t] → [t].

/ft/ -- All codas are monomorphemic. Chinh: 0% → 25% → 0%; [sp], [st] → [s], [st] → [s], [t], [f]. Lan: 0% across time; [s] → [t], [st] → [s], [t], [f].

Voiced Fricative - Stop -- All are bimorphemic.

/zd/ -- Chinh: 33% → 0% → 33%; [zd] (reading passage), [∅] (interview) → [z] → [z], [zd]. Lan: 8% → 0% at time 2 and 3; [zd], [z], [z.də] (reading passage), [z], [∅] (interview) → [z] → [z], [zə].

/zd/ -- Chinh and Lan are both 0% across time. Chinh: [.də] → [.də], [zd], [.giy] → [d], [t]. Lan: [.ɡ] [.ɡə] → [.za], [zd] → [d].

/6d/ -- Chinh and Lan are both 0% across time. Across time, both are producing a single [tʰ], with audible aspiration.

/vd/ -- Chinh: 0% → 0% → 33%; [.də] → [ft], [v] → [vd], [v.də]. Lan: 0% across time; [v], [bt] → [.və], [v.də] → [.və], [b], [.bə].

Voiceless Fricative - Fricative

/fs/ -- Chinh: 100% → 0% → 0%; [fs] → [ps] → [ps]. Lan: 0% → 33% → 0%; [ps] → [fs], [ps] → [ps].
/θθ/ -- Chinh and Lan are both 0% across time. Chinh consistently produces both consonants across time while modifying the final fricative to the stop [tʰ]. Lan: [tʰ] → [tʰ], [fθ] → [f], [fθ].

/θθ/ -- Chinh and Lan are both 0% across time. Both Lan and Chinh have similar strategies for the production of this coda, which is word specific. For most words with this cluster, both Lan and Chinh only produce the final fricative, with the absence of the interdental fricative. However, for the word Smiths, both Lan and Chinh produce [ts] consistently across time.

Voiced Fricative-Fricative -- All are bimorphemic.

/ɔz/ -- Both Lan and Chinh are 100% across time. Chinh consistently produces [z] for the cluster across time. Lan also produces [z] for the cluster, but epenthesizes it at time 2 so that the fricative is syllable initial.

/vz/ -- Chinh: 33% → 67% → 100%; [vz], [.vaz] → [z], [vz] → [vz]. Lan: 0% → 0% → 33%; [z], [v.za] → [z] → [z], [vz].

Nasal-Voiceless Fricative -- All codas are monomorphemic.

/nθ/ -- Chinh has 0% across time; for this coda as well, Chinh consistently produces /θ/ as [t], with the resulting coda [nt]. Lan: 100% → 0% → 100% (reading passage) and 0% (interview data). Lan can produce this coda correctly in the reading passage, but the fricative is categorically absent in the interview data.
\(/mf/ -- \text{Chinh: } 0\% \rightarrow 67\% \rightarrow 67\%. [mp] \rightarrow [mp], [mf] \rightarrow [mf], [mp].

Lan: 0\% \rightarrow 100\% \rightarrow 100\%; [m] \rightarrow [mf] \rightarrow [mf].

\(/ns/ -- \text{Chinh has 100\% across time 1 and 2 and 33\% at time 3 as he begins voicing the fricative. Lan has 100\% across time.}

\text{Nasal-Voiced Fricative}

\(/mz/ -- \text{Chinh: } 44\% \rightarrow 50\% \rightarrow 83\%; \text{Lan: } 0\% \rightarrow 20\% \rightarrow 11\%. \text{For both Lan and Chinh, the nasal is produced correctly across time. While this was produced correctly for both Lan and Chinh in the reading passage data, which was bimorphemic, both had /z/ absence in the interview data, which was also bimorphemic. There was also an effect for preceding vowel: both Lan and Chinh had } [\emptyset] \text{ after diphthongs, for both bimorphemic and monomorphemic clusters, a linguistic environment which occurred frequently in Lan's data, bringing her total accuracy percentage lower than Chinh's even though their patterns were similar.}

\(/nz/ -- \text{Chinh: } 100\% \rightarrow 57\% \rightarrow 67\%; \text{Lan: } 17\% \rightarrow 14\% \rightarrow 18\%. \text{Both Chinh and Lan produce the nasal across time, but /z/, serving as a plural marker, is absent across time. Lan also devoices the fricative, producing it as [ns], a coda with which she has no difficulty, producing it 100\% across time.}

\(/gz/ -- \text{Chinh: } 100\% \text{ across time. Lan: } 0\% \text{ across time as she consistently modifies the velar nasal to an alveolar nasal, so the coda is produced as } [nz].\)
Nasal-Voiceless Affricate

\(/ŋʃ/\) -- Chinh: 75% → 75% → 100%; Lan: 75% → 75% → 50%. Both Lan and Chinh have 100% accuracy across time on the reading passage but typically only produce the nasal, with the affricate absent, during the interviews.

Nasal-Voiced Affricate

\(/nɔg/\) -- Chinh and Lan both had 0% at time 1 and 2, and 67% at time 3. Their patterns of development differed, however. Chinh: \([n.ʒə], [n.ʃə], [n] \rightarrow [ŋʃ], [n.ʒə] \rightarrow [nʃ], [n].\) Lan: \([nʃ], [n.ʒə] \rightarrow [ŋʃ], [n.ʒə] \rightarrow [ŋʃ], [n.ʒə].\)

Nasal-Voiceless Stops

\(/mt/\) -- Chinh had 100% across time. Lan: 100% → 33% → 100%. At time 2, Lan produced the cluster as either \([m] or [m.ə].\)

\(/mp/\) -- Chinh: 33% → 67% → 100%; \([m], [m.ə], [mp] \rightarrow [mp], [m] \rightarrow [mp].\) Lan: 0% → 0% → 100%; \([m.ə] \rightarrow [m.ə] \rightarrow [mp].\)

\(/gk/\) -- Chinh: 0% → 75% → 16%; Lan: 5% → 75% → 25%. For both, at time 1 the coda was produced as a single nasal in the reading data and the interview data. By time 2, however, both Lan and Chinh were able to produce the coda correctly in the reading data; the lower percentages from time 2 to 3 are a result of an increase in the number of tokens in the interview data wherein the coda was consistently produced as a single nasal \([ŋ] across time except preceding a pause when it was produced as [ŋ.ə].\)
/nt/ -- Chinh: 15% → 5% → 5%; Lan: 3% → 0% → 3%. This coda is almost categorically produced as a single nasal. After diphthongs, however, both produce a single stop and the nasal is absent. In the interview data, the coda may also be produced as [na] preceding a pause.

**Nasal-Voiced Stops**

/md/ -- Bimorphemic: Chinh: 0% → 67% → 100%; [m.də] → [md], [m] → [md]. Lan: 0% across time; [m], [m.də] → [m] → [m], [mt].

/ɡd/ -- Bimorphemic: Chinh: 0% across time; [ɡ.də] → [ɡ], [ɡ.də] → [n], [ɡ.də]. Lan: 0% at time 1 and 2, but 100% at time 3; [n], [ɡ.də] → [ɡ.də] → [ɡ], [nd].

/nd/ -- Chinh and Lan had 0% across time and similar patterns of production across both monomorphemic and bimorphemic codas: The stop is almost categorically absent in production, except for a few cases when it is epenthesized so it is syllable-initial. Two types of modifications are also common, with absence and epenthesis to produce [na], particularly before pauses. Typically, when any vowel except for a diphthong precedes the cluster, the stop is absent while the nasal is produced. After any diphthong, the cluster has a null realization -- both the nasal and stop are absent. By time 3, both Lan and Chinh produced the final stop after diphthongs for the
reading passage data, though the nasal was still absent, similar to the pattern for /nt/ as described above, though in the interview data, the whole coda is still absent after diphthongs.

**Affricate-Stop Voiceless** -- Bimorphemic with the stop a past tense marker.

/ʃt/ -- Chinh: 20% → 0% → 40%; [ʃ], [ʃt], [k] → [s], [ʦ], [ʃ] → [ʃt], [ʃ], [k].

Lan: 0% → 0% → 20%; [t], [.ta] → [t], [.də] → [ʃt], [ʃ], [t].

**Affricate-Stop Voiced** -- All these codas are bimorphemic.

/c^d/ -- Both Lan and Chinh have 0% accuracy across time. Chinh: [.c^ə] → [c^] → [c]. Lan: [t] → [.də] → [c].

3. **Discussion:**

There are a number of interesting findings that emerge from the examination of the two-member codas. First of all, it is clear that while percentages may indicate general trends in the development of syllable codas, they do not fully depict what is going on in the data. For example, while quite a number of codas are at 0% accuracy across time, and others remain at very low accuracy percentages, these low percentages do not mean that the codas are not in the process of being acquired across time. Additionally, the initial high accuracy percentage of some codas at time one is not always an indicator that acquisition has taken place; rather, these percentages appear to indicate the initial stages of a U-shaped curve where the codas are produced accurately because of the facilitative interference effects of the L1.
Furthermore, lower percentages at time 3 are not necessarily indicative of a lower production accuracy overall. In fact, the lower percentages may be due to the fact that while the participants are producing the words in the reading data at times with 100% accuracy, there is an increase of these tokens in their interview data. This decreases the overall accuracy percentage.

Another interesting finding is the patterns of absence across different coda types. One pattern was similar across all codas with consonants that also exist in Vietnamese as these codas could be modified towards an allowable L1 syllable structure. For example, for all codas with a nasal, the nasal was produced while the other consonant was optimally absent, and this was the case whether or not the nasal was the first or the second member of the coda. In liquid-stop/fricative/liquid clusters where the /u/ was co-articulated with the vowel, the following consonant was usually produced since the coda may have been interpreted as a single consonant coda. For voiceless stop-fricative clusters, the stop was typically produced while the fricative may be absent or epenthesized to be syllable-initial.

Other patterns of absence appear to be coda specific, especially those involving bimorphemic markers such as the plural marker. These patterns of absence also appear to be affected by L1 interference as well as developmental processes. In codas with voiceless stops and nasals, the plural marker was often absent, as explained above. However, in clusters with voiced stops, the plural marker was often produced while the stop was absent.
Additionally, in clusters with other fricatives, it was usually the unmarked fricative, often the plural marker, which was produced while the other fricative was absent.

Coda specific patterns of absence can also be noted for those clusters containing a past tense marker, especially when compared against similar codas where the final stop is part of the monomorpheme. If the cluster was monomorphemic, the final stop was typically produced while the initial stop in the cluster was absent at times. However, when the final stop served as a plural marker in the coda, the initial stop was produced while the stop was absent at times or epenthesis was employed between the two consonants. This latter strategy appears to be based on orthographic cues since the past tense ending for regular verbs is spelled -ed and is often pronounced as a separate syllable by learners of English. It thus appears that unlike other bimorphemic clusters, clusters with a past tense marker appear to be analyzed morphologically. While the past tense marker may be less difficult to pronounce than other final consonants in the cluster, it is optimally absent and this is in contrast to when the final stop is part of the monomorpheme, when it is usually not absent. This confirms the findings on the single codas ending in these two consonants: codas with a past tense marker tended to have higher rates of absence than monomorphemic codas. It also confirms prior research (i.e., Bayley, 1996; Wolfram & Hatfield, 1984) that L2 learners of English are more likely to have absence for bimorphemic rather than
monomorphemic codas. As explained in the single coda discussion, the learners appear to be in the beginning stages of the development of past tense markers, which explains the absence rates of these codas.

A discussion of which linguistic constraints may affect the development of two-member codas follows.

a. L1 Interference:

Similar to the single codas, L1 interference appears to be a primary factor in the development of two-member syllable codas by speakers of Vietnamese, especially in the early stages of L2 acquisition, which also confirms prior research (i.e., Benson, 1988; Osburne, 1996; Sato, 1984, 1985). As in the single coda data, the participants appear to be making equivalence classifications and production modifications based on the L1, especially at time 1 and 2 when they are in the beginning stages of acquiring the L2 consonants. This is especially true for Lan across time while Chinh appears to be making equivalence classifications based both on the L1 and on the consonants emerging in his L2 repertoire to a greater extent than Lan. Additionally, similar to the single coda data, epenthesis was typically employed to resyllabify those consonants to be syllable-initial which were allowed in this position in Vietnamese. This was especially common for the fricatives such as /z, s, v, f/ which were the second member of the two-member codas, i.e., after liquids or nasals. For example, the cluster /lʌ/ was
often produced as [l.ə]. Unlike the final voiced stops in the single coda data, which were often devoiced to conform to Vietnamese phonotactics, the final voiced stops were often epenthesized to fall syllable-initially, similar to the fricatives. This different strategy for the production of voiced stops in two-member codas was probably due to the fact that devoicing the consonant would still not make the coda conform to Vietnamese phonotactics as the coda would still have two members, whereas epenthesis would resyllabify the coda into an allowable L1 structure. This strategy, which appears to be based on L1 interference in terms of not allowing voiced stops syllable-finally, was especially common for Lan. Chinh appears to have less difficulty in producing a two-member coda.

As with the single codas, there is also an effect of the previous phonological environment on two-member coda production. As discussed previously for the single coda data, consonants are not allowed syllable-finally after diphthongs in Vietnamese. It appeared that the participants were transferring this phonotactic rule into their production of English syllable-final consonants as there was a strong likelihood of coda absence after diphthongs. In fact, both members of the coda were typically absent after diphthongs in this data set. Additionally, as in the single coda data, the participants appeared to be perceiving the English low back vowel /a/ as a
diphthong as in English it is produced with longer duration that the Vietnamese equivalent. Similar to the single coda data, this preceding low back vowel also promoted absence of following consonants.

There were also similar results on the production of the liquids as in the single coda data. As mentioned in the discussion of the single coda data, previous research on the production of English codas by speakers of Vietnamese (Osborne, 1996) has suggested that Vietnamese speakers may perceive the articulation of /u/ after a vowel as a glide and therefore co-articulate the liquid with the vowel. In the single coda data, it was found that the participants tended to co-articulate the liquid with the vowel after all vowels with the exception of the low back vowel. The two-member coda data confirms this findings: /u/ is typically co-articulated with the preceding vowel, especially if it is a mid or low central vowel, and typically absent after a low back vowel. In the cases when /u/ begins to emerge in the two-member cluster, it emerges only after a mid central vowel. Interestingly, when the /u/ is co-articulated with the vowel, the second member of the coda is typically produced correctly, possibly because the coda structure is interpreted as a single coda.

Similar to the single coda data, /u/ was also modified based on the preceding vowel in the two-member coda data: After front vowels and diphthongs, it was produced as a rounded back vowel while after a central or unrounded back vowel, it was produced as a nasal. In the discussion of the
single coda data, I suggested that these modifications were possibly due to the liquid being co-articulated with the glide in diphthongs and the tense vowels. After lax vowels, the /l/ is articulated as a [ɛ], which is allowed syllable-finally in Vietnamese. Interestingly, in the two-member coda data this change is more common for Lan than Chinh. While Chinh is able to produce codas with this liquid correctly, for the most part, across time, Lan consistently modifies the liquid across time.

As discussed above, which member of the coda is absent may also be affected by L1 interference effects. For example, if a coda has a member which is allowed syllable-finally in Vietnamese, that member is usually produced, while the other member may be absent. For coda structures which do not contain consonants which are also present in Vietnamese or which cannot be modified via absence, feature change, or epenthesis to conform to Vietnamese syllable structure, other linguistic constraints may affect absence.

Overall, it appears that L1 interference effects may constrain the development of two-member codas in terms of syllable structure, which member is absent, and how the produced consonants are modified if modified. Lan appears to be in the earlier stages of acquisition wherein L1 interference exerts a greater influence on development of codas while Chinh is affected less by L1 interference, perhaps indicating that he is progressing through the stages of acquisition at a faster rate than Lan.
b. Developmental Effects:

Prior researchers (Flege & Davidian, 1984; Hancin-Bhatt & Bhatt, 1997; Hecht & Mulford, 1982; Major, 1987c, Mulford & Hecht, 1980) have found that L1 interference and development effects interact in the acquisition of an L2 phonology. Major (1986, 1987a, 1994) developed the Ontogeny Model to explain this interaction. According to this model, L1 interference is more prominent in the early stages of L2 acquisition. These effects begin to decrease as the influence of developmental processes initially increases, and then decreases as acquisition takes place. This research study confirms this finding: It appears that as L1 interference effects decrease for two-member codas, developmental effects increase at time 2, and then also begin decreasing across time.

One common developmental effect is ‘stopping,’ a type of substitution which Piper (1984) also found to be a common developmental effect for the L2 learners in her study. For example, Chinh produced the cluster /mf/ as [mp], producing both consonants but ‘stopping’ the fricative. Lan, on the other hand, produced the cluster as a single nasal. These two very different productions indicate that while Lan may be affected more by L1 interference, i.e., producing a single nasal which is allowable in Vietnamese, Chinh is able to produce two consonants, which violates Vietnamese syllable structure, while ‘stopping’ the fricative, which is a developmental process.
Another developmental effect is devoicing. Similar to the single coda data, the participants also devoiced voiced consonants which do not exist in Vietnamese, such as the voiced affricates and interdental fricatives. Additionally, the voicing element of the members of the coda also appears to have an effect on acquisition as based on accuracy ratios, which mirrors the acquisition orders for child L1 learners (Jakobson, 1968): For most clusters that had both voiced and voiceless pairs, the voiceless coda had a higher accuracy ratio, indicating that voiceless codas may be acquired before their voiced equivalents. Therefore, L1 interference may explain the devoicing of the voiced stops since the voiceless stops exist syllable-finally in Vietnamese. In contrast, developmental effects may explain why consonants which do not exist in Vietnamese are typically devoiced, as well as the sequence of acquisition based on voicing.

Additionally, as with the single coda data, developmental constraints may be a factor in the higher level of difficulty the participants had with the relatively more difficult consonants such as the palatal fricatives /ʃ, ŋ/, voiced affricate /tʃ/, and interdental fricatives /θ, θ/. As in the single coda data, these consonants were the ones with which the participants had the most difficulty and clusters with these consonants had the lowest accuracy percentages, often remaining at 0% accuracy across time, similar to their accuracy percentages in single codas.
Finally, as in the single coda data, the two-member codas which were comprised of front consonants appear to be acquired before those containing back consonants, as indicated by the higher accuracy percentages of the former. This mirrors the acquisition order found for single codas: front consonants appear to be acquired before back consonants. This acquisition order has been established as a universal developmental process (Jakobson, 1968).

c. Markedness:

In general, the findings from this study does suggest that markedness relations between coda types does play a role in acquisition. As Greenberg (1978) states, two-member codas comprised of two consonants from a similar category, i.e., stop-stop or fricative-fricative, are more marked in relation to consonants from different categories, such as stop-fricative or fricative-stop, which are considered unmarked in comparison. Overall, the data indicate that the participants were able to produce the unmarked codas with more accuracy than the more marked codas. For example, in all three data sets, the voiceless fricative-fricative coda cluster had a lower accuracy rate than any of the following clusters: voiceless fricative-stop, liquid-voiceless fricative, voiceless stop-fricative, nasal-voiceless fricative. In most cases, the voiced fricative-fricative coda also had a lower accuracy ratio than the voiced stop-fricative coda, though it was typically produced with greater accuracy than the
fricative-stop coda. Sequences based on accuracy of production percentages could also be established for codas with stop consonants. The voiceless stop-stop coda was typically produced less accurately than the voiceless stop-fricative, voiceless fricative-stop, liquid-voiceless stop and nasal-voiceless codas. The voiced stop-stop coda was produced with less accuracy than the voiced stop-fricative, nasal-voiced stop though with less accuracy, overall, than the voiced fricative-stop sequence. In terms of the liquid-nasal codas, for all three data collection times, they were produced with less accuracy than liquid-voiceless fricatives and liquid-voiceless affricate codas. In general, they were produced with less accuracy than liquid-liquid codas. At time 1 and 2, they were also produced with less accuracy than liquid-voiced fricative and liquid-voiceless stop codas. For all three data sets, however, they were produced with more accuracy than either the liquid-voiced affricate or the liquid-voiced stop clusters.

The effect of length of coda structures on production is another area of markedness that has been investigated by L2 researchers. Longer coda structures are considered to be less marked than shorter codas. Thus, a coda ending in only one consonant would be considered relatively unmarked in comparison with a two-member coda. Prior research (i.e., Anderson, 1987; Broselow & Finer, 1991; Carlisle, 1991, 1997, 1998; Eckman, 1987, 1991; Sato,
1984; Weinberger, 1987) has found that learners appear to have less difficulty with shorter coda structures. This study had similar findings: Overall, two-member clusters were produced with less accuracy than single coda clusters.

There also appears to be an effect of length and coda type. Prior research (i.e., Carlisle, 1998; Eckman, 1991) has indicated that learners may be constrained in acquiring a longer syllable structure until they have acquired shorter codas with the same constituents. At time three, the two-member codas which were produced with the highest degrees of accuracy were those comprised of voiceless stops, nasals, voiceless fricatives and affricates, and liquids, which were the consonants with the highest levels of production accuracy in single coda form. For example, both Lan and Chinh produced the codas /mp, mt, lt/ at 100% accuracy at time 3; in the single coda data, the 5 consonants which comprise these 3 two-member codas are among the most accurately produced consonants with /p, m, t/ at 100%, 72%, and 76% combined accuracy for Lan and Chinh, respectively. This is without considering the effect of linguistic environment so the accuracy of the nasal is actually 100% after a preceding vowel. Overall, for the most part, there does appear to be an effect of markedness based on coda length and type: The two-member codas produced with the greatest accuracy are comprised of those consonants which are produced with a higher level of accuracy in single coda form.

Additionally, the two-member codas comprised of consonants produced with 0% accuracy as single codas are also produced with 0% accuracy, perhaps
indicating that consonants comprising two-member codas must first be acquired in single coda form before they can be produced as constituents in a two-member coda.

d. Linguistic Environment:

There were similar effects of linguistic environment on production as in the single coda data. First of all, a preceding diphthong strongly promoted absence, which can be explained by L1 interference effects. There is some indication, however, that as time proceeds, Chinh and Lan are acquiring final stops, especially /tv/ and /d/, after diphthongs. For example, the word behind had been produced as [biy.'hoy] at time 1 and 2, was produced as [biy.'hoyd] at time 3. Additionally, as explained above, there was an especially strong effect of a preceding phoneme on the production of a liquid, similar to the effects for single liquids. There were also a number of cases of voicing assimilation with the preceding segment, especially after the co-articulated /tv/. If a voiceless consonant followed this liquid, it tended to be produced with voicing if the liquid was co-articulated.

Furthermore, there was also an effect of following linguistic environment; as for the single coda data, a following pause promoted epenthesis. This was especially common in the interview data since the participants often paused while talking. For example, the coda /ụk/ was
typically produced accurately on the reading data, but was produced as [q] or [n] in the interview data before another consonant or vowel and [.gə] in the interview data before a pause.

e. Data Type:

There also appears to be different production strategies based on the data type, with higher accuracy percentages on the reading data across all coda types. This confirms prior research findings (i.e., Dickerson & Dickerson, 1977; Gathbonton, 1975; Major, 1987) that careful, monitored speech, which may be elicited on a reading task, promotes accurate production in contrast to a more casual and informal speech style, which may be more indicative speech style of the interview data. For example, while the participants are able to produce the nasal-voiceless affricate cluster /nʧ/ 100% accurately across all three reading data sets, both tended to only produce the nasal in the interview data. In other words, while they could produce the nasal-voiceless affricate in careful, monitored production, they typically produced only the nasal in casual, unmonitored speech. In another example, both Lan and Chinh were able to produce the /ʧ/ coda accurately at time 3 in the reading data. In the interview data, however, they produced only the [ʃ] at time 3. Interestingly, the coda was not modified – rather absence, again of the second consonant, was common. This pattern occurred for many of the codas which were elicited in both the reading and the interview data. While the reading
data indicate the stages of development of the codas, including absence of either the first or second member of the coda as well as epenthesis and feature change, the interview data, especially at time 3 where there were more CC tokens in the interview data, had a consistent pattern of absence of the second member. This absence of the second member appears to be a production effect, which like the effect of linguistic environment on coda production, appears to be a secondary constraint on production. That is, while the coda structure may be acquired and exist in the learners' underlying grammar and able to be produced in careful, monitored speech, casual speech promotes absence of the second member of the coda, for a number of reasons. First of all, the learners are not monitoring their speech in the interviews and thus not as careful in producing the codas. Secondly, the absence of a consonant in a cluster is a natural speech phenomenon for native speakers of English as well. As Celce-Murcia, Brinton, and Goodwin (1996) state, in connected speech (i.e., such as the interview data), deletion is a common phenomenon. One motivation for these adjustments in connected speech is ease of articulation. It appears that, at least to some extent, the differences among the production accuracy in the reading and interview data sets can be explained by natural phonological processes in connected speech, rather than being a indicator that the final member of the coda has not been acquired.
4. Summary of Two-Member Coda Findings:

Overall, it appears there are many different linguistic constraints on both the development and production of two-member codas across time. L1 interference appears to constrain which consonants are acquired in the initial stages, and thus produced more accurately. Additionally, L1 interference appears to affect how consonants are modified, as well syllable structure, and which member is absent if the codas are comprised of consonants which are in the L1. Developmental affects appear to constrain the order of acquisition of all consonants, both in terms of voicing (voiceless > voiced) and place of articulation (front > back), similar as for single consonants. Developmental effects may also explain why consonants which do not exist in Vietnamese are typically produced in a devoiced manner, which is similar to the data for the single codas, as this is a common developmental process. The stopping of fricatives may also be explained by developmental effects.

Markedness also appears to affect the acquisition of two-member codas in several ways. Unmarked codas, in terms of length, length and type, and constituents, are acquired before marked codas. Finally, linguistic environment and data type affect the production of codas, with preceding diphthongs and the connected speech in the more unmonitored talk in the interviews promoting coda absence. Therefore, it appears that multiple constraints operate on the acquisition of two-member codas, as well as on
production, which is also subject to second-order constraints such as linguistic environment and data type. These findings will be investigated in more detail in the analysis of the data for the three-member codas.

C. Three-Member Codas

1. Descriptive Statistics:

There were a total of 749 triple consonant clusters. Table 4.11 shows their distribution by production type across time and data type.

<table>
<thead>
<tr>
<th>Time</th>
<th>Time 1</th>
<th>Total</th>
<th>Time 2</th>
<th>Total</th>
<th>Time 3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
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<td>Accurate</td>
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</tr>
<tr>
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<td>100</td>
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<td>135</td>
</tr>
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<td>2</td>
<td>0</td>
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<td>0</td>
<td>28</td>
<td>22</td>
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<td>23</td>
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<td>11%</td>
<td>2%</td>
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<td>31</td>
<td>243</td>
<td>206</td>
<td>53</td>
<td>259</td>
</tr>
</tbody>
</table>

Table 4.11: Distribution of CCC consonant codas by data type, production, and time

Overall, while the accuracy percentiles are fairly low, they do increase over time. However, at all three data collection times, the overall accuracy percentages remain lower than those for two-member codas, which in turn
are lower than those for single codas. Additionally, similar to the single and double coda data, there are several differences in the data for the three-member codas based on data type. Like the other two coda types, the most accurate production percentages are for the reading data. In fact, there is a 0% accuracy in the interview data across all three data sets. Production also differs based on data type. For the interview data, there was typically absence or two types of modifications while for the reading data, feature change was a common modification type. Another interesting point is the apparently large increase in two types of modifications at time 2. This, as well as other details in the data, is best investigated by examining the production of three-member codas by participant. Lan had a total of 371 three-member codas while Chinh had a total of 378 tokens of this type of coda. These findings are outlined in Table 4.12, below.
Table 4.12: Distribution of CCC codas by production type across participant, time, and data type

There are a number of interesting differences in the production of three-member codas by Lan and Chinh. First of all, while both the single and the two-member coda data has indicated that there are production accuracy differences between Chinh and Lan, the data for the three-member codas
clearly indicate significant differences in accuracy across time. While Lan remains at an accuracy between 4 - 10% across time, Chinh is between 17 - 23%, and at time 3, there is a 13% difference in accuracy between the two participants. Secondly, Lan is increasing in production across time. However, Chinh’s data show a U-shaped curve of development; this can partly be explained by the increase in tokens in the interview data at time 2, which results in a lower overall production accuracy. Another difference between Lan and Chinh is that whereas Lan usually has absence for the interview data, Chinh has other types of modifications, indicating that the consonants are beginning to emerge, albeit in a modified manner. Additionally, Chinh has more instances of feature change, which involves only one of the three consonants in the cluster, than Lan, indicating that he is able to closer approximate the CCC clusters than Lan. Conversely, Lan typically has two types of modifications (usually absence and epenthesis to resyllabify the CCC) or absence of one or two members, indicating that she has more difficulty with the structure of three consonants in a row, just as she had with two consonants in a row.

Finally, in terms of the increase in the number of two types of modifications at time 2, it seems to be due to an increase in interview tokens for both Lan and Chinh for a limited type of codas. The production patterns of these codas (liquid-stop-stop, nasal-fricative-fricative, and stop-fricative-
stop for Lan and nasal-fricative-fricative and nasal-stop-fricative for Chinh) at time 2 in the interview data follow the overall patterns for these particular codas in the reading data.

Three-member codas are investigated in more detail in Table 4.13, which illustrates the distribution of individual CCC clusters by production type and time. These production patterns are collapsed across participants.
<table>
<thead>
<tr>
<th>Time:</th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th>Time 2</th>
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<td>Ep</td>
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<td>3</td>
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(continued)

Table 4.13: Distribution of individual CCC clusters by production type
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* = 99%  ** = 101%
Across time, it appears that there is some consistency with which three-member codas are produced. Overall, liquid-fricative-stop, nasal-fricative-stop, liquid-stop-stop, and liquid-nasal-fricative clusters are produced more accurately. Conversely, the clusters with which the participants had the most difficulty were the liquid-fricative-fricative, stop-fricative-fricative, nasal-fricative-fricative, liquid-liquid-stop, nasal-stop-stop, and stop-stop-fricative. All of these clusters, with the exception of the stop-stop-fricative, which has an accuracy percentile of 25% at time 1, have a 0% accuracy of production across time.

2. Individual Coda Analysis:

As with the two-member codas, each coda will be discussed individually, with separate production sequences and percentages given for Lan and Chinh. This facilitates an understanding of which patterns of development and modification exist across three-member codas.

**Liquid - Stop - Stop** — The final stop is a past tense marker.

/pt/ -- Chinh: 33% → 0% → 0%; [pr], [pt] → [pt], [.pa] → [pt]. Lan: 0% across time; [pt], [.pa] → [pt] → [p], [pt]. The liquid is co-articulated with the vowel.
\(/jkt/ -- Chinh: 100\% \rightarrow 67\% \rightarrow 67\%; [jkt], [k] \rightarrow [jkt], [k].

Lan: 0\% across time; [kt] across time.

\(/lp\) -- Chinh: 0\% \rightarrow 0\% \rightarrow 67\%; [lt] \rightarrow [lt], [lpt]. Lan: 0\% \rightarrow 0\% \rightarrow 33\%; [lp], [p], [lpa] \rightarrow [lt], [pt] \rightarrow [lp], [lpt].

\(/kt/ -- Chinh and Lan both 0\% across time. Chinh: [ts] across time. Lan: [uwt], [uw.ta] \rightarrow [uwt] \rightarrow [uwt]. Lan also has difficulty producing the /t/ after a high front vowel, as for the C and CC codas.

**Liquid - Stop - Fricative**

\(/dz/ -- Chinh: 0\% \rightarrow 33\% \rightarrow 0\%; [rz] \rightarrow [rz], [diz] \rightarrow [r]. Lan: 0\% across time; [z] \rightarrow [z], [rz] \rightarrow [r].

\(/ts/ -- Chinh and Lan are both 0\% across time. Chinh: [ts], [s] \rightarrow [z] \rightarrow [s], [z]. Lan: [ts] \rightarrow [t], [s] \rightarrow [s], [ts]. In this coda, the liquid is co-articulated with the vowel.

\(/bz/ -- There were only tokens at time 1 and 3. At time 1, Chinh had 100\% while at time 3 he had 0\% and produced it as [b.z] or [ps]. Lan had 0\% at both time 1 and 3: [bza], [z] \rightarrow [bza].

\(/ps/ -- Chinh and Lan were both 0\% across time. Chinh: [ps] \rightarrow [bz] \rightarrow [bz]. Lan: [ps], [p] \rightarrow [ps], [z] \rightarrow [ps], [p]. The liquid was co-articulated with the vowel in this coda.
/aks/ -- Chinh: 0% → 67% → 33%; [lz] → [iks], [l.kaz] → [iks], [lz]. Lan: 0%
across time and pronounced as [uwz] at all three times.

/adz/ -- Chinh and Lan are both 0% across time. Chinh: [z], [lst] → [lz],
[mz], [n.za] → [lz]. Lan: [owz] → [z], [za] → [lz], [t].

Liquid-Fricative-Stop

/jst/ -- Chinh: 60% → 100% → 25%; [jst] (reading), [jz] (interview) → [jst]
(reading) → [jst] (reading), [st], [jz] (interview). Lan: 20% → 0% → 0%; [st],
[kt], [jst] (reading passage), [jz] (interview) → [st] (reading), [jz] (interview) →
[st] (reading), [jz] (interview). The decrease in accuracy across time for this
coda is due to the increase of the number of these codas in the interview data.
These clusters can be produced accurately in the reading data, but in the
interview data, the cluster is typically reduced to a liquid-fricative cluster.

Liquid-Fricative-Fricative

/jθ/ -- Chinh and Lan are 0% across time. Chinh: [If], [ift] → [If] → [It].
Lan: [If], [Iv] → [It] → [It], [Is].

/jθs/ -- Chinh and Lan are 0% across time. Chinh: [zs], [jzs] → [zs], [jps]
→ [zs], [jps]. Lan: [zs], [jks], [j.ə] → [jst], [z] → [z].
**Liquid-Nasal-Stop**

/\nd/ -- There were only two examples of this coda in the data. At time 2, Lan had absence to [\nd]. At time 3, Chinh produced it with epenthesis, [\nd\da].

**Liquid-Liquid-Fricative**

/\lz/ -- There was only one token in the data. At time 2, Lan produced it as [lz].

**Liquid-Liquid-Stop**

/\ld/ -- Chinh and Lan both 0% across time. Chinh: [\ld\a] \rightarrow [\ld], [\ld\d\a] \rightarrow [\ld], [\ld\d\a]. Lan: [\ld], [\ld], [\ld\a] \rightarrow [\ld], [\ld\d\a] \rightarrow [\ld], [\ld], [\ld].

**Liquid-Nasal-Fricative**

/\nz/ -- Chinh: 20% \rightarrow 40% \rightarrow 100%; [\nz], [nz] \rightarrow [\nz], [nz] \rightarrow [\nz].

Lan: 0% \rightarrow 0% \rightarrow 40%; [nz] \rightarrow [n\za] \rightarrow [\nd], [nz].

/\mz/ -- Chinh: 100% across time. Lan: 0% \rightarrow 0% \rightarrow 33%; [\mz] \rightarrow [m], [m\za] \rightarrow [\mlz], [\mz].

/\mt\a/ -- Chinh: 33% \rightarrow 0% \rightarrow 0%; [\mt\a] \rightarrow [\mt\p], [\mt] \rightarrow [\mt\a].

Lan: 100% \rightarrow 0% \rightarrow 0%; [\mt\a] \rightarrow [\mt] \rightarrow [\mt], [\mt].
Nasal-Stop-Stop

/mpt/ -- Chinh and Lan both had 0% across time. Chinh: [m], [m.d̥] → [mt], [.miy] → [md], [.m̥d]. Lan: [.ma], [.m̥d] → [mt], [m.d̥] → [m], [m.d̥].

/gkt/ -- Chinh and Lan both had 0% across time. Chinh: [gt], [g.d̥] → [g], [ng] → [ng]. Lan: [nt] → [gt] → [n.t], [g.d̥].

Nasal-Stop-Fricative

/mps/ -- Chinh: 0% → 0% → 33%; [mz] → [mz] → [mps], [mz]. Lan: 0% → 33% → 0%; [mz], [mp] → [mps], [mz] → [mz].

/gks/ -- Chinh: 0% → 33% → 33%; [gz] → [gks], [n], [ks] → [gk], [gks]. Lan: 0% → 33% → 0%; [gz] → [gks], [nz], [n.z̆] → [n], [nt], [nz].

/ndz/ -- Chinh and Lan both had 0% across time. Chinh: [nz] → [nz] → [n.z̆], [nz], [n]. Lan: [nz], [n] → [n.z̆], [n] → [nz], [n]. For both Chinh and Lan, in every case that a single nasal was produced, it was in the interview data.

/nts/ -- Chinh: 100% → 0% → 0%; [nts] → [nz], [.n̥] → [n], [nz]. Lan: 0% across time; [n], [nz] → [n], [nz] → [n], [nz].

250
Nasal-Fricative-Stop

/\nst/ – Chinh had 100% across time; Lan: 33% → 100% at time 2 and 3:

\[\text{[nst], [ns]} \rightarrow [\text{nst}]\].

/\gst/ – Chinh: 0% → 100% to time 2 and 3; Lan: 0% → 33% → 100%:

\[\text{[nst], [ns]}, \text{[gst]}.\]

Nasal-Fricative-Fricative

/\n\gs/ – Chinh and Lan both had 0% across time. Chinh: [n.daz] → [ns],

\[\text{[n], [nts]} \rightarrow [\text{nz}].\] Lan: [ns], [nts] → [ns], [nt], [n] → [nz], [nθ]. For both Chinh and

Lan, the single nasal was produced only in the interview data.

Nasal-Affricate-Stop

/\n^/ – Chinh: 0% → 0% → 25%. [n^] → [n^] → [n^]. Lan: 0% across time; [n^] → [nt] → [n^]. For the most part, the past tense marker was

absent across time.

Stop-Stop-Fricative

/\kt\ / – Chinh: 50% → 0% at time 2 and 3; [kt\], [ts] → [ks], [st] → [kst].

Lan: 0% across time; [s], [f\a] → [s] → [t], [s].

Stop-Fricative-Fricative

/\t\theta/s/ – Chinh and Lan both had 0% across time. Chinh: [t\as] → [ts],

[t\as] → [ts]. Lan: [ts], [t\as] → [s], [f\], [f\a] → [ts], [t], [s].
Stop-Fricative-Stop

/dst/ -- Chinh: 0% → 33% → 0%; [st] → [st], [l], [dst] → [st]. Lan: 0% across time; [ts], [t] → [t], [st], [s,t,] → [st], [t].

/kst/ -- Chinh: 17% → 0% → 20%; [k], [ks], [st], [kst] → [s], [ks] → [kst], [ks], [k], []. Lan: 0% across time; [ks] → [ks], [k,s,], [k,sa] → [ks], [k], [k,sa].

Fricative-Stop-Fricative

/sks/ -- Chinh: 0% → 20% → 60%; [ks], [st] → [sk], [s], [ps], [sks] → [sks], [s], [sk]. Lan: 0% across time; [s] → [s] → [s], [t].

/sts/ -- Chinh and Lan 0% across time. Chinh: [st], [ts] → [ts] → [ts], [s].
Lan: [s] → [s] → [s], [st].

3. Discussion:

There were similarities between the findings for the CCC data and that for both the single and two-member consonant codas. First of all, the clusters which are produced with a higher accuracy for CCC codas are comprised of consonants which are produced more accurately as single as well as two-member codas, overall. These are the codas containing nasals, voiceless stops, and voiceless fricatives. In other words, it appears that the participants are producing CCC codas more accurately if they have already begun acquiring their constituent members as C or CC codas. Additionally, similar to the single and two-member coda data, the codas containing the interdental
fricatives, voiced affricates, and voiced palatal fricatives had the lowest accuracy ratings overall, indicating that these are the consonants with which the participants had the most difficulty.

Several patterns can be noted for production modifications and absence. For nasal-stop-fricative and nasal-fricative-stop clusters, and similar codas beginning with a liquid, the stop may be absent while both the nasal and fricative are produced. In clusters with two members of the same category, such as liquid-stop-stop or liquid-fricative-fricative, the medial member of the coda is typically absent while the initial and final member of the codas are typically produced, even though the final member may be a bimorphemic marker. The stop-fricative-stop and fricative-stop-fricative codas are overall more difficult and tend to be modified in more random patterns.

The absence patterns for CCC codas can partly be explained by markedness as defined in terms of sonority (see below) as well as by articulatory ease (which in itself may be explained by sonority). In fact, many native speakers reduce CCC codas in similar ways: As Celce-Murcia et al. (1996) state, native speakers often delete medial /t, d/ when it occurs between two consonants. However, it is important to note that many of the CCC modifications, while including the medial alveolar stops, also extended to medial fricatives and other medial stops, which are not typical for native speakers of English. The high rate of absence of the medial consonant may
also be due to the fact that this consonant has the least auditory salience, and it may be difficult to produce. In fact, after beginning to acquire the final consonant in the cluster, which is typically a grammatical marker, the participants may be expending greater articulatory energy on producing this final element, along with the first consonant in the coda, which also has perceptual salience in initial position. As a result, the medial consonant, which may have the least salience auditorily, is often lost.

This brings up the question of the role of grammatical conditioning. In the single coda data, it was found that overall, bimorphemic codas were more likely to be absent than monomorphemic codas. In the two-member coda data, it was found that past tense markers tended to be absent while plural markers tended to be produced. The CCC data in part confirm these findings. Overall, the plural markers tended to be produced in CCC codas as well. The data also indicate that past tense markers are in the early stages of being acquired, which confirms the findings for both C and CC codas. For example, at time 1, the past tense marker was absent at times while at later stages, i.e., time 2 and 3, the past tense marker was typically produced, while the medial member of the cluster was absent at times.

Following is a more detailed discussion of the CCC data, with an examination of the linguistic constraints which appear to operate on the acquisition and production of these types of codas.
a. L1 Interference:

As with the CC data, L1 interference effects also appear to constrain the development of CCC codas, though it appears that Lan is more affected by L1 interference. Chinh, on the other hand, is more likely to build on his emerging L2 repertoire, and appears to be less affected by L1 interference.

One way in which L1 interference effects appear to constrain the development of CCC codas is in the higher production accuracy of codas which contain consonants that also exist in Vietnamese, especially those allowed syllable-finally in Vietnamese. This is similar to the effects of L1 interference for C and CC codas. As with the C and CC codas, the CCC codas which were produced the most accurately were comprised of voiceless stops, nasals, and voiceless fricatives and affricates. For example, at time 3, both Chinh and Lan produced the clusters /nst, ´gst/ with 100% accuracy. Additionally, the codas /iks, ks, ŋks, ŋst, jst/, which have begun emerging in Chinh’s speech, but with lower accuracy percentages (i.e., ranging from 20 - 33%), are also comprised of voiceless stops, alveolar fricatives, nasals, liquids, and the voiceless affricate. While these interference effects are not straightforward, since CCC codas do not exist in Vietnamese, it is significant that across all coda types and lengths, the codas with which the participants have the least difficulty are those containing consonants which also exist in Vietnamese, and for the most part, are allowed in syllable-final position in Vietnamese. Of course, it is also likely that the participants are building on
their emerging L2 repertoires after first making equivalence classifications between the L1 and L2, and in effect, transferring those L1 consonants into their emerging L2 phonologies which are similar to L2 consonants, such as the nasals, and voiceless stops, fricatives, and affricates.

Another effect of L1 interference is that some CCC codas are produced in a manner which conforms to an acceptable L1 syllable structure. This is more prevalent for Lan than Chinh. For example, Lan is more likely to produce the CCC clusters as a single consonant and she is also more likely to employ two types of modifications, i.e., absence and epenthesis, in order to resyllabify the CCC syllable structure into one which is acceptable in Vietnamese. This indicates that she is relying on the L1, to some extent, in producing CCC clusters. For example, for the cluster /tθs/, Chinh always produced two consonants across time, though he does employ epenthesis at time 1 and 2. He initially produced the cluster as [.tas], which does indicate some L1 interference effects because of the resyllabification of the coda to a CVC structure. At time 2 and 3, however, Chinh has begun to produce the cluster as [ts], indicating he is building upon his emerging L2 repertoire, as he is beginning to produce this CC coda accurately as well. Lan, on the other hand, has more difficulty with the cluster. She typically produces a single stop, fricative, or affricate in place of the CCC. This seems to indicate that overall, she has more difficulty with longer, and more complex clusters, and favors a Vietnamese syllable structure, even though she is in effect building
on her emerging L2 repertoire by producing the voiceless fricative syllable-
finally. These patterns exist across other CCC structures, such as /skʃ, stʃ/, with which both Chinh and Lan have difficulty. However, while Chinh is able to produce two and even three consonants in a row, Lan still tends to produce only one consonant, typically the voiceless fricative. Again, it appears that while she is beginning to acquire the voiceless fricative in syllable-final position, she still has trouble with syllable structures beyond a single coda, an indication of L1 retention. Therefore, while L1 interference appears to affect L2 development, it does seem that Lan has more L1 retention, overall, than Chinh. In summary, L1 interference effects do appear to constrain the development of those codas which contain consonants which exist in Vietnamese, and can be modified, via absence and epenthesis, towards an acceptable L1 syllable structure.

b. Developmental Effects:

As in the CC data, Chinh’s development of CCC codas appeared to be affected by L1 developmental effects, though not to a great extent, while Lan appeared to be affected to a greater extent by L1 interference. Similar to the CC data, Chinh had examples of stopping and devoicing in his data while Lan overall did not. For example, Chinh co-articulated the vowel in the coda /sʦz/ and devoiced the stop and fricative to [ps] while Lan produced the liquid plus fricative with epenthesis, which more closely resembles an allowable
Vietnamese syllable structure. Additionally, for the cluster /jʊ/, Chinh tended to produce all three consonants, but 'stopped' the interdental fricative, producing it alternately as either [p] or [t]. Lan, on the other hand, often reduced this cluster to a two-member coda, with epenthesis at time 2.

Similar to the findings for C and CC codas, developmental effects also appear to constrain acquisition orders for both Lan and Chinh. As noted earlier, the most difficult type of coda, regardless of length, contained voiced affricates, palatal fricatives, and interdental fricatives, and typically these codas remained at 0% accuracy across time. These consonants are also acquired late by native speakers of English. For the C and CC codas, it was also found that voiceless codas appear to be acquired before voiced codas, which may also be a developmental effect. However, this phenomenon was difficult to ascertain for the CCC codas since most of them were comprised of voiceless stops and fricatives. Additionally, for the other codas it was also found that front consonants were acquired before back consonants, which may also be a constraint based on developmental effects. Again, it was difficult to determine whether these constraints operated on the CCC codas as most codas were comprised of both front and back consonants simultaneously. Therefore, the effect of voicing and place of articulation could not be determined for CCC codas.
c. Markedness:

There are several markedness effects which can be observed in the data: 1) type, 2) length, 3) length and type, and 4) sonority. Each will be discussed separately below.

As noted earlier, some three-member codas are more marked, and thus may be more difficult to acquire, than others (Greenberg, 1978). For example, codas consisting of a stop-stop are more marked than fricative-stops and stop-fricatives. Fricative-fricative codas are also more marked than stop-fricative and fricative-stop codas. Overall, the participants do have more difficulty with the more marked codas. For example, both the liquid-fricative-stop and liquid-stop-fricative codas had higher accuracy percentages than liquid-fricative-fricative codas. Additionally, the nasal-stop-fricative and the nasal-fricative-stop codas had higher accuracy percentages than nasal-fricative-fricative codas. In fact, the clusters with which the participants had the most difficulty were the liquid-fricative-fricative, stop-fricative-fricative, nasal-fricative-fricative, liquid-liquid-stop, nasal-stop-stop, and stop-stop-fricative codas. All of these clusters, with the exception of the stop-stop-fricative coda, which has an accuracy percentile of 25% at time 1, have 0% accuracy of production across time. These clusters have a common feature: They are all comprised of two consonants of the same category in a row. Clusters comprised of a fricative-fricative sequence seem particularly difficult for the participants. In fact, with the exception of the liquid-stop-stop cluster, which
has a 29% accuracy percentage at time 3, all clusters with two members of the
same category are more difficult than clusters comprised of a fricative-stop
sequence or stop-fricative sequence.

In terms of markedness defined by length, this study also confirms
prior research (Anderson, 1987; Broselow & Finer, 1991; Carlisle, 1991, 1997,
1998; Eckman, 1987, 1991; Sato, 1984; Weinberger, 1987) that has shown that
learners modify longer codas in favor of shorter, and less marked, codas, and
have higher accuracy ratings on shorter codas. The high percentage of
absence across time for both participants provides clear evidence that more
marked (i.e., longer) codas were modified, resulting in a shorter, and less
complex, coda structure. Additionally, in comparing the production
accuracies of the C, CC, and CCC data, it is clear that the longer and more
complex codas are produced less accurately across time than shorter codas.
Single codas have a higher accuracy percentage than two-member codas,
which in turn are produced more accurately than three-member codas.
Therefore, this study does confirm prior findings that markedness, defined by
length, is a factor in the production of syllable codas.

As discussed previously, there is also an effect of length and coda type.
Prior research (i.e., Carlisle, 1998; Eckman, 1991) has shown that learners may
be constrained in acquiring a CCC syllable structure until they have acquired
its constituent C and CC syllable codas/onsets. In other words, there appears
to a clear developmental sequence in that a longer coda/onset does not
appear to be acquired until its constituents have been acquired in shorter coda structures. In most cases, the CCC codas that were produced correctly were those whose constituent consonants had begun emerging in coda position in both single and two-member codas. As mentioned above in the discussion of L1 interference, the codas which were produced the most accurately were comprised of voiceless stops, nasals, and voiceless fricatives and affricates, which were the consonants that were produced most accurately in the single coda data and as two-member codas. This may be partly due to L1 interference effects. However, this phenomenon can also be extended to codas containing a consonant(s) which does not exist in Vietnamese such as the voiceless affricate in /ŋŋ/, which has begun emerging in Chinh’s speech. This coda was produced with 25% accuracy for Chinh at time 3, (0% for Lan). In CC form, Chinh produced /ŋŋ/ with 100% accuracy and /ŋŋt/ at 40% at time 3, while in single coda form, he produced /n/ with 89% accuracy, /n/ with 76% accuracy, and /ŋ/ with 57% accuracy at time 3.

Overall, Chinh is also able to produce more CCC with higher degrees of accuracy than Lan, possibly because he is able to produce the constituent two-member clusters with greater accuracy. For example, at time 3, Chinh also produced /ɔmz/ with 100% accuracy. Additionally, the clusters /mps, pkt/ are produced with 67% accuracy and /skps/ with 60% accuracy. These codas are comprised of two-member codas which Chinh also produces with a higher degree of accuracy at time 3: /ɔm/ - 100%; /ɔmz/ - 83%; /ɔmp/ - 100%; /ɔps/ - 100%;
/kl/ - 25%; /sk/ - 67%; /ks/ - 50%. While the cluster /sk/ has 0% accuracy in
production at time 3, there is an effect of preceding phonological
environment, so it is difficult to compare this cluster against the CCC data. In
fact, even the clusters with a lower accuracy percentage for Chinh are also
comprised of CC codas which have begun emerging as well.

Therefore, it appears that there is an order of acquisition in that CC
codas are not produced accurately until their constituent member have begun
to be acquired as single codas. Additionally, CCC codas are not produced or
acquired until their constituent single and CC codas have begun to be
acquired. This confirms research by Eckman (1991), who also found that in
98% of the cases of his data, if the three-member coda had been acquired, then
the two-member codas which comprised the CCC coda had already been
acquired. This is also supported by research on onsets by Carlisle (1998).

We can also extend the comparison between the production of C, CC
clusters with the production of CCC clusters to examine the resulting coda
when a CCC coda is modified. In most cases, when modification occurs, the
result is a CC coda which has begun being produced with some accuracy. This
is especially true for Chinh, who tends to modify CCC clusters in favor of a
CC cluster while Lan often modifies the cluster to a single coda or two-
member coda with absence and epenthesis. For example, the cluster /ndz/ is
commonly produced as [nz] rather than [nd], even though the final consonant
is a plural marker, and thus a separate morpheme. The nasal-fricative cluster is produced with some degree of accuracy while the nasal-stop cluster has 0% accuracy across time.

Finally, there also appears to be an effect of markedness defined by sonority in terms of absence within a CCC coda. As Carlisle (1997) states, absence may be more dominant in codas which violate the Universal Canonical Syllable Structure (UCSS). Margins meet UCSS if “there is a continuous rise in sonority from the most peripheral member of both structures through the nucleus of the syllable” (Carlisle, 1997, p. 334). The order of sonority for consonants is as follows, from the most sonorous to the least sonorous: liquids > nasals > fricatives > stops. This means that a nasal-fricative-stop coda would not violate the UCSS since the syllable coda decreases in sonority in a rightward direction, i.e., moving away from the syllable nucleus. On the other hand, the cluster nasal-stop-fricative would violate the UCSS since there is an increase in sonority from the stop to the fricative consonant. As previous research has indicated, learners tend to have less difficulty with clusters that do not violate the UCSS (Carlisle, 1991; Tropf, 1987). This study also found that with only one exception (i.e., /iks/, which Chinh produced accurately) all the clusters with which the participants had the least difficulty in the CCC codas did not violate the UCSS. In other words, the codas that emerged first did in fact meet the UCSS. Additionally, in cases where the CCC violated the UCSS, the codas were often modified in
favor of a coda which did meet UCSS. For example, both liquid-stop-fricative and nasal-stop-fricative codas tended to have absence of the stop consonant, even though the fricative is a bimorphemic plural marker and the stop was part of the monomorpheme. This resulted in a liquid-fricative and nasal-fricative coda, respectively, both of which do meet the UCSS.

In summary, markedness effects appears to constrain the development of CCC codas in terms of type, with less marked codas emerging before marked codas, as well as length, with shorter codas emerging before longer coda. Additionally, the length and type of codas is also an important element of development, as it appears that a longer coda does not emerge in the participants’ L2 phonology until shorter codas with similar constituents have begun to be acquired. Finally, sonority, as well as ease of articulation, may have an effect on which member of a CCC coda is absent.

d. Linguistic Environment:

There is also an effect of linguistic environment for CCC codas. These effects are similar to those for C and CC codas. The most notable effects are modification of /u/ to [n] after a rounded back vowel (both Lan and Chinh exhibited this pattern) and modification to [uw] after a high front vowel, a pattern that was only found for Lan, similar to the CC data. The liquid /j/ also tended to be co-articulated with a low central vowel, and began to emerge after a mid-central vowel, which follows patterns for both the C and the CC
data. There were no cases of a CCC coda following a diphthong, so the effect of a preceding diphthong on the production of CCC clusters could not be determined. However, it is likely that a preceding diphthong would also promote absence for this type of coda. Finally, there were few cases of epenthesis in the data. In the C and CC data it was found that epenthesis was promoted by a following pause in connected speech such as the interview speech. The lack of epenthesis in the CCC data set could be due to the fact that this data came mostly from the word list in the reading data, a speech style which does not appear to promote epenthesis. Therefore, data type could also be seen as affecting epenthesis, or lack therefore, as in this case, as in the C and CC data.

e. Data Type:

As in the C and CC data, there was an effect of data type on production of CCC codas. There was a much higher percentage of absence for the interview than the reading data. In addition, no CCC codas were produced accurately in the interview data. There are two factors involved in this: First of all, the accuracy of the CCC data was low and the participants had difficulty with most of the CCC codas in both the reading and the interview data. Secondly, even though a coda could be produced correctly in a careful, monitored speech style such as the reading data, this same coda still tended to be produced inaccurately in the interviews as the participants were possibly
not monitoring their speech as carefully in this more casual speech style. This confirms the prior findings for both the C and the CC data, as well as prior research on speech style that careful speech styles promote accurate production while casual speech styles promote absence and modification (Dickerson & Dickerson, 1977; Gathbonton, 1975; Major, 1987). For example, while Chinh was able to produce the cluster /sti/ correctly in the reading data, he reduced the cluster to [z] in the interviews. The same pattern exists for both Lan and Chinh for the cluster /ndz/: While both of them were able to produce this cluster accurately in the reading data, both reduced the cluster to a single nasal in the interviews. When they previously modified this cluster they usually produced a nasal-fricative. This pattern follows the production pattern for the CC data: The modification in the interview data typically results in a single consonant while in the reading data, the cluster is either produced correctly or modified in favor of a CC coda. Therefore, the modifications in the interview data appear to be related to production constraints, rather than an indication of a stage of development.

4. Summary of the Three-Member Coda Findings:

In conclusion, the data for CCC codas indicates that L1 retention, especially for Lan, exerts an influence on the development of CCC codas. However, both participants are beginning to build upon their emerging L2 phonologies, and L1 interference effects do appear to decrease across time.
For Chinh, developmental effects such as stopping and devoicing also appear to play a role. Additionally, developmental effects appear to constrain the sequence of development of codas in that codas containing the voiced affricate, interdental fricatives, and palatal fricatives appear to be acquired later as well, which is the case for native speakers as well. Markedness also appears to exert a strong effect on both the development of individual CCC codas across time, and the production of these codas within time, based on type, length, and sonority.

D. Four-Member Codas:

1. Descriptive Statistics:

There were 54 tokens for four-member codas in the data, and in each case, the tokens were elicited on the word list. Lan and Chinh each had a total of 27 CCCC codas. The findings are outlined in Table 4.14.
### Table 4.14: Distribution of CCCC codas by production type and time.

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<th>Lan</th>
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<td>18</td>
<td>9</td>
<td>9</td>
<td>18</td>
</tr>
</tbody>
</table>

As Table 4.14 indicates, there was 0% accuracy in production for CCCC codas across time. Overall, absence was the most common production modification although two types of modifications were also common. Additionally, the data were similar for both Lan and Chinh although Lan tended to have more modifications for the codas and Chinh tended to have absence.
2. Individual Coda Analysis:

The sequence of development for each CCCC coda type is shown below for Lan and Chinh, respectively. Percentages are not given as they remain at 0% across time for all CCCC codas.

/kstθ/ — Chinh: [k], [θh] → [kθ], [θh] → [θ], [k]. Lan: [θ] across time.

/Îfθs/ — Chinh: [lt] → [lf], [l.tas] → [ls], [lf], [lf.tas]. Lan: [lf], [l], [ls]
→ [l.tas] → [l.tas].

/Îdz/ — Chinh: [dz] → [dż] → [dz]. Lan: [dz] → [dż], [dz] → [j], [dz].

3. Discussion:

Both Lan and Chinh appear to have more difficulty with the stop-fricative-stop-fricative cluster, which resembles their greater difficulty with both stop-fricative-stop and fricative-stop-fricative clusters. The alternation between these two classes of consonants may be more difficult articulatorily, which helps explain the almost consistent absence of three consonants in this cluster across time. Interestingly, both Lan and Chinh tend to produce only a [θh] for this cluster, which I believe is their modified attempt to produce the interdental fricative due to its perceptual salience as the final member of the cluster, rather than the retention of the medial stop consonant. The production of the interdental fricative as a strongly aspirated voiceless alveolar stop is similar to their production of the interdental fricative in
other codas, and helps to reinforce the idea that the participants tended to produce the initial and final consonants in longer clusters due to the perceptual salience of these consonants.

For the liquid-fricative-fricative-fricative coda, both Lan and Chinh produced the liquid across time initially followed by the first fricative, which is similar to their production strategy for the /ft/ coda, which is initially typically produced as [If]. Furthermore, similar to the CCC coda, once the interdental fricative begins to be produced, in both cases as [th], and the plural marker is produced, the first fricative is often absent and instead a three-member coda consisting of the liquid, stop, and final fricative is produced, often with epenthesis to break up the complex coda structure. This indicates that as acquisition takes place, it may first be in an incremental manner, with the first then second and then third member of the coda acquired in a successive manner. However, the consonants on the margins of the coda structure appear to have more perceptual salience, and so once those begin to be produced, the medial member, often a more marked consonant, is absent. Chinh is able to produce four consonants by time 3, but still modifies the interdental fricative to a stop and employs epenthesis between the last two consonants in order to break up the structure.

Finally, in terms of the liquid-liquid-stop-fricative cluster, both Lan and Chinh produce the initial liquid and the final fricative, a plural marker, while often having absence of the second liquid and the medial stop. This is
similar to their modifications of the /ldz/, which was produced as a liquid-fricative. Similar to other CCCC codas, the consonants in this coda which tended to be produced are the first and final, while the medial consonants, possibly not as perceptually salient, were absent.

Overall, it also appears that the participants are building on their emerging L2 repertoire in producing and modifying the CCCC codas. For example, they tend to modify the /ldz/ coda to [lx], a CC coda they can produce correctly when the effect of the co-articulation of the liquid with the vowel is not considered. Similar to the /lfθ/ coda, the learners are also producing the first fricative and modifying the interdental fricative to a stop in the initial stages of development. However, as more members of the coda begin being acquired, the participants utilize a similar strategy of production as for the CCC codas in producing the first and the final member of the cluster. Possible explanations will be offered for these patterns in the following discussion of linguistic constraints.

a. L1 Interference:

Overall, the effect of L1 interference appeared to be lesser for the longer codas than for the shorter coda structures. The modification of the /ksθ/ coda to a single voiceless stop, which is allowed syllable-finally in Vietnamese, does indicate that at least for this coda, L1 interference has an effect (however, this may interact with developmental effects, as explained below).
typical modification of this stop-fricative-stop-fricative to a single consonant resembles the participants' production strategy for the fricative-stop-fricative and stop-fricative-stop codas, and indicates that the learners have difficulty building upon their emerging L2 repertoires for this coda as it has not been acquired as a CCC coda. The stop-fricative and fricative-stop CC codas have begun emerging, but while they can be produced accurately at times, they are often modified to a single consonant. Therefore, it may be difficult for the learners to build on their existing L2 repertoire for this coda as its component CC and CCC codas are still in the process of emerging in the L2.

b. Developmental Effects:

There were also few instances of developmental effects for these codas; the more difficult interdental fricative, which is developed later for child learners of English, was also the consonant with which the learners had the most difficulty in these codas, as in other coda structures. Similar to the other codas with this members, this consonant was often 'stopped', a common developmental process, and produced as an alveolar stop rather than a fricative.

c. Markedness:

As with the CCC codas, markedness appears to have a significant effect on both the development and the production of the CCCC codas. First of all,
in terms of length, there is an effect as these longer codas are produced with less accuracy than CCC codas, etc. This again confirms research by Anderson (1987), Broselow and Finer (1991), Carlisle (1991, 1997, 1998), Eckman (1987, 1991), Sato (1984), and Weinberger (1987) that longer clusters are produced with more difficulty than shorter clusters, and that these longer clusters are often produced with absence in favor of a shorter, and thus less marked, cluster.

In terms of length and type of coda, as with the CCC codas, there is some evidence that the CCCC codas only begin being acquired after their constituent C, CC, and CCC codas have already begun emerging in the learners' L2 repertoire and have achieved a higher degree of accuracy than the longer codas which they comprise. This also confirms prior research by Carlisle (1998) and Eckman (1991).

Finally, there does also appear to be an effect of sonority on member absence for the CCCC coda, similar to the CCC codas. Both the stop-fricative-stop-fricative and the liquid-liquid-stop-fricative codas violate the UCSS. When produced, the liquid-liquid-stop-fricative coda is typically modified to a liquid-fricative or liquid-liquid-fricative, both of which do meet the UCSS. Similarly, the stop-fricative-stop-fricative coda was produced as a single stop, which also meets UCSS. As for the liquid-fricative-fricative-fricative cluster, the most marked member, the interdental fricative, is the member which is either modified or absent, which may also be a markedness effect.
d. Linguistic Environment:

The CCCC codas were all preceded by lax vowels which had previously been shown to have no effect on syllable coda production. Therefore, the effect of linguistic environment could not be determined for the CCCC data.

e. Data Type:

All the data for this coda type were solicited from the word list, as none occurred in the interview data; therefore, the effect of data type could not be determined for CCCC codas.

E. Summary of Linguistic Constraints Findings:

There are a number of common findings across all four coda types. First of all, confirming prior research (Altenberg & Vago, 1987; Benson, 1988; Broselow, 1987; Flege & Davidian, 1984; Hancin-Bhatt & Bhatt, 1997; Hodne, 1985; Major, 1987a; Major & Faudree, 1996; Sato, 1984; Tarone, 1976, 1980, 1987; Vago & Altenberg, 1977; Weinberger, 1990), L1 interference effects appear to be a primary factor in the development of codas, especially at the beginning stages as may be evidenced at time 1. L1 interference effects influence the development of the consonants that already exist in the learners' L1 repertoire, in that the consonants that are allowed syllable-finally in Vietnamese, nasals and voiceless stops, have a high accuracy percentage. In fact, for all coda structures, codas with these elements are produced more
accurately than any other codas. Also, L1 interference affects the emerging syllable structures of the L2, as the participants employ different production modifications such as feature change, epenthesis, and absence, in order to modify L2 codas to an acceptable L1 syllable structure. Those consonants which exist in Vietnamese in syllable-initial position are typically epenthesized, resulting in an acceptable Vietnamese syllable structure.

Finally, L1 interference also affects the production of final consonants as a preceding diphthong promotes absence, as in Vietnamese, and liquids are modified, or co-articulated, based on the preceding vowel. However, L1 interference, while still a dominant factor in the production of both C and CC syllable structures, do not appear to have as strong an effect on the development of CCC and CCCC structures. The exception to this is Lan, who appears to still rely on the L1 to some extent in modifying the longer clusters, indicating that L1 retention is more common for her than for Chinh.

Developmental effects and markedness also appear to constrain the development of English syllable codas for speakers of Vietnamese. Developmental effects may influence the acquisition and production of the English consonants which do not exist in Vietnamese for all coda types. Similar to previous research, (i.e., Flege & Davidian, 1984; Hecht & Mulford, 1982; Major, 1987a, 1994; Mulford & Hecht, 1980; Piper, 1984), this research project also found that developmental effects promoted obstruent devoicing and fricative 'stopping', and that developmental effects were more dominant.
as interference effects decreased (cf. Major, 1987a, 1994), as illustrated by Chinh’s data set. Additionally, this research also found that developmental effects constrained the sequence of development of English consonants as the participants appeared to acquire English consonants in the same sequence as children learning English as a native language, in that front consonants were typically acquired before back consonants and voiceless consonants before voiced consonants (cf. Jakobson, 1968). Furthermore, those consonants which are acquired later for children learning English as a native language, such as the interdental fricatives and voiced affricates, were also acquired later for the participants, which is also indicative of developmental effects.

Markedness may affect the development of codas based on length, as well as length and type, and sonority. Not only are shorter, and thus less complex and less marked, codas produced more accurately than the longer, and thus more complex and more marked codas, but a clear developmental sequence can be established: C > CC > CCC > CCCC. Additionally, longer codas are typically modified in favor of shorter, and less marked, codas, confirming prior research (Anderson, 1987; Broselow & Finer, 1991; Carlisle, 1991, 1997, 1998; Eckman, 1987, 1991; Sato, 1984; Weinberger, 1987). This can be analyzed even further as it is also clear that the type of consonant within each coda combined with length has an effect on development: A longer coda does not appear to be produced with some accuracy until shorter coda structures containing the same consonants have begun being acquired. This
also confirms prior research (Carlisle, 1998; Eckman, 1991). Additionally, if modified (i.e., via absence) a longer coda is usually modified in favor of a shorter coda which has begun to be acquired.

There also appears to be some effect for sonority in terms of which codas are more easily produced and how a coda is modified: Codas which violate the Universal Canonical Syllable Structure (UCSS) are produced with less accuracy than those which do not. Additionally, these codas are also often modified in favor of a coda which does meet the UCSS, confirming prior research by Carlisle (1991) and Tropf (1987). Ease of articulation also appears to be a major factor in the production of longer codas, which are often reduced to a less articulatorily complex coda (one which has been more easily acquired as a shorter coda), by the elimination of the medial consonant or more marked consonant. The consonant which violates the UCSS is typically the one which is absent. In codas which do meet the UCSS, the medial consonant, often the least perceptually salient, is typically absent, since the consonants at the edge of the coda are typically more auditorily salient.

Furthermore, this research project confirms prior findings (Benson, 1988; Hodne, 1985; Sato, 1984, 1985; Tarone, 1976, 1980, 1987) that there is no preference for an open, or CV, syllable structure. In fact, the preferred syllable structure, especially in the beginning stages of development, is a single coda structure, similar to the preferred Vietnamese syllable structure.
In terms of the role of grammar in the development of the codas, it appears that if the bimorphemic grammatical marker is analyzed grammatically, it is typically absent. This is especially the case in single codas. However, once the grammatical marker has begun being acquired, it appears to be analyzed phonologically, and as the last member of the coda, it is typically produced while the medial member may be absent. Overall, it does appear that the learners have acquired the plural marker, and are in the process of acquiring the past tense marker.

Additionally, the learners appear to be following a U-shaped curve of development (Kellerman, 1985) in that in the initial stages of acquisition, the codas are produced accurately, to some extent. However, the codas may only be memorized as formulaic chunks, especially if they are comprised of similar consonants as those which exist in the learners' L1. As acquisition proceeds, accuracy decreases, which is notable at time 2 in the data. Across time, accuracy again increases, which is illustrated by the slightly higher level of accuracy at time 3. Furthermore, the low accuracy percentages, and at times slight changes in percentages across time, does not indicate that the development of codas is not taking place. In fact, even when there is 0% production accuracy across time, there are notable developments in the production of these codas across time, indicating that the learners are in the beginning stages of development of these codas even though they cannot produce them with 100% accuracy.
Finally, it appears that there are two levels of constraints operating on the development and production of syllable codas. There are primary linguistic constraints such as L1 interference, developmental effects, and markedness, which appear to operate on the development, or acquisition, of the coda structures across time. These constraints are considered to be primary since they affect acquisition and development, i.e., which consonants are acquired, in what order, and how consonants are modified across the stages of development. There are also secondary effects, which are production effects. They include the effect of preceding linguistic environment (which is also an effect of L1 interference) and data type. These effects are considered to be secondary since they appear to operate on the coda after the primary effects have already affected the coda structure. For example, even though a coda structure may be produced accurately in the reading data, and thus appear to be acquired to some extent, secondary effects such as a preceding diphthong, or data type (i.e., connected, unmonitored speech) may promote absence, or modification of the coda which otherwise could be produced accurately.

The question of which social constraints affect the development of syllable codas and to what extent remains to be addressed. This is examined below in the analysis of the social data.
Social Data Analysis:

A. Description of the Social Context across Time:

A description of the overall social context and factors that affect each participant at all three linguistic data collection times will be discussed, followed by an analysis of specific social constraints such as social identity, social interactions, acculturation, affective variables, and investment. Throughout this section, verbatim quotes from the interviews will be used in order to both present the participants' own voices and also to provide more examples of their language use at each of the linguistic data collection times.

1. Spring (March):

At this stage, Lan's interactions in English are fairly limited as she is surrounded by Vietnamese work mates at her job in the nail salon. Even though her customers are not Vietnamese, the majority of them are Mexican, and like Lan herself, have limited English communication skills. While she talks with her customers (in fact, her boss requires all the employees to converse with their customers while doing their nails), her communication is restricted as she has difficulty expressing her ideas, and also understanding the English her Mexican customers speak. She also has an additional difficulty -- as she is new at being a nail technician, she also experiences problems in performing her job well. Coupled with the need to speak English, the work environment is pressure-filled for Lan, and she is
often stressed about her lack of English skills. She is also under increasing pressure from her boss to speak more English with her customers, and this pressure fuels her anxiety, culminating in her switching nail shops in late April. As she says:

I have just nail technician because my owner talk talk me and why why you don’t talk customer... are you nervous... are you afraid customer... sometime I ... yeah...because I am talk a little bit... speaking English with customer... sometime I ... I made in ... I make I make no good... no good... I... control machine... yes because I worry.... I nervous in talk customer.

She often feels frustrated at work due to her limited English skills partly because of the pressure from her boss to have ‘small talk’ with the customers. Lan must talk to her customers about nail diseases and fungi, but does not feel that she has the vocabulary or the grammatical structures to communicate her ideas. She forces herself to try to communicate with them, but her experiences are not usually successful because: “I don’t understand American with a customer because I talk... vocabulary no sentence no structure... I can’t explain I can’t explain their understand nail and disease... I speak vocabulary... no sentence no structure sentence... customer don’t understand and I don’t understand them... I think it is bad experience” These experiences are very depressing and discouraging for Lan, and she breaks down crying when she relates them. Her strategy is to memorize sentences to
use with her customers, and to write down her sentences so her customers can read them instead. This latter practice, however, is strongly discouraged by her boss, both at the old and at the new nail salon, and she is only able to use it when her boss is not around. When she talks with her customers, she says she understands about fifty percent, especially if they speak slowly.

Lan craves a supportive and stable work environment so she can relax and spend her energy on improving her English and learning more about life in the US. Contrary to Chinh, however, this is not easy for her to find. Most of her co-workers are young, and have come to Tucson from California in order to seek work in the nail salons. They change jobs quickly, moving to the nail salon where the money is best. This leaves Lan feeling a little lost, since her co-workers, and her potential support network, change constantly. In fact, at this point in time, Lan does appear to be struggling not only in developing her nail technician skills and English communication ability, but also in finding a place for herself in this new society. While she wants to learn English and to interact more with Americans, her opportunities are extremely limited and appear to be reachable only in the distant future when her English has improved. Therefore, interacting with Americans is not a means to improving her language skills, but rather a goal once her language skills have strengthened. Instead of putting her energy into creating more opportunities to use English with native speakers, which seems hopeless, Lan instead focuses on developing social ties inside her work environment. In
effect, she attempts to acculturate not to the American style of life, but rather to the life of the Vietnamese immigrants in the US who, for the most part, are immersed within a Vietnamese community and way of life. As such, she changes her clothing style to fit in with her co-workers, favoring the short skirts and cropped tops that the young Vietnamese women who are 20 years younger than her are wearing, and joining their frequent social gatherings such as trips to Las Vegas and the many casinos in the Tucson area. She is adapting to the Vietnamese lifestyle in the US rather than the American lifestyle.

At the beginning of the research project, Lan was enrolled in an intermediate listening and speaking ESL class at Pima Community College, which provided her with opportunities to interact with non-Vietnamese speakers, though to a limited extent as the class was fairly large (33 students) and only held for 40 minutes a day, Monday through Thursday. In fact, when asked to list her friends in the US, Lan names three of her classmates, one from Indonesia, one from China, and one from Mexico, as her closest friends in the US. She typically speaks with her friends 5-10 minutes a day, before and after class.

She desperately wants more chances to speak English and more American friends, but does not know how to meet more Americans since her
social interactions are highly restricted. To her, the key to success in the US is speaking English well and while she does not feel that her English is good, she is happy she came to the US.

At home, she tries to improve her English by watching TV an hour a day with captions, stating that without captions she would not be able to understand anything. With captions, she understands about 20-30%. At work, there is always a movie on the TV to entertain customers while they wait for a technician. She therefore also watches TV when she is waiting for customers, but does not understand very much. She feels that she speaks English about the same as other Vietnamese, but much worse than native speakers, especially in terms of fluency, pronunciation, and knowledge of American culture.

Chinh's social situation differs markedly from Lan. He is very happy in the US, and unlike Lan, he does not feel the same level of stress that she does, partly due to the different natures of their work environments, and also different personalities. While Chinh also wants more opportunities to speak English, he does have a fairly supportive work environment in terms of English language practice, unlike Lan. He has four good friends at work, two of whom are American while the other two are Mexican. He talks with them everyday during their break times and lunches, and as he says, "they teach English...if I if I speak wrong they correct for me." They teach him job terminology and they often joke during breaks, as he says, "when... break
time...we have we talk we talk together funny.” While one of his Mexican co-workers speaks English better than him, and therefore is easy to understand (“Jose speak I hear easy”), the other Mexican co-worker speaks English worse than him (“Eddie speak I hear very very hard...you speak English ... no ... no speak English no structure no sentence”), which in a way gives Chinh more confidence since he is not the only person struggling to communicate in English. He does understand everything when he speaks with his friends at work as they tend to speak very slowly so he can follow and join their conversation.

At this time, he also has a weekend job as a dishwasher in a Chinese restaurant. His co-worker, a Mexican male, also helps him practice English. While Chinh does have more chances to speak English, personality is also a factor. Chinh is much more relaxed and overall friendlier in personality than Lan; in fact, Chinh might be called 'happy-go-lucky' due to his constant smile, even in the face of adversity. This attitude and personality makes him easy to interact with. Lan, on the other hand, tends to be more serious, and takes adversity very heavily. Chinh is very busy with both jobs, and does not have friends outside of work. In fact, he rarely even sees his family “because I work ... from ...seven o'clock until five o'clock... I don't meet ... my ... family” since by the time he gets home from school, Lan and his daughter are both at work.
Chinh’s goal is to study to be an electrician at Pima Community College, so he can change jobs from the factory to be an electrician. However his English skills are also not sufficient for him to be successful in taking these courses, for as he says, “I speak very bad English.” Though he also feels that he speaks English much worse than native speakers, unlike Lan, he feels that his English is better than other Vietnamese. His biggest problem is his listening comprehension; in April, his company had a meeting about safety where his boss spoke and all the employees watched a video. Chinh stated that he only understood about 10%. If he watches TV with captions, he can understand about 30%. He usually understands his co-workers if they speak slowly, and says he understands everything I say; however, I also speak very slowly with them.

Chinh tends to equate speaking English with Americans with happiness, which is a more simplistic view of American life than Lan holds. As he says, “I happy when when I speak... English... and I hear English my friend and everybody understand.” In fact,

In American English is my life. I I want to I want to I want to understand Ameri American culture... and I want American American understand me...yeah... so my life is happy.
Chinh equates adjusting to American life with happiness, and being understood in speaking English is a symbol of this adjustment: "I need to adjust to American way because... because I want I want every American understand me."

Like Lan, Chinh also changes his appearance in order to fit into American life. To him, wearing American clothing is symbolic of his Americanization, and is a way for him to be viewed as American by other Americans: "I must I must wear... I must wear ... American style clothes... to... together...I must wear American style clothes... the same with... everybody everybody in... American." When I asked why, he responded with "friendly friendly," meaning that other Americans would be friendly towards him if he appeared 'American' via his clothing. More importantly, he also begins smoking, a habit he had in Vietnam but had stopped before moving to the US. His co-workers smoke during breaks, and Chinh begins to smoke again, much to Lan's chagrin. When I asked why he smoked again, he said, "my friends...work friends," indicating that smoking with them gave him an opportunity to interact with them more during breaks.

By mid-April, Chinh has quit his weekend job in the restaurant in order to concentrate more on learning English, though he is not enrolled in any ESL classes during that time.
2. Summer (August):

By summer, both Lan and Chinh's social contexts of language use change, in opposite directions. Lan's ESL classes end in May, and she does not enroll in any summer classes as she is busy at work, working almost every day. As such, she loses her tenuous connection to her friends from Pima, whose friendship provided her with her only opportunity for English language use in a supportive, and relaxed atmosphere. She has very little contact with them during the summer. In fact, her only friends at this time are her workmates, who are all Vietnamese. When she has free time, she usually spends it with her own family, or her sisters and brothers.

She still has difficulties at work, not as much due to the job itself, but rather still due to her problems in communicating in English: "I been difficult my work yes... because ... many nail customer... I must explain... their nail... difficult... I must my owner help help me."

Another major change in Lan's life is the move of her sister's family from Virginia to Tucson, and their rental of the house next door to the Trans. This creates an even tighter Vietnamese environment around Lan for a number of reasons: her social interactions outside of work are now focused on her sister's and her own family, and when she goes shopping, she often goes with her sister, who speaks better English than Lan and usually takes over the communication in stores, etc.
True to his happy-go-lucky nature, Chinh views the move of his sister-in-law and her family next door as a new English language use opportunity because of his two nieces, ages 8 and 11, who understand Vietnamese but do not speak it. Instead, the family language is English. Chinh views his nieces as 'English teachers' and makes the most of any opportunity when he is around them to speak with them in English and ask them to teach him vocabulary. Thus, while the move of Lan's family to next door is tightening the Vietnamese social structures around Lan, they actually open up new language use opportunities for Chinh since he interacts more with the children than with Lan's sister or brother-in-law. Chinh also expands his social interactions by enrolling in an ESL class in the summer, the same listening and speaking class Lan took in the Spring, but at a different place. His main goal is still to surround himself with many American friends once his English is better: "as soon as I speak English ... so-so... I will try to find... many .many... American friends." He finds some new friends through his classmates, "because I go to school I have many new friends" whom he speaks with before and after class for a few minutes. At work, his social interactions expand as well, as he has a new co-worker, an American woman who is extremely talkative: "my my factory... my group have ... a new friend a new friend... woman... she she talk all the way." He credits her
talkativeness to his English improvement: "I I I speak English with my my
workmates better... better yes... because my my my friends... she is talks very
talks a lot."

Aside from at school and work, however Chinh does not speak English
very much, except with his nieces:

Friday and Saturday I meet my niece... I ... I try in hear hear hear them
speak and I ... I I ... we are we are we are speak... together everything...
everything... for example... I... you are you you you pass me glass.

On a material level, the Trans are now beginning to settle into
American life as well. Prior to this time, their house had been mostly
unfurnished, and they had used an outdoor patio table and chairs as their
dining room furniture. Around the beginning of August, their house begins
to become populated with furniture. First, they buy second hand couches for
the living room, and then a formal dining room set complete with a
matching china cabinet. The transformation of the Trans' home is symbolic,
in a way, of their own transformation from newly arrived immigrant,
initially nervous and unsure, to permanent residents who are planning their
future in this country. Their reception of their green cards, marks of
permanence, also symbolizes this period. Additionally, they have invested in
two new cars, one of which is a van, so they are now a 3 car household. In
some ways, they materially represent the American dream. This may be
directly related to their family in the US, who are American, complete with
the house with swimming pool and two car garage. Not only do the Trans’ wish to emulate them, but it is as if their family here expect them to settle in a similar fashion once they have adapted to their new life. In effect, since the earlier family who came to the US successfully adapted to and assimilated into American life, the newly arrived Trans are expected to do so as well, after a certain initial time of adjustment. While this did come to a shock to Lan, especially, at first, she did begin to appreciate her independence as well as the future independence of her daughter, and the furnishing of their home in a way represents their attempts at permanency in the US.

In another symbol of their continuing adjustment to American life, in August, the Trans decide to go to the cinema to watch the movie *The Sixth Sense*, which one of Lan’s co-workers had recommended. This was their first trip to the cinema since they had moved to the US, though they often went to movies and the theater in Vietnam. Going to the movies is not only a way to relax from their busy lives, but also to spend time together, which they rarely do. As Chinh states, “our plan our plan ... our plan... every weekend every weekend... we are we are we will go to cinema together... because every day every day...we work and don’t ... have free time... I don’t see her... you are you come back and ... you come back then I sleep.” The change to this plan also represents the fact that the Trans are no longer as worried about their lives in
the US, and feel they can relax. As Lan states, "we... don't like go to cinema or go to visit my friend," to which Chinh adds, "because we are ... because we have worry... worry ... now now my life our lives... better.. yeah."

3. Fall (December):

By Fall, Lan re-enrolls in English classes at Pima, taking the elementary and intermediate listening and speaking classes simultaneously, in order to work on improving her ability to communicate in English, which she is now desperate to do as she had few opportunities to communicate in English in the summer. However, her classes do not provide her with many opportunities to practice English: "I I watch the TV video 'Contact with English' yeah... I answer answer when... video and practice... we are don't talk topic... yeah yeah ... speak... so I not conversation practice."

The pressure to communicate with her customers is still present, even though she is at a third nail salon. She still struggles to communicate with her customers at work: "Friday and Saturday... many customers my owner told me... you you you must .... talk with customer... but I don't hear I don't answer." She tries to communicate with them:

   I I always... their name name and ... what do you work work? You you live around live around... yeah I ask... their ... mmm... family family... and children... sometimes... because in the salon... only one
me talk... talk a little customer and my owner attention me... she and he ... and they are always... complain ... complain me... why you don't speak English....

When she does talk with her customers, she understands only about half: “my my customer always ask me... I I understand about fifty or seventy... yeah... but I answer ... a little.” She especially has difficulty with pronunciation and listening, but overall, she does feel she is improving and understanding more of what her customers have to say. Additionally, she is becoming more comfortable with her work as a nail technician, which makes communicating with her customers also a bit easier as she does not have to concentrate so much on what she is doing: “my my job is easily easily my work more and more better... I I feel... my life is ... my life is ... more and more little difficult.” She has finally gained confidence in her job, experiencing difficulty only with pronunciation. This difficulty, she believes, is in part because of her restricted opportunities to interact with native speakers in English as she only communicates with speakers of Spanish in English:

I feel confident in my my job... yes... mmmm... the the difficult in ... with me are now pronunciation my my ... the ... my pronunciation ... is harder... because I always... communication with with customer Mexican...although my classmates in study English... almost Mexican...

She feels it is difficult to improve her pronunciation since she almost speaks English exclusively with other non-native English speakers. She tries to
speak English everyday “but... customer Mexican... sometime they are don’t speak English... or speak a few English...I very hard to speak... customer... I I I feel I speak... slow slow slowly yeah... cause I I I want contact with Americans... I can speak a lot of...”.

She struggles to improve her English, but finds that her only resources are other Vietnamese such as her sister and her nieces, along with the radio and TV:

sometimes I I I ask my sister and my niece... yes... because I work all day long long time and I I no free time... talk with sister and my niece...but I try yeah I try everyday... I ... when I free time... I I try watching TV and hear radio when I drive car to... to go... my my shop.

At this time, she understands about 40-50% of TV without captions and about 50-60% with captions, indicating that her listening skills are improving.

She has lost contact with her friends from the Spring semester at Pima, and does not see them as she is now at a different campus. Even though she is taking classes at Pima, she does not talk with too many of her classmates as they are mostly Mexican and tend to speak in Spanish together before and after class. She is also very busy and does not have time to talk with them after class, as she must immediately go to work. Instead, as she says, because most of her friends are Vietnamese workmates, “I I talk in Vietnamese many.”
In Fall, Chinh also enrolls in classes at Pima, taking not only two ESL classes (a beginning reading class and an English on the job class), but also two content courses: Electrical drafting and computers. As he says, “Everyday I am happy ... because... everyday I...I go to school.”

Chinh still spends a lot of time talking with co-workers, and they tend to discuss fairly complex issues, such as one friend’s marital problems as well as another’s husband’s alcoholism. His classes continue going well, except he decides to drop the electrical drafting class since “because because ... in in in ... electric electric class no speak English only read... reading.” However, his computer science class is going well, though when he first registered for the class, he admits he was worried: “when when when I when I register register... the register the basic basic programming... computer... at Pima I I was.... very worried... mmm ... now I I feel I feel I feel... learning good I happy.” Even though he appears to have miscommunications with the teacher, he is able to communicate his language problems to the teacher so his teacher can adjust his speech rate so Chinh can understand:

in the computer class... the teacher... the teacher... mis... understand me.. he’s handicap because I speak a little bit... I I I say I say... my teacher... I said my teacher ... I understand your your speak... but I speak slowly yeah....

Being able to understand the teacher in class also has something to do with Chinh’s prior preparation – “before before I .. I have class.. I read book...
yeah .. and .. then I hear... the teacher explain I understand about ... sixty percent yeah.” Overall, his English appears to be improving, especially listening in general and his perception of individual sounds:

My English is improving... I can speak... I can speak more quickly...
yeah and and... I I hear... and I hear... more clearly... because I I I know...
pronunciation... and I hear...who who speak English I hear
pronunciation I hear their pronunciation.

His work mates still provide him with a very supportive environment for language use, and they teach him new words as well as correcting his mispronunciations. They also speak slowly enough for him to be able to follow and understand their conversations, and join in when he has something to say:

when I ... I speak wrong... they ... correct for me... example I... I say
[pə.lɑt]... they correct [pæ.lɑt] ... and sometimes sometimes... I
misunderstand... their ... misunderstand... their description yeah... I I I I
ask again... they speak slowly... slowly I understand.

In fact, he feels that he is relying less on Vietnamese to understand English; while he was translating his ideas from Vietnamese into English before speaking, which slowed him down, he now feels he can think in English: “I am practicing because before I speak English... I guess... I guess my Vietnamese so I speak slowly...now I I I try...before speak... speak English... I guess by English...yeah... I I feel I feel I feel... I feel easy...easily improving.”
His English improvement has also been noticed by his boss, who has
given him a different job assignment. Instead of pulling orders inside the
warehouse, he now directly interacts with customers, taking orders to give to
the person inside the warehouse to pull. While Chinh appreciates the stable
and supportive environment of his job, he is also beginning to feel
disenchanted with his job as he feels it prevents him from putting as much
time into studying English which he really wants and needs to do in order to
achieve his goal of going to the university to study chemistry. He has
changed his mind about becoming an electrician after visiting the university
when his daughter began school there. Instead, he wants to return to college
and study chemistry again, for 3 or 4 years, to get a BA. What he wants to do
after getting his BA, however, is unclear: “I don’t know... now I don’t know...
I I I only study I only study yeah.”

Although Chinh seems to have more opportunities to talk than Lan,
he perceives that his opportunities to speak English as fewer than hers as she
actually interacts with more people (though her conversations are actually
fewer than Chinh’s): “because I ... I have... a few chance to practice English... I
... I ... I have... I have... I have conversation with my workmates... in
company yeah.” Even his social contacts are limited outside of school and
work: “outside my my job... I I I don’t have... friends.” Like Lan, Chinh also
uses the TV as a tool for English language learning, watching with captions,
and he understands about 50%. 

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Interestingly, at the beginning of the fall, Lan begins to be more assertive in the interviews I have with them. As time passes, she becomes more and more confident in communicating, and often dominates the conversation, while Chinh smilingly looks on. The talkativeness and confidence in communicating she displays with me and continues to develop across time during the interviews contrasts with her descriptions of her interactions in the nail shop, as well as her interactions when she comes to my house for dinner one day in November. All the Trans are invited, and during the several hour stay at my house, Lan appears withdrawn and shy while Chinh and Anh both freely converse with my friends and me. While Chinh also at times defers to his daughter, who becomes the dominant voice of the Trans, he still initiates conversation and responds on his own. Lan, on the other hand, uses Anh as her translator, often telling Anh something in Vietnamese which her daughter then says in English. This occurs so frequently that Anh jokes about it, saying "she uses me to talk to you."

Interestingly, after Anh leaves the room in order to play videogames, Lan and Chinh resume their interactive conversational pattern that was evident during the interviews, and Lan becomes much more confident and assertive in speaking English.

For both Lan and Chinh, the United States is still a land of opportunity, especially if one is willing to work hard. They feel they can achieve success here since they have adapted to the American work ethic. As Lan says, "I
think I live in here... if if I work hard... I have everything because... in here I
don’t worry ... unemployed.” They also feel peace and safety in the US, in
contrast to life in Vietnam, where they constantly worried and stressed about
work and life. Chinh says, “and now we don’t worry... don’t worry about
anything... because everybody American Mexican... Mexican... are friendly
yeah.”

They are also constantly adjusting themselves to American life, which
they embrace openly. When asked whether it was necessary to adapt to
American culture in order to learn English, Chinh responds, “Oh, it is too
necessary.” However, Lan and Chinh diverge in their feelings about
whether they live an American life, and whether they view themselves as
American or Vietnamese. For Chinh, it is very clear -- he lives an American
life because everything he does and has is American:

I feel I ... I am living... I am American life... yes... because ... all all my
action... and all... my guess every everything is American ... yes... in my
home... always... I... American thing... newspaper... magazine... hear
music... American... American ... no Vietnam no Vietnamese... I feel I
am I am living ... American life... yeah.

For Lan, its not so clear: “I think ... I not perfect American life...
because I confuse... confuse you American life and Vietnam yeah.” While
Chinh is also clear about his identity -- he is American because his life is
American -- Lan is unsure about who she is. As they say:
Chinh: now now we... we are ... now we are ...we feel... we are American... except language... Vietnamese... because ... because... my way my way life ... is American.

Lan: I think I different he... because in Vietnam I have a way life... enough... I .. confident in Vietnam but when I move in here I speak English not well and... sometimes in my job is difficult because I don't understood my customer... I I feel lonely because my my boss... sometimes complain me... you don't talk customer... I I ... I feel I ... I try very very hard... cause some classmates... my friend almost... from Mexican... if they don't understand they are change speak Spanish... Spanish with together... I I don't understand yeah... yes... in here... a few a few friends... I don't have free time visits ... my friend... cause my workmates... he always change.... because if... shop... another shop get make a lot of money... they are go shop... I don't like because I I ... want I want.. have job...long time.... I seldom feel I seldom feel American.”

When asked if she wanted to be American, Lan responded, “yes... maybe... because I ... I don't know everything in here.” To her, knowing “everything” about life in America appears to be a prerequisite to being an American, possibly because she compares herself against her sisters and brothers, who are American, and have a great deal of knowledge about life in the US.
Both Lan and Chinh, however, are critical of how other Vietnamese live their lives in America. Many fairly recent arrivals from Vietnam who have settled in Tucson tend to be immersed within a dense Vietnamese community, living in the same neighborhood and living several families within one home. They exist largely independent of the larger American society, with few symbols of permanency, as if their life in Tucson is merely transitory: They do not open bank accounts, preferring to use money orders to pay their bills, they do not buy new cars or furniture for their homes or new clothing, and they find jobs in factories and Vietnamese shops, where English is not necessary. As Chinh says, "everything their life are... are Vietnamese... in America... yeah... uh... they they they are many... came United States seven year... they don’t speak English.” Lan and Chinh both believe this is not good, for as Lan states:

if they are... live ... Vietnamese way... I think they are ... very difficulty... live in here because they are not confident everything around... they are... don’t have friend in American... they are... life... live together...live the same in Vietnam....I think no good no good... because if in here ... I live ... a good... I live a way of life good... American here... every good everything... good everything... I think my family ... have try try very hard.

While the Trans have a critical view of this group of Vietnamese, the Vietnamese community views the Trans are perhaps too Americanized and
assimilated into American life. As Lan says, "they are surprised my family... because you are just come here one year... you you bought new car." Because of being busy and preferring to study and relax rather than cooking every night, Lan also brings American foods like salads and fruit with her to work, while her co-workers still bring Vietnamese lunches and dinners. Her co-workers told her "you are American" and advise her to stop studying so much, and instead concentrate on working more hours so she can make more money: "they told me why you you older you study every day... why you don't work make a lot of money... I don't think ... the take [of money] ... too many good... because I I worry if if I choose live in here... I I must... know I must know everything in here... I I am... I will study study English know everything." Because these individuals still retain a Vietnamese lifestyle and the Trans are trying hard to become American, the Trans, as Lan states, prefer not to interact with them too much: "I don't like contact with... with them because... they are come here... long time... they are not change no change life... confuse American life and Vietnamese life."

In terms of their language skills, in December, the end of the study, both Lan and Chinh said that while they both understood other people fairly well, especially when they spoke more slowly, they had a great deal of difficulty being understood by others. As Chinh states, "I begin to work at company... I didn't hear and didn't speak... English everybody... and now... I speak English everybody... in department... in my company... and I speak..."
they are ... they understand.” In fact, when he compares himself with his Vietnamese workmates, he feels that he speaks better English than them since they do not study English. Lan also feels her English is improving, though she is still not confident. This is often reinforced since her customers often have difficulty understanding her.

Both are very aware of their linguistic difficulties; as Chinh says,

I can pronounce for each word... but when ... I say a sentence... I confuse... I confuse... I confuse about structure... so I I I pronounce no good yeah... one word one word I pronounce good... but when I when I speak English with... everybody ... I I always confuse... struc struc sentence structure... and ... I forgot I forgot pronunciation.

While Lan is highly motivated to change her way of life, working hard to earn money and studying English so she can go back to school, Chinh is still the optimist, who is happy just be able to be understood by other Americans. Both Trans know that it is Lan who drives the family forward: “I believe I believe.... she will study good... she will go... she very hard work very hard study... but I don’t believe me...because I I ... I am always happy I don’t worry... I follow I follow I follow her.”

B. Social Constraints:

As this short description of the Trans’ social contexts of language use indicates, the social constraints operating on their English language
development are multiple and dynamic, as well as symbiotic in nature.

Additionally, this description indicates that there are two striking differences between Lan and Chinh when it comes to the social data. One difference is the language opportunities available to them outside the home, specifically in their work and school environment. The other difference is their perceptions of what being an American is, which is affected by multiple social factors including their language use contexts, experiences, and personalities. This in turn reinforces their perceptions of who they themselves are, i.e., American, Vietnamese, or both, which then affects their level of comfort and confidence in using English. The changing social environment around them also affects their language use opportunities, which then also reinforces their emerging identities and feelings towards America and their English. These issues will be discussed in more detail below in light of prior findings on the effect of social constraints in second language acquisition. Rather than separating the discussion into discrete parts, the discussion is fluid and dynamic, moving from one social constraint to another in acknowledgment of the complex and symbiotic nature of these types of constraints.

An important starting point for a discussion of social constraints is the notion of social identity. As Lum (1982) states, social identity is a complex phenomenon that involves both our own perceptions of who we are, and also how others perceive us. Tajfel (1974) defines it as “that part of an individual’s self-concept which derives from his knowledge of his
membership of a social group (or groups) together with the emotional significance attached to that membership" (p. 69). He further states that since individuals' identities are derived from in-group memberships, an individual can choose to change membership in a group if this membership does not satisfy those elements of their social identity which they view positively. People construct their identity in various ways, through language, clothing, actions and behaviors, which they believe reflect their social identity. For second language learners, this may include but not be restricted to adopting the habits and customs of the new culture, including clothing, eating, and working habits if they wish to develop an L2 identity, or retaining their L1 behaviors and customs if they wish to keep their L1 identity, or both under different circumstances, as social identity may best be viewed as context-dependent, i.e., multiple and changing across different contexts (Peirce, 1995).

Chinh very much wants to be an American, and to be viewed as an American by others. He has constructed an American identity through American clothes, car, and other material goods, the possession of which he believes makes him American. He also believes that others view him as American because they understand his English and because he wears American clothes. Beginning to smoke again is also a way to construct closer ties to his workmates, an in-group with whom he clearly wants to be affiliated as they are mostly American. Considering himself an American
gives him confidence in doing American things. Fortunately for Chinh, his experiences with people in the US have also been mostly positive -- he considers most people he meets as 'friendly' -- which may be their reaction to him, as he is typically extremely friendly. These interactions, which are positive in nature, give him added confidence in using English, to the point that he tells his computer science teacher to speak more slowly so he can understand better, to which his teacher obliges.

Lan on the other hand, is 'lost' -- she compares herself to her family, who are American, in most respects, but feels she does not know everything compared with them and therefore she is not American. Striving to fit in somewhere, i.e., to have an in-group beside her immediate family, she then changes her clothing style to that of her much younger Vietnamese co-workers, until she realizes that she does not want to retain a Vietnamese lifestyle in the US. She has difficulties developing an L2 identity, however, since she is immersed within the L1 community, from which she clearly wants to be distanced but has no clear way of distancing herself from.

Another pressure on Lan is her family in the US; they symbolically push her and her family to become assimilated into American life, but this pressure, as it were, creates an unrealistic expectation for Lan in that she feels that she must 'know everything' about America like her family in order to truly be American. Furthermore, she is identified as American by her Vietnamese co-workers, with whom she avoids contact in order to try to
separate herself from a Vietnamese way of life and Vietnamese identity, to some extent. This pressure to acculturate is also an important social constraint on second language development and L1 retention.

Schumann's (1986, 1990) 'Acculturation Model,' attempts to link social factors such as degree of acculturation with second language acquisition. Schumann hypothesized that social factors (social dominance, integration pattern, enclosure, cohesiveness, size, cultural congruence, attitude, and length of stay) are primary in affecting the degree to which the learners acculturate into the L2 culture, and thus their level of L2 development. The ZISA project (Clahsen, Meisel, and Pienemann, 1981) and Heidelberger Forschungsprojekt 'Pidgin Deutsch' (1978) both found that social distance was a factor in L2 proficiency, with a lesser degree of social distance promoting L2 development. This study found that 'perceived' degrees of acculturation, much like perceived social identities, affected the Trans' levels of confidence in using English and in seeking opportunities to use English. For example, Chinh perceives himself to be American and living an American way of life. Chinh's perceived acculturation gives him greater confidence to interact with people, which in turn gives him greater English language use opportunities. While Lan does perceive herself to be living an American lifestyle, she is less sure that she is American and has acculturated as she does not believe she is American until she 'knows everything' because she compares herself against her brothers and sisters. As she compares herself negatively against her
family members (and even her daughter) she often shies away from
opportunities to use English, ceding them to someone more confident (and
Americanized) when they are with her. However, social identity and
acculturation are only part of a complex picture of the social constraints
operating on the Trans. Social interactions, as well as the notion of
'investment' (Peirce 1995), which encapsulates attitude, motivation, and
personality, must also be considered.

Social interactions can be defined as both amount of contact and type of
contact, both of which are intricately connected with social identity as who
one has contact with may represent the group with which one identifies. The
research in this area does indicate that overall, a greater quality and quantity
of interactions with native speakers of the target language promotes second
language acquisition, possibly because it leads to increased opportunities to
engage in the negotiation of meaning, which may facilitate second language
acquisition (Ellis, 1994). Oyama (1976), for example, suggested that amount of
language use was important in the degree of accentedness for learners in her
study while Tahta, Wood, Loewenthal (1981) found that the top predictor of
non-accentedness for their participants was the use of English at home,
followed by exposure to English models outside of school. Research on
syntax such as the Heidelberger Forschungsprojekt 'Pidgin Deutsch' (1978)
and the ZISA project (Meisel, Clahsen, & Pienemann, 1981) also found that
amount of contact and degree of interaction was significant factor in L2

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acquisition, with those learners having a greater extent of interactions with native speakers of the target language achieving higher levels of L2 proficiency than those with fewer interactions. Spada (1986) also found that learners with qualitative better contact with NS of English had higher levels of oral proficiency than those with less contact. Furthermore, the number of native-speaker friends has also been found to be a strong predictor of L2 proficiency (Monshi-Tousi, Hosseine-Fatemi, and Oller, 1980).

On the surface, Lan appears to have greater opportunities for English language use than Chinh, as she takes ESL classes at Pima, has several friends who are not Vietnamese and with whom she must speak English, and interacts with non-Vietnamese customers at the nail salon all day long on a daily basis. Chinh, on the other hand, does not appear to have many chances to use English as he does not take any ESL classes, and speaks English mostly during his breaks at work. However, the quantity of access of language use does not equate quality, and it is the quality of the interactions that facilitate second language acquisition as more complex conversations promote the type of interactions which is necessary for second language acquisition to take place (Ellis, 1994).

Lan's work environment, though full of potential English language use opportunities, proves to be unsupportive and restrictive across all three nail shops she works at during the duration of this study. This work environment hinders rather than promotes English language use since the
only opportunities to use English are with the customers, most of whom are also limited in their English proficiency. Her communications with her customers are formulaic in nature, based on the same ten questions that Lan has memorized, which do not push her in real communication. When the customers do not understand, she writes her information down, rather than trying to say it again, or asks her boss to help. If miscommunications occur, which they do frequently, the communication either breaks down completely, or is taken over by someone else, i.e., her boss. Initially, Lan is also learning her trade, which makes her anxious when she is controlling the machines she works with. The pressure by her bosses to speak English with the customers, though they sense her frustrations with the language and concerns about operating the equipment, creates a tense work environment for Lan, which in turn makes her feel more nervous about using English, even after she has developed both her abilities as a nail technician and her English language skills. Additionally, Lan is also a sensitive person, given to anxiety and worry about life in general, her future, and her English. Therefore, she takes her miscommunications with her customers very negatively, and becomes even more frustrated and depressed. This also causes her to lose confidence in her ability to communicate in English, as evidenced in her continuous difficulties across time in making 'small talk' with customers, even as her English improves.
Chinh, on the other hand, has an extremely supportive English language use environment at work, and creates one for himself at school as well, once he begins taking classes. His relaxed attitude and constant smile make him very approachable, and he soon makes friends with whom he can practice his English. Most of these friends are native speakers of English, and those who are not are proficient in English, to a certain extent. While he does not speak English for a long time everyday, his interactions are more complex than Lan’s, and his co-workers provide him with a supportive scaffold, giving him the vocabulary he needs, as well as correcting him when he makes a mistake. These collaborative interactions have also be claimed by some researchers (i.e., Hatch, 1978; Peck, 1978; Wagner-Gough, 1975) to aid in SLA as it is through this that a learner “learns how to interact verbally, and out of this interaction syntactic structures are developed” (Hatch, 1978, p. 404). Interestingly, Lan does not appear to participate in such collaborative interactions; instead, as described above, when miscommunications occur, either conversation stops or a more confident speaker of English takes over the interaction. Chinh, on the other hand, often engages in these types of interactions with his co-workers, and they discuss complex topics such as alcoholism and marital problems and discussions change day-by-day, exposing Chinh to a rich array of vocabulary and grammatical structures. Additionally, across time, Chinh’s opportunities to use English expand, rather than becoming more restricted, contrary to Lan’s. His new co-worker is
extremely talkative, giving Chinh more chances to use English. He begins taking ESL classes and eventually takes a computer science class with native speakers of English, where he must not only interact with other students but also negotiate meaning with the instructor, which he is not afraid to do. Also, he views the move of Lan's sister to next door as an opportunity to learn English from his nieces.

These two very different communities of language use brings up another issue -- the effect of the L1 and L2 community on language learners' opportunities to use the target language. Prior research by Peirce (1995) has found that the L2 community limited the interactions learners had with members of that community. However, both Goldstein (1995) and Hansen (1998) found it was the L1 community which limited the opportunities the learners had to use English. Chinh and Lan were immersed within two different communities; while Chinh was immersed within a predominant L2 community both at school and at work, Lan was immersed within the L1 community at work and a fairly Mexican community at school. Unlike Peirce (1995), this study found that the L2 community enabled Chinh to create and have more second language use opportunities both at school and at work. Lan, however, was immersed in the L1 community but was hindered in English language use even though on the surface it appeared that this environment would actually promote English use. The manner in which these opportunities were promoted, i.e., with some pressure by the boss,
actually debilitated the communication, as Lan constantly felt she was being observed by her boss. Additionally, the communication within the L2 community was not with native speakers of English but with a third language community, speakers of Spanish, whom Lan had difficulty understanding. This third community also formed the environment at school and so even in a supposedly nurturing L2 language use environment, Lan was distanced as the other members of this community all belonged to another in-group to which she did not belong and could not join as they spoke a different language. Lan's immersion within the L1 community also extends to her social life, which consists mostly of her family. She becomes even more immersed within this community across time as her contact with English speakers decreases and her sister moves next door.

This brings up the notion of 'investment,' which Peirce (1995) coined in order to explain the complex interaction between the language learner and the learning environment. Building on notions of motivation and attitude, as well as personality, Peirce (1995) argues that past research has not adequately examined why learners sometimes appear to be motivated and extroverted while at other times anxious, introverted and unmotivated, as prior research on attitudes, motivation, and personality have operationalized these constructs as stable, rather than dynamic across social contexts. Thus, while both Lan and Chinh have positive attitudes towards members of the target culture, which has been found to promote learning, and both express
they are highly motivated to learn English, these constructs do not explain why Lan and Chinh acquired English to such differing extents. Why does Lan not create more language use opportunities when she is constantly interacting with non-Vietnamese? One could argue that different personality traits could affect communication styles. For example, Lan is typically introverted and anxious while Chinh is outgoing and more confident, which supports prior research findings (i.e. Strong, 1983) that extroverted learners have an advantage in acquiring basic interpersonal communication skills (BICS) over introverted learners. Additionally, variables such as talkativeness, responsiveness and gregariousness, all associated with extroversion, have been linked to higher levels of L2 proficiency (Strong, 1983).

However, these traits do not appear to be fixed for Lan; in her work environment, Lan appears to be very introverted and almost unmotivated to use English as she still struggles with making ‘small talk’ with her customers in December, even as her English skills have become much better. A very different side of Lan emerges in our interviews, however. In this setting, Lan is not only confident, but she is an extremely capable communicator who expresses her ideas freely, with emotion and clarity. It is obvious that Lan is neither introverted or extroverted, and neither motivated nor lacking motivation, but all of them, depending on the situation of language use. She does not invest heavily in English language use in her work environment,
even though she wants to, because of the difficulties in communicating with her customers, and the fact that the communication does not help her learn English, of which she is very aware. Having difficulties conversing both in English and operating the equipment, Lan instead invests largely in becoming a better nail technician, which she feels can win her steady customers who will return and ask for her because of her nail abilities rather than her English proficiency. It is not that she does not want to speak English with them, but rather than she perceives that given the choice of investing in her nail or her English skills, having difficulties doing both at once, it is more efficient to invest in her nail skills as her interactants are non-native speakers as well, and therefore unlikely to help her learn English.

In contrast, her interviews with me are perceived by her to be the only opportunity she has to use English in a supportive and relaxed atmosphere. In fact, Chinh almost 'cedes' this opportunity to her, as he is not as anxious as he has supportive atmosphere at work and school, whereas for Lan, this is her only chance to practice English. As such, Chinh noticeable lets Lan take the lead in initiating conversation, and typically only speaks when directly addressed or responding to an issue Lan has brought up. If the question is for both of them, Lan does most of the talking. These interviews, however are not just an opportunity to use English for as time passes, the subjects become more and more personal, addressing her struggles at work, in the US, and learning English. It seems that Lan and Chinh both view me as a 'confessor'
— i.e., a non-judgmental person to whom they can confide their struggles in life without repercussions. This is especially important for Lan, who has no one else to confide to except for Chinh. Additionally, she does not discuss these issues with her family since she is under pressure, both from them and herself, to adjust to life in the US as quickly as possible and become independent as is typical of extended families in the US. Discussing these issues with them would indicate that they were not succeeding.

In summary, these social constraints are difficult to separate from one another as they interact with one another while also differing across time and place. From this research, it seems clear that supportive social contexts promote the learners' investment in English language use, and that unsupportive contexts may restrict learners' opportunities to engage in meaningful communication even though English language use appears to be a necessity in these contexts. Additionally, perceptions of levels of acculturation and social identity may not directly affect SLA, but may affect learners' levels of confidence in using the target language, which may then lead the learners to actively seek more opportunities to use English. Confidence, of course, can be facilitated or debilitated depending on the context of language use, and therefore is dynamic as well.

This brings up an important question: How do these social constraints affect the Trans' development of English syllable codas? This question will be addressed in the following section.
Interactions among Social and Linguistic Constraints:

It is possible to establish a tentative framework for the interaction among primary linguistic constraints, which affect acquisition and developmental sequences, secondary linguistic constraints, which affect production, and social constraints, which affect rate of development and extent and duration of L1 interference effects. Primary linguistic constraints, which include the effects of L1 interference, developmental processes, and markedness, constrain the sequence of development of syllable codas both within and across stages. This is initially via the equivalence classifications the learners make between their L1 and their perceptions of the sounds in the L2. Additionally, primary linguistic constraints affect how consonants are modified based on L1 interference, developmental, and markedness effects, which change across time. Initially, consonants are modified towards the L1 as these effects may be predominant while as the learners move through the stages of development, these effects lessen as they begin building a L2 phonology. At this point, developmental and markedness effects increase, especially for those codas which are not similar to those which exist in the learners' L1.

Secondary constraints, i.e., data type and linguistic environment, appear to affect production accuracy. Even after a learner has appeared to have acquired a coda, i.e., being able to produce it accurately in the reading data, a speech style which is characterized by careful monitoring, the learner
may produce the same coda with absence in the interview data, which is a speech style characterized by less monitoring and more frequent pausing and hesitations. In fact, production effects follow a fairly predictable pattern: the participants tend to make orthographic mistakes in the reading data, mispronouncing words based on orthographic miscues. However, these types of errors are rare in the interview data, which in turn promotes epenthesis due to the frequent pausing. Additionally, this speech style promotes absence. Interestingly, the absence that is promoted by the interview data follows a different pattern from that in the reading data even for the same coda, indicating that these are two different types of effects. In the reading data, for example, as a CC or CCC coda is beginning to be acquired, the absence patterns may be explained by L1 interference effects, or markedness. Therefore, absence is coda specific, and may occur for the initial, medial, or final consonant. However in the absence for the interview data for those codas which are beginning to be produced accurately in the reading data, absence is always of the final consonant in the coda, even if when the coda was begin developed, as indicated by the reading data, absence was of the initial or medial consonant in the coda.

Another secondary constraint which has a strong effect on production regardless of data type is the effect of linguistic environment, which although it is a constraint based on the effects of L1 interference, is considered secondary since it appears to be a rule that is activated after the primary
constraints since some codas are produced accurately after a vowel, but then are absent after a diphthong. Therefore, the codas themselves may be acquired, but the preceding linguistic environment affects the production accuracy of the coda.

Finally, social constraints in terms of the language use environment provides opportunities for and investment in meaningful L2 use, which may be necessary to push learners through the stages of development and minimize L1 retention. Social constraints also provide learners with the rich input necessary for L2 development, without which they may not move through the stages of L2 acquisition, as well as potentially increasing the effect and duration of L1 interference effects, i.e., L1 retention, if the language use environments of the learner are primarily L1.

In summary, social constraints appear to affect the rate of development across time and across stages. The stages of development appear to be constrained by linguistic effects. Finally, production across all the stages may be constrained by secondary effects such as linguistic environment and data type, which may not be indicative of actual acquisition of the codas, but rather a temporary effect.
CHAPTER 5

DISCUSSION AND RECOMMENDATIONS

In this chapter, I discuss my data, which are presented and analyzed in terms of the findings, conclusions, and recommendations for future research. There are several limitations of these findings, however. First of all, these results are based on research on only 2 language learners. Secondly, the findings on the specific codas are based on the two data sets put together. However, these findings do provide insights into the process of acquisition of a second language phonology for some language learners, which adds to our overall understanding of SLA as well as highlighting areas for further investigation.

Summary of the Findings:

1. Is there a developmental sequence in the acquisition of English L2 syllable-final codas?

It does appear that a developmental sequence, constrained by L1 interference effects, developmental effects, and markedness, can be established. The developmental sequence is similar for both participants, Lan and Chinh, and therefore may tentatively be generalized to other adult learners of English who
speak Vietnamese as a native language. In addition, all learners of English, regardless of native language, may be constrained by similar developmental and markedness effects in the acquisition of an L2 phonology; however, this developmental sequence may not be generalizable to all L2 learners of English as the initial constraints on the development of L2 syllable codas appear to be primarily L1 interference effects, which differ across learners of different L1s according to the phonotactics of the L1. The developmental sequence is first illustrated in a series of figures, which depict each of the four stages in the developmental sequence, as well as the interaction among the linguistic constraints in the acquisition of an L2 phonology by Vietnamese speakers of English.
Figure 5.1: Stage 1 in the acquisition of an L2 phonology by native speakers of Vietnamese
Figure 5.2: Stage 2 in the acquisition of an L2 phonology by native speakers of Vietnamese
STAGE 3: Build on emerging L2 repertoire

Emergence of CC, CCC, and affricates, interdental fricatives, palatal fricatives

Level 1: Modified towards L1 via eponthesis, absence, feature change

Level 2: Modified towards existing L2 via eponthesis, absence, feature change

Level 3: Produced accurately

Developmental Effects:
1. Front > Back
2. Voiceless > Voiced
3. Lateness of affricates, interdental fricatives, palatal fricatives

Markedness Effects:
1. C > CCC-CCC-CCCC
2. Unmarked > Marked clusters
3. Shorter codes > Longer codes with the same constituents

Accurate L2 phonological repertoire: almost all C, and some CC, CC, especially with voiceless stops, fricatives, affricates, and nasals

Figure 5.3: Stage 3 in the acquisition of an L2 phonology by native speakers of Vietnamese
Stage 4: Acquisition of L2 phonology

Approximate native speaker phonology with some errors

Markedness Effects
1. Codeword length of more than one
2. Unmarked > Marked clusters
3. Shorter codas > Longer codas with the same constituents

Developmental Effects:
1. Front > Back
2. Voiceless > Voiced
3. Laterality of affricates, interdental fricatives, palatal fricatives

Figure 5.4: Stage 4 in the acquisition of an L2 phonology by native speakers of Vietnamese
Figures 5.1, 5.2, 5.3, and 5.4 illustrate the hypothesized stages in the developmental sequence of the acquisition of English L2 syllable codas by native speakers of Vietnamese as well as the complex interaction among the various linguistic constraints on acquisition across and within time. In Figure 5.1, which illustrates the first stage of development, it appears that the participants make equivalence classifications between Vietnamese and English. Those consonants which are similar in type and in position, i.e., they are allowed syllable-finally in Vietnamese as well as in English, are transferred. These consonants are the nasals and voiceless stops. Those consonants which are similar in type but different in allowable syllable position, such as the fricatives and voiced stops, which only exist syllable-initially in Vietnamese, are also transferred into the learners' emerging L2 repertoire. However, these consonants undergo modification in production (i.e., epenthesis and devoicing) in order to be modified towards an acceptable L1 syllable structure. However, all the consonants, whether transferred from the L1 into the L2 based on equivalence classifications or modified towards the L1, are subject to the constraints of developmental effects in terms of the sequence of acquisition. Front consonants are acquired before back consonants, and voiceless consonants are developed before voiced consonants. In addition, the interdental fricatives, palatal fricatives, and affricates are developed relatively late. Markedness effects also affect acquisition in terms of length, type, length and type, and sonority. Generally,
the more unmarked codas, both in terms of length (shorter > longer), type (i.e., stop-fricative > stop-stop, fricative-fricative), length and type (shorter > longer with similar constituents), and sonority (margins meeting UCSS > margins violating UCSS) would be acquired before the comparatively more marked codas. At this point, the emerging L2 repertoire would begin including final voiceless stops, nasals, and fricatives with epenthesis.

Figure 5.2 illustrates the second stage of development, wherein those codas and consonants that are not in the L1, such as the affricates, and some of the fricatives, as well as the CC, CCC, and CCCC codas, are produced in light of the transferred L1 consonants, which now comprise the learners’ emerging L2 repertoire due to transfer of these consonants in stage 1. Some of these consonants are devoiced or stopped in order to be produced as voiceless stops, which are allowable syllable-finally in Vietnamese, while the longer codas may undergo two types of modifications, i.e., epenthesis and absence, or feature change, in order to approximate an L1 syllable structure. Again, all these consonants and codas would also be subject to the constraints of both developmental and markedness effects in terms of the sequence of development. Additionally, the consonants at this point are typically modified towards the emerging L2 repertoire, rather than towards the L1. However, L1 interference is still a constraint, especially for Lan, who has greater L1 retention. The participant’s emerging L2 phonologies at this point include the codas from stage 1, plus the voiceless affricate, and the more
difficult fricatives are also beginning to emerge. Furthermore, some two-
member and three-member codas are beginning to emerge, especially those
containing the nasals, voiceless stops and fricatives, which have emerged as
single codas and can be modified towards an acceptable L1 syllable structure
through absence and/or epenthesis.

At stage 3, which is depicted in Figure 5.3, the participants make fewer
equivalence classifications between Vietnamese and English as interference
effects appear to decrease. Instead, codas are initially modified towards the
already emerging codas which represent the participants' existing L2
phonologies. The more marked consonants begin emerging, as do the CC
and CCC codas. There appears to be three developmental levels within this
stage: For some consonants, L1 interference effects are still dominant. This
means that the longer codas and more difficult single coda consonants are
still modified towards an L1 phonology, i.e., via absence, epenthesis, and
feature change. This is especially true for Lan. The other level is
modification towards the emerging L2 repertoire, i.e., building on the
previously acquired codas. This is especially prevalent for Chinh. The third
level is correct production, usually of those codas containing the voiceless
stops and nasals, as well as voiceless affricates and fricatives, which appear to
have been acquired at this point. Developmental as well as markedness
effects would still constrain the development of codas at this stage as well.
Finally, stage 4, illustrated in Figure 5.4, which the participants did not reach at the end of this study, would include the development of almost all the codas, including the emergence of the CCCC codas. This stage is also constrained by developmental and markedness effects. The result of this stage would be the approximation of a native-speaker-like phonology, which may still include some errors. This stage is extremely difficult to reach, and the participants may never reach this level of development.

It is clear that Chinh, at least, has entered stage 3 by the end of the study. He is able to produce most single consonant codas, as well as many of the CC and CCC codas, especially those containing the nasals, voiceless stops, fricatives and affricates, and clearly builds upon his emerging L2 phonological repertoire rather than being constrained by L1 retention. Lan, on the other hand, appears to be in a transitional stage as she is still struggling with longer coda structures, which marks stage 2, while being able to produce some of the longer codas, which marks stage 3.

It is unclear whether either participant will even reach stage 4. As they are adult learners and as Vietnamese has relatively simple coda structures compared with English, which makes it more difficult to acquire the fairly complex syllable structures of English, it is doubtful whether either of them will ever approximate a native speaker in phonology. However, it is quite possible that both Lan and Chinh will reach a transitional stage between stage
3 and 4, wherein they have acquired many features of English phonology, but where the CCCC coda, for example, along with the interdental fricatives, are still marked by modifications.

2. Is there an effect for data type (i.e., reading passage vs. interview data) on the production of syllable codas?

There does appear to be an effect for data type on production. These effects do not appear to change across time, and are apparently secondary constraints in contrast with linguistic and social constraints, which are primary in that they affect acquisition while secondary constraints such as data type appear to affect production only. In addition, another secondary constraint, linguistic environment, also affects production. The interaction among these constraints are illustrated in Figure 5.5, which is followed by an discussion of the figure.
Figure 5.5: Secondary constraints on the production of syllable codas
Figure 5.5 illustrates the effect of secondary constraints on production. These secondary effects do appear to be stable across time. That is, even while more codas are being acquired, these codas may still be modified, especially via absence and epenthesis, based on production constraints and linguistic environment.

As the figure illustrates, the preceding linguistic environment has a strong effect on production. A preceding diphthong (including the low back vowel /ɔ/) promotes absence of the following coda, regardless of coda length or type, while all other vowels do not appear to have an effect on production. Conversely, the following linguistic environment appears to have a greater effect on the interview data, where a following pause appears to promote epenthesis. Additionally, in the interview data, less monitoring of production also promotes absence, even of codas that have a high rate of accuracy in the reading data and thus appear to have been acquired.

In terms of the reading data, orthographic miscues, i.e., reading mistakes, promote feature change while careful monitoring promotes accurate production. Epenthesis is not as common for this data set as the participants do not pause as often while reading, and when reading the word lists, they do not pause but rather stop speech entirely between words. Additionally, as they concentrate more on accurate production in the reading data, absence is relatively low in comparison with the interview data.
3. How do linguistic constraints such as linguistic environment, L1 interference, L1 developmental process, linguistic universals, and markedness affect the acquisition of English L2 syllable-final codas by speakers of Vietnamese?

The effect of linguistic environment has been addressed under question 2, above. One main finding of the research project, which confirms prior research (Altenberg & Vago, 1987; Benson, 1988; Broselow, 1987; Flege & Davidian, 1984; Hancin-Bhatt & Bhatt, 1997; Hodne, 1985; Major, 1987a; Major & Faudree, 1996; Sato, 1984; Tarone, 1976, 1980, 1987; Vago & Altenberg, 1977; Weinberger, 1990), is that L1 interference effects appear to be a primary constraint in the development of codas, especially at the beginning stages such as at time 1. For example, initially, L1 interference facilitates the development of the consonants that already exist in the learners’ L1 repertoire, in that the consonants that are allowed syllable-finally in Vietnamese, nasals and voiceless stops, have a high accuracy percentage. In fact, all codas which have these consonants are produced with higher levels of accuracy than other codas. L1 interference constraints also have a debilitating effect on the development of L2 syllable codas, as the participants employ different production modifications such as feature change, epenthesis, and absence, in order to modify L2 codas to an acceptable L1 syllable structure. For example, consonants which exist in Vietnamese in syllable-initial position only are typically epenthesized, resulting in an
acceptable Vietnamese syllable structure. Finally, L1 interference constraints also have a debilitating effect on the production of final consonants, which remains somewhat stable over time, as a preceding diphthong promotes absence, as in Vietnamese, and liquids are modified, or co-articulated, based on the preceding vowel. Since it may be difficult for the participants to make equivalence classifications between the longer L2 codas, i.e., CCC and CCCC, and Vietnamese syllable structures, L1 interference effects do not appear to constrain the production of these codas to as great an extent as for C and CC codas. However, Lan does appear to still rely on the L1 in modifying the longer clusters, indicating that L1 retention is more common for her than for Chinh.

Both developmental effects and markedness also constrain the development of English syllable codas for speakers of Vietnamese. First of all, it appears that developmental effects, in conjunction with the effects of L1 interference and markedness effects (i.e., see the answer for question 1, above) constrain the sequence of development of English consonants as the participants acquired English consonants in the same sequence as children learning English as a native language, in that front consonants were typically acquired before back consonants and voiceless consonants before voiced consonants (cf. Jakobson, 1968). Furthermore, those consonants which are acquired later for native speaking child learners of English, such as the interdental fricatives and voiced affricates, were also acquired later for the
participants, which is also indicative of developmental effects. Confirming prior research, (i.e., Flege & Davidian, 1984; Hecht & Mulford, 1982; Major, 1987a, 1994; Mulford & Hecht, 1980; Piper, 1984), this study also found that developmental effects promoted obstruent devoicing and fricative 'stopping', and that developmental effects were more dominant as interference effects decreased (cf. Major, 1987a, 1994).

Markedness effects also constrained the development of codas based on length, type, length and type, and sonority. Shorter, and thus relatively unmarked, codas emerged before and with a higher level of accuracy than longer, than more marked, codas. Thus, the following developmental sequence can be established: C > CC > CCC > CCCC. In fact, longer codas were typically modified in favor of shorter, and less marked, codas, confirming prior research (Anderson, 1987; Broselow & Finer, 1991; Carlisle, 1991, 1997, 1998; Eckman, 1987, 1991; Sato, 1984; Weinberger, 1987). In addition, some consonant combinations within coda structures which are considered to be more marked such as a stop-stop or fricative-fricative coda (cf. Greenberg, 1978) were acquired after the relatively more unmarked coda (i.e., stop-fricative or fricative-stop) had been acquired. Furthermore, the type of consonant within each coda combined with length has an effect on development: A longer coda does not appear to be produced with some accuracy until shorter coda structures containing the same consonants have
begun being acquired. This also confirms prior research (Carlisle, 1998; Eckman, 1991). Additionally, if modified (i.e., via absence) a longer coda is usually modified in favor of a shorter coda which has begun being acquired.

Markedness in terms of sonority also appears to affect both the development and production of L2 syllable codas in that codas which violate the Universal Canonical Syllable Structure (UCSS) are produced with less accuracy than those which do not. Additionally, these codas are also often modified in favor of a coda which does meet the UCSS, confirming prior research by Carlisle (1991) and Tropf (1987). In fact, the consonant which violates the UCSS is typically the one which is absent. In codas which do meet the UCSS, the medial consonant, often the least perceptually salient, is typically absent rather than the initial and/or final consonants in the coda since the consonants at the edge of the coda are typically more auditorily salient.

One linguistic constraint which did not appear to affect the development of L2 codas by native speakers of Vietnamese was the universal preference for an open, or CV, syllable structure, possibly because of the overriding effects of L1 interference. This confirms prior research (i.e., Benson, 1988; Hodne, 1985; Sato, 1984, 1985; Tarone, 1976, 1980, 1987) which has found that there does not appear to be a preference for an open syllable structure, especially among native speakers of Vietnamese. In fact, the
preferred syllable structure, especially in the beginning stages of development, is a CVC coda, a single coda structure, similar to the preferred Vietnamese syllable structure.

4. How do social constraints such as social interactions (i.e., amount and type of contact with speakers of the L1 and the L2), social identity, acculturation, attitude, and motivation affect the acquisition of English L2 syllable-final codas by speakers of Vietnamese?

The social constraints operating on the English language development of the participants in this study are intricately interconnected as well as multidimensional in nature. At the nexus of these constraints are the social environments of language use. These language use environments may be: 1) supportive of L2 use; 2) unsupportive of L2 use; or 3) predominantly L1 use contexts. The participants encounter these environments across work, home, school, and social situations, etc., and their reactions to these environments based on social identity, acculturation, and their levels of investment in L1/L2 language use are also important factors in how social constraints affect SLA.

Figures 5.6, 5.7, and 5.8 illustrate how language use environment may affect the development of English syllable codas. Figure 5.6 illustrates the effects of a supportive L2 use environment while Figure 5.7 shows the effects
of an unsupportive L2 use environment. Figure 5.8 describes the effects of a primarily L1 use environment on L1 retention and L2 development. A discussion follows the presentation of these figures.

Figure 5.6: The effects of a supportive L2 use environment on SLA
Figure 5.7: The effects of an unsupportive L2 use environment on SLA
Figure 5.8: The effects of a primarily L1 use environment on SLA and L1 retention
Figure 5.6 illustrates the effects of a supportive L2 use atmosphere. Based on the findings from this study, it appears that a supportive L2 use atmosphere, such as the one Chinh has at work and at school, provides increased opportunities to use the L2, and facilitates the learner's investment in L2 use. Both of these may lead to greater opportunities for complex interactions. This then could lead to increased negotiation of meaning in the L2, which is hypothesized to lead the development of the L2, in this case, the development of syllable codas.

In contrast, Figure 5.7 illustrates the effects of an unsupportive L2 atmosphere, such as the one Lan has at work and at school, on L2 development. This type of environment appears to minimize the opportunities learners have to use the target language. The environment itself as well as the few opportunities to use the L2 may in turn lead the learner to minimize their investment in L2 use, as the learner perceives that it is anxiety provoking, and/or not beneficial, which is Lan's case. Instead, the learner may invest in other things. This is illustrated by Lan's investment in developing her nail technician skills over her English skills in her work environment as she perceives that her investment in the former is more beneficial in the long run.

Finally, Figure 5.8 illustrates the effect of an L1 environment on L2 development, such as Lan and Chinh's environments at home and Lan's environment at work when there are no customers present. This
environment does not provide learners with many opportunities for L2 use, and this in turn decreases the learner’s investment in L2. This environment inhibits L2 development; instead, L1 use is promoted, as is the learners’ investment in L1 use, which in turn facilitates L1 retention rather than L2 development.

The participants’ reactions to these environments are also important. Social identity, levels of perceived acculturation, and investment in language use, are all important social constraints that affect how the participants’ react to their various social environments of language use. For example, Chinh perceives himself to be American, and believes he is viewed as an American by others because he possesses American goods (i.e., car, clothes, etc.). His view that he has an American social identity helps him gain confidence in forging in-group memberships with Americans, which provide him with more opportunities for English language use. Lan, on the other hand, is confused about her social identity. She works with many Vietnamese who have retained their L1 identities within the L2 culture. Lan does not want to be like them, and in comparison to them perceives herself and is perceived by them as being more Americanized. Though more Americanized than her co-workers, she is not ‘American’ in comparison with her brothers and sisters, and even her daughter, and she loses opportunities to use English as she cedes these opportunities to the more ‘American’ speaker due to her lack of confidence in herself as a speaker of English. Perceived levels of
acculturation is an important component of Lan's perception of her identity, as it also is for Chinh. However, this is in a contrastive manner to Lan as Chinh's perceived acculturation gives him greater confidence to interact with people, which in turn gives him greater English language use opportunities.

What Lan and Chinh do have in common is their positive attitudes towards members of the target culture, and high levels of motivation to learn English. Therefore, these constructs alone do not help explain the different reactions to their social environments of language use since Lan does not appear to take advantage of the chances she has to speak English all day at work while Chinh appears to actively seek and exploit any opportunities for L2 use. One possible explanation is personality, since Lan is typically introverted and anxious, while Chinh is outgoing and more confident, the latter of which has been linked to higher levels of L2 proficiency (Strong, 1983). However, as the study indicated, Lan only appeared to be introverted in some social situations, such as work, and not in her interviews with me.

Investment, a term coined by Peirce (1995), in L2 use may be a better explanation of the differential reactions to supportive and unsupportive language use environments illustrated by the learners. For example, Lan does not invest heavily in English language use in her work environment, even though she wants to, because of the difficulties in communicating with her customers, and the fact that the communication does not help her learn English, of which she is very aware. In contrast, her interviews with me are
perceived to be the only opportunity she has to use English in a supportive and relaxed atmosphere and she invests heavily in L2 use in this environment. Chinh, on the other hand, invests in language use in his work environment, which is very supportive of L2 use, and at school, which in turn provides him with increased opportunities for L2 use.

When examined integratively, it becomes apparent that having a supportive L2 use environment may be a crucial, though not in itself sufficient, stimulus for second language acquisition to take place. Just as important are the participants' reactions to the language use environment -- accepting, as in Lan's case, or exploitive, as in Chinh's case. These reactions are tied to social identity and perceived levels of acculturation as well as the perceived gains from investing time and energy, etc., in L2 use. Obviously, Chinh's social environments facilitate investment in L2 use since they are mostly supportive in nature. Even when faced with an L1 use environment when his sister-in-law moves in next door, Chinh's reaction is to exploit the opportunity by practicing his English with his English-speaking nieces. The majority of Lan's social environments are supportive for L2 use on the surface -- working with English speaking clients and taking ESL classes. However, in actuality, these environments are unsupportive for L2 use since the interactants also have difficulties with English (both at school and work), and as her classmates often rely on Spanish language use among themselves and with the teacher in order to understand the class lessons. Therefore, her
investment in L2 use in these environments is low, which then decreases her opportunities for engaging in meaningful communication. These very different social environments and reactions to the social environments help explain Lan’s and Chinh’s differential levels of L2 development across and within time, which is examined in more detail below under question 5.

5. Do the linguistic and social constraints change over time? If so, how?

Figures 5.9 and 5.10 help to illustrate the differences in rates and stages of development between Lan and Chinh by connecting the social constraint of language use environment (which includes opportunities and investment in language use) with syllable coda development. These language use environments may help to explain the different rates of development of syllable codas by Lan and Chinh across time. As discussed earlier, not only did Chinh appear to acquire syllable codas at a faster rate than Lan, but in his development of these codas, Chinh appeared to have less L1 retention, and was able to build upon his emerging L2 repertoire to a greater extent than Lan. In other words, not only did he move through the stages of development at a faster rate but within each stage he also more closely approximated correct coda production than Lan.
As these two language learners have similar L1 and English language backgrounds, are similar in age, and came to the US at the same time, it is important to examine social constraints in order to understand their differential levels of L2 achievement both within and across time as the participants appear to be constrained by the same linguistic effects but at different rates across time.
Figure 5.9: The effects of social constraints on Lan's development of L2 syllable codas across time
Figure 5.10: The effects of social constraints on Chinh's development of L2 syllable codas across time
Figure 5.9 illustrates the effects of social constraints in terms of supportive or unsupportive language use environments on the development of syllable codas across time for Lan. In March, time 1, Lan's social contexts of language use are work, home, school, her interviews with me, and social opportunities with classmates. While a number of these are supportive for L2 use, such as school and social interactions, these L2 use opportunities are with other non-native speakers of English who have limited English skills, which may not provide her with the input necessary to push her L2 development. However, her interviews with me are very supportive in L2 use and do push her to negotiate and clarify meaning. At work, she has two types of language environments, L1 use with her co-workers and her boss, and L2 with her customers. Although her interactions with customers provides her with an opportunity to practice the target language, the language use environment is actually unsupportive due to pressure from her boss, anxiety about work, and limited ability to communicate with her Spanish-speaking customers. In terms of her linguistic development, at this time she appears to be at stage 1 of development.

At time 2, in August, her opportunities to use English have become more limited. She is no longer in school, and her social connections to her classmates have been broken, replaced by Vietnamese co-workers and her family, as her sister moves next door. The other language opportunities, i.e., at home, in the interviews, and at work, remain the same. By time 2, Lan is
still in stage 1 in her language development, while moving towards stage 2. She development of English syllable codas is also constrained by L1 retention. The fact that she is still in stage 1 could be due to her restricted opportunities to engage in meaningful interaction in the L2, and the tight L1 social structures around her may promote L1 retention, both of which may minimize her opportunities for L2 development.

This only changes slightly by time 3. Her home, work, and interview language use environments remain the same. Her social connections also stay the same: Vietnamese co-workers or family members. While she does begin school again, Lan’s L2 use opportunities do not improve as this is an unsupportive L2 use environment: her language learning is non-interactive via a videocassette tape and most of her classmates are Spanish-speakers and she has a difficult time communicating with them. Her language development is relatively limited as well, as she remains at stage 2, only beginning to move into stage 3. L1 retention is decreasing, but still constrains her development of English syllable codas, along with her limited opportunities for English language use.

Figure 5.10 illustrates Chinh’s language use environments in light of his language development. It is clear that his language use environments differ from Lan’s, which may be a reason for their differing rates of development of syllable codas across time. At time 1, in March, his home and social language use opportunities are primarily in Vietnamese and he is not
enrolled in school. Like Lan, his interviews with me are also in a supportive L2 use environment. However, unlike Lan, his work is an extremely supportive L2 use environment, wherein he receives input, feedback, and has meaningful interactions which push him to negotiate meaning. At time 1, he is also in stage 1 of L2 development, for the most part, though he appears to be in the initial stages of stage 2.

By time 2, his L2 use opportunities have expanded, contrary to Lan's. Chinh has begun taking ESL classes, and his classroom environment is supportive for L2 use. In addition, a new American co-worker at his job provides him for even more opportunities for English language use as she is extremely outgoing and interactive with him. While his home language use opportunities remain primarily Vietnamese, his social opportunities expand to include English language practice, as he views the move of his sister-in-law, along with his two native English speaking nieces, as giving him more chances to speak English. Additionally, his interviews with me remain supportive of L2 use. It is not surprising then to see that he has reached another stage of syllable coda development, and is in the beginning of stage 3. Additionally, as he is not surrounded by as many L1 environments in comparison with Lan, it is not surprising that his L1 retention is not as great as hers.
These language use environments, which are primarily supportive of L2 use, remain stable across time, and by time 3, December, Chinh has reached the stage 3 of syllable coda development. L1 interference effects continue to decrease, while L2 development increases across time for Chinh.

By examining the interaction among social and linguistic constraints within and across time, it is possible to explain, in part, why Lan and Chinh appear to acquire English syllable codas to such differing extents. First of all, Lan’s opportunities for meaningful communication in the L2 are extremely limited at each time, and become more limited across time. She has few opportunities to engage in meaningful exchanges which could push her to modify her output through the clarification and negotiation of meaning, as well as providing her with the rich input which may be necessary for L2 development (Ellis, 1994). While Lan does, on the whole, acquire some of the L2 across time, her development is much slower than Chinh’s, and characterized by more L1 retention than Chinh’s, possibly as her L1 interactions and environments are qualitatively and quantitatively greater than Chinh’s. In comparison, Chinh has opportunities both at school and at work to engage in the type of communicative behaviors which may push him in L2 acquisition, and overall, has few opportunities for L1 use, which may in part explain his lesser degree of L1 retention than Lan. Therefore, by examining the linguistic findings in light of each participants’ social contexts of language use, which take into consideration both investment in L1/L2 use
and opportunities for language development, the differential rates and sequences of development between the two participants may be explained, in part.

Conclusions:

The interaction among social and linguistic constraints is complex and dynamic. Social constraints affect learners' levels of investment in L2 use as well as opportunities for L2 use, which are necessary in order for learners to initiate and utilize the opportunities to engage in meaningful interactions in the L2, which may provide chances to negotiate of meaning. Social constraints also affect rate of development by providing supportive or unsupportive (or L1 only) environments for language use. Additionally, environments which are L1 rich and L2 poor may promote greater L1 retention and thus increase the effect and duration of L1 interference effects. It is important to note that social constraints are dynamic and change across time and space, and are different among learners even in similar situations, as is exemplified by the different cases of Lan and Chinh. Therefore, while the type of social constraints operating on language development may be similar across learners, individual learners' social situations of language use and their reactions to these situations are not generalizable.
Linguistic constraints appear to be similar across learners from the same L1 backgrounds as well as social situations, to some extent. Overall, it may be possible to able to generalize these linguistic constraints across learners from the same L1 backgrounds and in general, to most L2 learners, though more research is necessary. Linguistic constraints are also interconnected and do change across time. L1 interference appears to be the primary linguistic constraint in the initial stages of SLA -- L1 interference is facilitative for SLA via equivalence classifications between the L1 and the L2, and the transfer of L1 sounds into the L2 when similarities exist. However, L1 interference effects can also be debilitating through the transfer of L1 phonotactics which do not exist in the L2, and the difficulties of acquiring more marked L2 structures which are not in L1. Developmental effects constrain acquisition orders in terms of place and manner of articulation (front before back consonants, voiceless before voiced consonants). Markedness also constrains acquisition orders in terms of length, type, and sonority. All these linguistic constraints are primary and can affect the development and production of a single coda simultaneously. Secondary constraints such as linguistic environment and data type also affect production even after the coda has been acquired.

In summary, the acquisition of English syllable codas by native speakers of Vietnamese is a complex process which is affected by multiple constraints, i.e., primary and secondary linguistic constraints as well as social
Most accurate
Voiceless stops p > t > k
Nasals n > m > N
Voiceless fricative s, f
Voiceless affricate i

Less accurate
Liquids l > ®
Voiceless fricatives S > Q

Very poorly produced
Voiced stops b > d > g
Voiced fricatives v > z > D
Voiced affricate Ø

*There were very few tokens of /l/ in the data and therefore this consonant is not included in the hierarchy.

Table 5.1: Hierarchy of accuracy of production for consonant codas

As Table 5.1 indicates, the codas which contained the voiceless stops, nasals, voiceless fricative, and the voiceless fricative were produced with the most accuracy overall. The greater accuracy of these consonants illustrates the facilitative effects of L1 interference. As discussed in Chapter 2, Vietnamese is restricted in the types of consonants which are allowed syllable-finally. In fact, only voiceless plosives, nasals, and semi-vowels are allowed in final position in a Vietnamese syllable. The consistent patterning of the greater accuracy of the voiceless stops and nasals, which are the few types of consonants allowed in final position in Vietnamese, across time for both participants and across all coda types regardless of length, provides powerful evidence for the primacy of L1 interference effects on the acquisition of English syllable codas by speakers of Vietnamese.
In summary, the acquisition of English syllable codas by native speakers of Vietnamese is a complex process which is affected by multiple constraints which change across time. These constraints have similar effects across learners in terms of the sequence of development of syllable codas, but also differ because of different social contexts of language use. It is not possible to disentangle these constraints from one another, as prior research has often done. Rather, these constraints should be examined interconnectedly so that a multidimensional perspective on SLA can be developed, which is what this research project has sought to do.

Suggestions for Future Research:

The following suggestions for further research are made:

1. A research project in longer duration would make it possible to further examine the sequence of development as well as to confirm the findings from this study. This type of project would also help to determine the eventual proficiency level the learners may attain, and which social and linguistic constraints facilitated the development to this level and prevented the learners from attaining native-like proficiency, if they did not reach this level.

2. It would be beneficial to conduct research with learners who have just arrived within several months of the onset of the study so the early stages of acquisition can be documented with more detail than was possible in this study.
3. Additionally, an ethnographic study that included observations of the participants in the different social environments of language use would facilitate understanding of the complex notion of ‘investment’ -- i.e., why learners invest in English language use in some situations and not in others. Furthermore, this type of research project would provide expanded insight into the learners’ language use opportunities, how they react to these opportunities, and to what extent the learners’ social contexts at home, work, school, etc., are supportive of L2 use. This research project could also gather linguistic data on the learners’ communicative interactions, which is necessary in understanding the scaffolding and negotiations of meaning that take place, both of which may facilitate SLA, during the learners’ interactions in English.

4. This research project should be repeated with more learners of Vietnamese to substantiate the findings from this study and further elucidate on how linguistic constraints constrain the development of L2 syllable codas.

5. Moreover, this study should be repeated with learners of other language backgrounds in order to make comparisons between the linguistic and social constraints which affected the learners of this study with those learners from other linguistic and cultural backgrounds may face.

6. This study only examined one area of L2 development -- syllable codas. There are many other areas of L2 phonological development that need further investigation through a longitudinal research study which examines both linguistic and social constraints, such as syllable onsets and stress.
LIST OF REFERENCES


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APPENDIX A

INITIAL INVITATION FORM
INITIAL INVITATION FORM

1) Name:

2) Phone number:

3) Address:

4) Native language:

5) Home country:

6) How long have you been in the US?

7) How long do you want to stay in the US?

8) Are you willing to meet with me once a week or once every two weeks for one hour each time: YES NO

9) Where do you want to meet? Do you want to meet at your home?

10) What days can you meet? Daytime or evening?

11) I want to tape record our conversation. This will help me understand how you learn English. Is this OK? YES NO

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APPENDIX B

INITIAL QUESTIONNAIRE
I. Biographical information:

1. Name: ________________________________________ E-mail: __________________________
   Address: __________________________________________________________
   ________________________________________________________________
   Home phone number: ____________________ Office phone number: ____________________

2. Age: ____________________ Sex: MALE  FEMALE

3. How long have you been in the United States? ___________________________

4. Have you lived any other place than Tucson in the United States? YES NO

5. If yes, where and for how long? ________________________________________

6. Why did you come to the US? _________________________________________

7. Did you have any family in Tucson before you arrived? YES NO

8. If yes, who? ________________________________________________

9. Did you have any friends in Tucson before you arrived? YES NO

10. If yes, who? ____________________________________________________

II. Language background:

1. Have you taken the TOEFL test? YES NO

2. If yes, what is your most recent score? _________________________________

3. Have you taken a spoken English test such as the TSE or SPEAK test? YES NO

4. If yes, what is your most recent score? _________________________________

5. What English classes have you taken in the United States (please include ALL ESL classes you have taken: __________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
6. When did you take them?____________________________________________________________

7. Did you study English in Vietnam? YES NO (please circle)

8. If yes, for how long did you study English?____________________________________________

9. When you studied English, did you: (please circle as many as apply):
   - Translate
   - Listen to tapes
   - Write compositions
   - Read English books
   - Other:___________________
   - Learn about American culture
   - Study grammatical rules
   - Speak English with native speakers
   - Have English dialogues with classmates

10. Did you learn spoken English in Vietnam? YES NO

11. If yes, did you learn British English or American English?______________________________

12. For how long did you learn spoken English in Vietnam?______________________________

13. Did you have any opportunities to speak English in Vietnam? YES NO

14. If yes, with whom did you speak English and how often?______________________________

15. Comparing yourself to native speakers of English, how well do you think you speak English? (Please circle)
   - About the same
   - A little worse
   - Much worse

16. Comparing yourself to other Vietnamese people studying English, how well do you think you speak English? (please circle)
   - Much better
   - Better
   - About the same
   - A little worse
   - Much worse

17. Please rate your own proficiency in English in the following areas:

<table>
<thead>
<tr>
<th>Area</th>
<th>5=Excellent</th>
<th>4=Good</th>
<th>3=Average</th>
<th>2=Poor</th>
<th>1=Very Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grammar</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Listening comprehension</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Reading comprehension</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
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<tr>
<td>Writing</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Pronunciation</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
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</tr>
<tr>
<td>Fluency</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Knowledge of American culture</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

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18. Do you feel different when you speak English than when you speak Vietnamese? Please explain:

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

19. Does the way of life in the US make it easy or hard for you to learn English? Please explain:

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

III. Language contact:

Please circle your answers to these questions:

<table>
<thead>
<tr>
<th>Question</th>
<th>All</th>
<th>Most</th>
<th>Some</th>
<th>A few</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How many people in your neighborhood speak English as a native language:</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. How many people in your neighborhood speak Vietnamese as a native language:</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. How many of your friends speak Vietnamese as a native language:</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. How many of your friends speak English as a native language:</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. If you are in school, how many of your classmates speak English as a native language?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. How many of your classmates speak Vietnamese as a native language?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. How many of your workmates speak English as a native language?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
8. List the three friends in Tucson that you see the most every day.

<table>
<thead>
<tr>
<th>Name of friend</th>
<th>Language used</th>
<th>Amount of time each day</th>
</tr>
</thead>
<tbody>
<tr>
<td>a._____________</td>
<td>_______________</td>
<td>____________________</td>
</tr>
<tr>
<td>b._____________</td>
<td>_______________</td>
<td>____________________</td>
</tr>
<tr>
<td>c._____________</td>
<td>_______________</td>
<td>____________________</td>
</tr>
</tbody>
</table>

9. List the three *English-speaking Americans* that you speak English with the most. What is their relationship to you? (For example: teacher, friend, neighbor, bus driver). How much time do you spend with them each day?

<table>
<thead>
<tr>
<th>Name of American</th>
<th>Relationship</th>
<th>Amount of time each day</th>
</tr>
</thead>
<tbody>
<tr>
<td>a._____________</td>
<td>_______________</td>
<td>____________________</td>
</tr>
<tr>
<td>b._____________</td>
<td>_______________</td>
<td>____________________</td>
</tr>
<tr>
<td>c._____________</td>
<td>_______________</td>
<td>____________________</td>
</tr>
</tbody>
</table>

IV. English language use:

1. How often do you speak English in your home?
   - Every day 1
   - 2 or 3 times a week 2
   - Once a week 3
   - Once or twice a month 4
   - Never 5

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>How often do you</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>speak English in</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>your home?</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

2. How often do you speak English outside your home?
   - Every day 1
   - 2 or 3 times a week 2
   - Once a week 3
   - Once or twice a month 4
   - Never 5

<table>
<thead>
<tr>
<th></th>
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<tr>
<td>How often do you</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>speak English</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>outside your home?</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

3. How often do you speak English to:
   a) your husband/wife
   - Every day 1
   - 2 or 3 times a week 2
   - Once a week 3
   - Once or twice a month 4
   - Never 5

<table>
<thead>
<tr>
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<th>2</th>
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<td>How often do you</td>
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<td>4</td>
<td>5</td>
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<tr>
<td>speak English to:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>your husband/wife?</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

   b) your children
   c) your relatives
   d) friends
   e) neighbors

<table>
<thead>
<tr>
<th></th>
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<td>How often do you</td>
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<td>4</td>
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<tr>
<td>speak English to:</td>
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<tr>
<td>your children?</td>
<td></td>
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<tr>
<td>your relatives?</td>
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<tr>
<td>friends?</td>
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<tr>
<td>neighbors?</td>
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<tr>
<td>f) classmates</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>g) workmates</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>h) shop/bank employees</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>i) others</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

4. Circle the average number of hours each day you watch television in Vietnamese.

<table>
<thead>
<tr>
<th>Hours</th>
<th>0</th>
<th>1 / 2</th>
<th>1</th>
<th>1 1 / 2</th>
<th>2</th>
<th>2 1 / 2</th>
<th>3</th>
<th>3 1 / 2</th>
<th>4</th>
<th>4 1 / 2</th>
<th>5</th>
<th>5 1 / 2</th>
<th>6</th>
<th>6 1 / 2</th>
<th>7</th>
<th>7 1 / 2</th>
<th>8</th>
<th>8 1 / 2</th>
<th>9</th>
<th>Over 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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<td>1 / 2</td>
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<td>3</td>
<td>3 1 / 2</td>
<td>4</td>
<td>4 1 / 2</td>
<td>5</td>
<td>5 1 / 2</td>
<td>6</td>
<td>6 1 / 2</td>
<td>7</td>
<td>7 1 / 2</td>
<td>8</td>
<td>8 1 / 2</td>
<td>9</td>
<td>Over 9</td>
</tr>
</tbody>
</table>

5. Circle the average number of hours each day you watch television in English.

<table>
<thead>
<tr>
<th>Hours</th>
<th>0</th>
<th>1 / 2</th>
<th>1</th>
<th>1 1 / 2</th>
<th>2</th>
<th>2 1 / 2</th>
<th>3</th>
<th>3 1 / 2</th>
<th>4</th>
<th>4 1 / 2</th>
<th>5</th>
<th>5 1 / 2</th>
<th>6</th>
<th>6 1 / 2</th>
<th>7</th>
<th>7 1 / 2</th>
<th>8</th>
<th>8 1 / 2</th>
<th>9</th>
<th>Over 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>1 / 2</td>
<td>1</td>
<td>1 1 / 2</td>
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<td>2 1 / 2</td>
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<td>3 1 / 2</td>
<td>4</td>
<td>4 1 / 2</td>
<td>5</td>
<td>5 1 / 2</td>
<td>6</td>
<td>6 1 / 2</td>
<td>7</td>
<td>7 1 / 2</td>
<td>8</td>
<td>8 1 / 2</td>
<td>9</td>
<td>Over 9</td>
</tr>
</tbody>
</table>

6. Are newspapers, magazines, or books available in your native language? YES NO
If yes, circle the average number of hours you spend reading them each day.

<table>
<thead>
<tr>
<th>Hours</th>
<th>0</th>
<th>1 / 2</th>
<th>1</th>
<th>1 1 / 2</th>
<th>2</th>
<th>2 1 / 2</th>
<th>3</th>
<th>3 1 / 2</th>
<th>4</th>
<th>4 1 / 2</th>
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<th>7</th>
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<th>8 1 / 2</th>
<th>9</th>
<th>Over 9</th>
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<tbody>
<tr>
<td>0</td>
<td></td>
<td>1 / 2</td>
<td>1</td>
<td>1 1 / 2</td>
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<td>2 1 / 2</td>
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<td>3 1 / 2</td>
<td>4</td>
<td>4 1 / 2</td>
<td>5</td>
<td>5 1 / 2</td>
<td>6</td>
<td>6 1 / 2</td>
<td>7</td>
<td>7 1 / 2</td>
<td>8</td>
<td>8 1 / 2</td>
<td>9</td>
<td>Over 9</td>
</tr>
</tbody>
</table>

7. Circle the average number of hours each day you read newspapers, books, or magazines in English.

<table>
<thead>
<tr>
<th>Hours</th>
<th>0</th>
<th>1 / 2</th>
<th>1</th>
<th>1 1 / 2</th>
<th>2</th>
<th>2 1 / 2</th>
<th>3</th>
<th>3 1 / 2</th>
<th>4</th>
<th>4 1 / 2</th>
<th>5</th>
<th>5 1 / 2</th>
<th>6</th>
<th>6 1 / 2</th>
<th>7</th>
<th>7 1 / 2</th>
<th>8</th>
<th>8 1 / 2</th>
<th>9</th>
<th>Over 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>1 / 2</td>
<td>1</td>
<td>1 1 / 2</td>
<td>2</td>
<td>2 1 / 2</td>
<td>3</td>
<td>3 1 / 2</td>
<td>4</td>
<td>4 1 / 2</td>
<td>5</td>
<td>5 1 / 2</td>
<td>6</td>
<td>6 1 / 2</td>
<td>7</td>
<td>7 1 / 2</td>
<td>8</td>
<td>8 1 / 2</td>
<td>9</td>
<td>Over 9</td>
</tr>
</tbody>
</table>

8. What kinds of radio programs do you listen to? _________________________________

9. What kinds of English TV programs do you watch? _______________________________

10. What kinds of things do you write in English? ________________________________
11. What do you think has helped you the most to learn English? 

D. Language and culture
1. Please reply to the following questions by answering YES! if you strongly agree, yes if you agree, no if you do not agree, and NO! if you strongly disagree.

<table>
<thead>
<tr>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Would you like more chances to speak English?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>b) Would you like more chances to write English?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>c) Do men have more chances to speak English than women?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>d) Do children have more chances to speak English than adults?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>e) Would you like more English speaking friends?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>f) Are Americans helpful when you speak English?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>g) Do you have to speak English to do well in the US?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>h) Do you have to speak English to do well at Pima?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>i) Would you do better at Pima if you spoke English better?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>j) Does your daughter speak better English than you?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>k) Does your husband/wife speak better English than you?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

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1) Will you lose contact with your children if you do not learn English?

\[
\begin{array}{cccc}
\text{YES!} & \text{yes} & \text{no} & \text{NO!} \\
1 & 2 & 3 & 4 \\
\end{array}
\]

m) Are you happy you came to the US?

\[
\begin{array}{cccc}
\text{YES!} & \text{yes} & \text{no} & \text{NO!} \\
1 & 2 & 3 & 4 \\
\end{array}
\]

2. Please circle your answers to these questions.

<table>
<thead>
<tr>
<th></th>
<th>Many times</th>
<th>A few times</th>
<th>One time</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Have you ever had a <strong>good</strong> experience at school because you are an international student who speaks English as a second language?</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>b) Have you ever had a <strong>bad</strong> experience at school because you are an international student who speaks English as a second language?</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>c) Have you ever had a <strong>good</strong> experience in the community because you are Vietnamese and speak English as a second language?</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>d) Have you ever had a <strong>bad</strong> experience in the community because you are Vietnamese and speak English as a second language?</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

3. Do you think people treat you differently because you are Vietnamese and not a native speaker of English? Please explain:

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________
4. Do you feel you need to adjust to the American way of life in order to be successful in the US?
   Please explain:
   ______________________________________
   ______________________________________
   ______________________________________
   ______________________________________
   ______________________________________

5. Have you changed your lifestyle/appearance since you came to the US? Why? Please explain:
   ______________________________________
   ______________________________________
   ______________________________________
   ______________________________________
   ______________________________________

THANK YOU VERY MUCH FOR YOUR HELP!
APPENDIX C

LETTER OF INFORMED CONSENT
Date

Dear potential participant:

I am Jette Hansen, a doctoral candidate in Foreign and Second Language Education in the College of Education at The Ohio State University. Currently, I am writing my dissertation. My topic is “Social and Linguistic Constraints on the Acquisition of an L2 Phonology.” The overall purpose of this dissertation is to understand the process of acquisition of final consonants by speakers, and to examine how linguistic and social factors affect the production and acquisition of final consonants.

I need volunteers who are willing to meet weekly or biweekly, for conversations, which will be tape recorded. The study will last for approximately 10 months.

Information gathered from this study will be used for a dissertation, and may be published in research journals and presented at professional conferences. Your identity will be protected, and you will be given a pseudonym in place of your real name.

Your participation is greatly encouraged and appreciated.

Please sign your name here if you are willing to participate: ____________

Thank you.

Sincerely,

Jette Hansen
APPENDIX D

SAMPLE FOLLOW-UP INTERVIEW QUESTIONS
SAMPLE FOLLOW-UP INTERVIEW QUESTIONS

1. Since our last meeting, how often have you spoken English in your home?
2. How often have you spoken English outside your home?
3. With whom have you spoken English? For how long?
4. Do you speak English or Vietnamese more often at school? At home?
5. With whom do you usually speak Vietnamese?
6. How often have you watched TV in English?
7. In Vietnamese?
8. What is helping you the most to learn English?
9. Do you have many chances to speak English? Why or why not?
10. Would you like more chances to speak English? Why or why not?
11. How can you get more chances to speak English?
12. Do you think your English has improved since ....?
13. If yes, how has it improved?
14. What has helped the most in improving it?
15. If not, why don't you think your English has improved?
16. Are you adjusting to the American way of life?
17. If yes, in what way?
18. If no, why not?
19. Do you think it is necessary to adjust the American way of life in order to learn English or be successful in the US? Why or why not?
20. What are the biggest appearance/lifestyle changes you have made since moving to the US? Why did you make these changes? Have they helped you make American friends or improve your English?

21. What are your strengths in English?

22. What are your weaknesses in English?

23. Is it easy/difficult to speak/read/write/listen to English? Why or why not?

24. How do you study English and what English do you study?

25. What friends, American or Vietnamese, do you talk with most with now?

26. When you watch TV, how much do you understand with captions? Without?

27. In meetings, work talk, customers, etc., how much do you understand?

28. When you talk with me, how much do you understand?

29. Do you still watch TV with captions? Why or why not? How much do you understand with/without captions?

30. What is/has helped you the most in learning English?

31. Who are your closest friends now? Are they American or Vietnamese or other?

32. How often do you rent videos? How much of them do you understand? What kinds of videos are they?

33. Do you get the newspaper? The US one? When/how often? How often do you read it? How much do you understand?

34. Vietnamese newspaper?

35. You said that you wanted to go to the theater together every week... are you? What do you go to watch? How much do you understand?

36. Do you have an American or Vietnamese life? Why?
37. Why does Chinh smoke (i.e., work mates?)

38. Do you still go to church every Sunday? In English? How much of the sermon do you understand? Are the other people going to church American or Vietnamese? Is the priest American or Vietnamese (i.e., is it a Vietnamese church?)

39. Where is Lan's mom? Who else of Lan's family is still in Tucson?

40. Who sponsored them to come to Tucson? Why go to L.A? Why then Tucson?

41. What are the biggest lifestyle changes you have made since coming to the US?

42. What do you miss the most/least about your life in Vietnam?

43. What do you like most/least about your life in the US?

44. What are your future plans? Goals?

45. What do you like the most about Americans?

46. Do you feel you are American or Vietnamese? When? Why?
APPENDIX E

WORD LIST AND READING PASSAGE
WORD LIST

A. Single Codas:
   1. Stops:
      /g/  dog
      /k/  duke, music, thwack, snake, check
      /t/  schmidt, straight, squat, quiet, throat, that
      /d/  good
      /p/  schlep, sheep
      /b/  flub

   2. Fricatives:
      /s/  less
      /z/  Tuesday, noise
      /ð/  language
      /θ/  breathe
      /ʃ/  splash
      /ʒ/  match
      /ðʒ/  breath, mouth
      /v/  cave
      /ʒ/  garage (alternately pronounced with a /ðʒ/ - either pronunciation was considered correct)
      /h/  hoof

   3. Nasals:
      /m/  vroom
      /n/  onion, gwen, hundredth, human, prawn, brown,
      /ŋ/  language, spring

   4. Liquids:
      /l/  popular, future, pure, hear, yourself, other
      /r/  beautiful, jewel, scowl

B. Double:
   /sp/  grasp
   /sk/  risk
   /ŋk/  think
   /rks/  merge
   /rk/  fork
   /rb/  curb
   /rτ/  dwarf, smurf
   /rʃ/  porsche
   /rg/  burg
   /rn/  turn
   /rm/  worm
   /rp/  harp
   /r̩l/  girl
   /r̩ʃ/  church
   /ŋʃ/  lunch
   /ndʒ/  lunge

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C. Triple:
/ʌt/ toothed
/jt/ wished
/pt/ script
/t/ touched
/mt/ amt
/ft/ swift
/kt/ hiked

/D. Quadruple:
/rtdz/ worlds
/lft/ twelfths
/kst/ sixth
When a student from another country comes to study in the United States, he has to find out for himself the answers to many questions ... and he has many problems to think about. Where should he live? Would it be better if he looked for a private room off campus or if he stayed in a dormitory? Should he spend all of his time just studying. Shouldn't he try to take advantage of the many social and cultural activities which are offered? At first... it is not easy for him to be casual in dress, informal in manner, and confident in speech. Little by little he learns what kind of clothing is usually worn here to be casually dressed for classes. He also learns to choose the language and customs that are appropriate for informal situations. Finally he begins to feel sure of himself. But let me tell you, my friend, this long awaited feeling doesn't develop suddenly, does it? All of this takes will power.

Syllable codas:
/t/ it, what, at, not, out, about, appropriate, that, but, it, let, private, it
/d/ awaited, United, should, would, stayed, advantage, should, shouldn’t
/k/ take
/p/ develop
/f/ off, if, if
/v/ of, of, of, of, live
/s/ dress, campus, this, this, questions
/z/ does, doesn’t, choose, has, has, is, is, classes, his
/,/ language, advantage
/ʃ/ speech, which
/in/ in, country, informal, informal, suddenly, in, answers, in, in, advantage, in, confident, when
/m/ himself, from, time, himself, campus, him, room
/ŋ/ long, feeling, clothing, language, studying
/ɹ/ informal, for, are, for, another, for, dormitory, here, informal, where, are, or, for, power, cultural, manner, sure, better

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tell, feel, casual, informal, social, informal, cultural, will, also, all
think
begins, situations, questions
answers
offered
worn
States
customs, problems, comes
confident, student
friend, and, and, and, spend, kind, and, find
looked
takes
dressed, just
himself, himself
first
learned, learned
APPENDIX F

LANGUAGE LOG
<table>
<thead>
<tr>
<th>Minutes per day:</th>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wed.</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
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</thead>
<tbody>
<tr>
<td>Speaking English at home</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Speaking Vietnam at home</td>
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<td></td>
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<td></td>
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<tr>
<td>Speaking English with friends</td>
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<td>Speaking Viet. at school</td>
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<tr>
<td>Speaking English at work</td>
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<tr>
<td>Speaking Viet. at work</td>
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<td>Speaking English in shops</td>
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<tr>
<td>Watching TV in English</td>
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<tr>
<td>English Reading</td>
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<td>Vietnam. Reading</td>
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</tr>
<tr>
<td>Studying English</td>
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