

Interlanguage variation: The influence of monitoring and contextualization on L2 phonological production _____

Gregory L. Thompson
University of Central Florida
Department of Modern Languages and Literatures
gregory.thompson@ucf.edu
Alan V. Brown
University of Kentucky
Department of Hispanic Studies
Alan.Brown@uky.edu

Abstract

This exploratory study analyzes the production of the English /I/ in obligatory contexts by a Spanish-speaking L2 learner of English, whose native phonological system does not include /I/. This study investigates how context—defined by Duranti and Goodwin (1992) as “a frame that surrounds the event being examined and provides resources for its appropriate interpretation”—affects a speaker’s ability to accurately produce native-like phonemes in her L2. The results of the study showed that the participant was most accurate in her production of /I/ in the more vernacular register, i.e. narration, than in the more formal register, i.e. minimal pair naming. Apparently, contextual clues influenced the speakers’ pronunciation of semantically and phonologically familiar words. The presence of contextualized language appears to facilitate the speaker and activate not only lexical features but also phonological components. In spite of being familiar with the semantics and the phonology of the target words, the subject of the current study achieved greater phonological success with production when the words were contextualized.

Keywords: phonological variation, L2 English interlanguage, contextualized language, text type, Spanish-English bilinguals

Resumen

Este estudio exploratorio analiza la producción de la vocal inglesa /I/ en entornos obligatorios de una aprendiz hispanoparlante del inglés, cuyo sistema fonológico no incluye la /I/. El estudio investiga como el contexto--definido por Duranti and Goodwin (1992) como “un marco que rodea el evento que se estudia

y ofrece recursos para una interpretación apropiada de él (traducción mía)--afecta la capacidad de un hablante de articular fonemas de una manera precisa en la L2. Los resultados indicaron que la hablante acertó con más frecuencia el fonema /l/ en el registro vernáculo, i.e. narración, que en el registro más formal, i.e. nombrando pares mínimos. Aparentemente, ciertas pistas relacionadas con el contexto influyeron en la pronunciación de palabras ya conocidas por la hablante en el nivel semántico y fonológico. El lenguaje contextualizado parece haberle facilitado a la hablante no sólo aspectos léxicos sino también rasgos fonológicos. A pesar de que la hablante conocía la semántica y la fonología de las palabras meta, logró precisar la articulación con más éxito cuando las palabras estaban contextualizadas.

Palabras clave: variación fonológica, tipo textual, interlengua del inglés como L2, lenguaje contextualizado, bilingüismo español- inglés

1.Introduction

One of the primary objectives of language variation research is to identify which factors, linguistic as well as social, influence concrete language production. More specifically, quantitative sociolinguistics attempts to assign values to the relative influence, or weight, pre-defined variables have on the expression of certain linguistic forms, whether they be morpho-syntactic, lexical, phonological, etc. Early researchers such as Weinreich (1953, 1957) and Ritchie (1967) developed theories used in describing the phonological features of bilinguals. Additionally, during the 1960's, much of the research conducted applied the theories behind contrastive analysis in an attempt to explain the reasons behind learners' acquisition of certain phonemes (Leather & James, 1996). As a pioneer of quantitative sociolinguistics, William Labov (1966) used quantitative means to study language variation in his investigation of speech monitoring among workers in several New York department stores. Since this time, an abundance of research in this tradition has investigated the speech of native (NS) and nonnative (NNS) speakers alike and what may influence their use, or non-use, of certain variants—particularly phonological variants. One productive area of research within this tradition has examined how speakers alter their production of particular sounds according to the context, or formality, of the discourse, e.g., narration, conversation, reading, naming, etc. Some (Major 2001; Labov 1966) have argued that increased attention to form results in the use of the most standard variants for both NS and NNS, the former attempting to suppress non-standard dialectal variants, the latter groping with acquisitional struggles, some of which pit native language (L1) against target language (L2) phonology. One of these predicaments faced by L2 learners is accurate interpretation of words, both from a semantic perspective as well as a phonological one.

Psycholinguistic research has shown that many factors influence word recognition, such as text frequency, subject familiarity, age of acquisition, and imageability (concreteness). The multitude of influential variables raises the question as to whether or not these factors not only influence recognition but also accurate production of phonemes. Wade-Woolley considers speech perception to a large extent to be language specific stating that “the phonological system of the native language constrains the L2 learner’s ability to perceive and produce the sounds of the target language” (1999: 451). Similarly, Major (1998) found that while there is a relationship between perception and production, they often do not correlate. Not only is the native language a crucial factor in speech perception but also the types of experiences a learner has had with the target language. Best and Strange (1992) claim that language-specific experiences may influence speakers’ perception of phonemic contrasts between their L1 and L2. That is, each speaker has a unique set of experiences with a particular language that may influence the ability to process phonological differences between L1 and L2, as well as the ability to produce accurate phonemes, syntactic structures, and other grammatical elements in the L2. Finally, Young-Scholten, Akita, and Cross (1999) argued that written information increases the likelihood that learners will retain phonological knowledge.

The following review of literature presents research on how L2 learners of English perceive and produce sounds that fall within their L1 phonology and how they deal with those that do not. This review especially focuses on research into Spanish/English bilinguals’ production and perception of English vowels. After the review of literature, the authors detail a study which examined the production of the English /I/ in obligatory contexts by a Spanish-speaking L2 learner of English. This study investigated how context—defined by Duranti and Goodwin as “a frame that surrounds the event being examined and provides resources for its appropriate interpretation” (1992: 3)—and textual formality affected a speaker’s ability to accurately produce native-like phonemes in English—her L2. The research questions that focused this study are the following:

1. How do differing levels of textual formality affect the phonological production of the English high/front, lax vowel /I/ by a Spanish (L1) second language learner?
2. What affect does the degree of contextualization have on the participant’s production of /I/ in obligatory contexts?

2. Literature Review

2.1. Spanish/English Vowel Inventory

Although the phonemic inventory of Spanish and English share many of the same sounds, crucial differences exist which present difficulties for both Spanish L1 learners of English and English L1 learners of Spanish. One notable complication that L1 Spanish learners of L2 English confront is the English vowel /ɪ/. Analysis of the Spanish vowel system reveals that the Spanish vowel /i/ approximates most directly the English /i/ but also may share features with the English vowel /ɪ/. The same can be said for the Spanish vowel /e/ which shares certain features with the English vowel /ɪ/ (Stockwell & Bowen, 1965). Both the /i/ and the /ɪ/ are front/high vowels with the major difference being that /i/ is tense and /ɪ/ is lax (Whitley, 2002). The Spanish vowels /i/ and /e/ are also front vowels. The overlap of these sounds can make the distinction between the English /i/ and /ɪ/ difficult for L2 speakers to produce and, in turn, difficult for L1 interlocutors to distinguish in the L2 speech stream. Such an analysis fits nicely with Stockwell and Bowen's Hierarchy of Difficulty which predicts that the most difficult sounds for L2 learners are those which do not exist in the native-language phonology but are obligatory in the L2 phonology. Some authors have suggested future research which would examine the production of whole words in L2 production (Flege & Munro, 1994). They claim that it is not known whether L2 learners can substitute a single sound in a second language word without affecting neighboring sounds. Their study of voice onset time (VOT) by speakers of both Spanish and English found that inexperienced listeners took into account the information distributed over the entire word when carrying out a language identification task or a goodness rating task.

Flege et al. (1998) investigated the effects of lexical factors and segmental accuracy in speech production and concluded that what is actually acquired during L2 language learning are the particulars of sound patterns from entire words rather than individual segmentals. Jongman et al. (1992) also claimed that listeners appear to perceive phones in the context of a particular word, not as abstract sound units. However, according to Flege et al. (1998), the hypothesis that L2 phonological acquisition is characterized by the learning of whole-word units clearly contradicts the view that literate L2 learners break down L2 words into separate sounds to then relate those sounds to their native phonology's inventory before producing them. They also cite the common store hypothesis which states that words in the L1 and L2 have specific phonological forms that are linked to a common semantic referent. They attempted to identify text frequency using self-report data because of the effect that this might have in the production of an item. "However, it is uncertain what effect, if any, variation

in lexical familiarity will have on L2 segmental production accuracy” (Flege et al., 1998: 159). They also recommended that future research investigate speech in a more natural setting such as conversation in order to see if this affects L2 production. One of the factors that these authors fail to consider is the effect that word context, i.e., contextualized, meaningful language, has on comprehension and also on production of target phonemes.

2.2. *Critical Period and Markedness*

In the field of L2 phonology, the critical period hypothesis is often cited in explaining the reason for second language learners’ foreign *accent*—a phenomenon partially due to the inaccurate production of target language vowels and consonants according to Flege et al. (1997). More directly, the idea is that if a L2 learner is unable or limited in accurately producing L2 vowels after the critical period, then it becomes very difficult to develop any effective technique to train learners that would result in superior performance. Though a much debated topic (see Scovel, 2000, and Ioup, 2005, for a more detailed discussion and extensive bibliography), if indeed the capacity to learn certain sounds is limited or inaccessible after a certain age then it would seem that attempts at achieving native-like control of L2 phonology would be futile. Recently, Flege (2007) declared that his Speech Learning Model (SLM) hypothesizes that:

the perceived phonetic dissimilarity of an L2 sound from the closest L1 sound is a determinant of whether a new phonetic category will or will not be established for the L2 sound. The more distant from the closest L1 speech sound an L2 speech sound is judged to be, the more likely it is that L2 learners—regardless of age—will establish a new category for the L2 sound . (Flege, 1997: 367).

However, this does not discount the effect that age has on the acquisition of native-like phonology. Flege et al. (1997) appear to support the notion of a critical period by claiming that there is an inverse relationship between the accuracy of L2 speaker’s vowel production and the age of initial exposure. Nonetheless, many speakers are able to accurately produce and recognize vowels and consonants that do not exist in their L1 even though their initial L2 exposure was during adulthood, supposedly after the close of the critical period. This information would again support the Speech Learning Model which would explain this acquisition due to the dissimilarity of the sounds and thus the creation of a new category.

Another theory to consider in the explanation of why certain sounds are perceived and others not is that of the Markedness Differential Hypothesis (Eckman, 1977). In the case at hand, the tense/lax distinction of many English vowels would be considered more marked for a Spanish-speaking learner, and, thus, more difficult to acquire. If

the familiar sounds, even though slightly different, are unmarked and the unfamiliar sounds are marked then the L2 learner would need to put more conscious attention to the marked phonological items where as those corresponding or approximate sounds would receive less cognitive attention. The question then arises as to whether vowel production and recognition by adults occurs due to normal and natural exposure to the L2 or if there are special abilities needed. According to Flege (1991), most adult beginning language learners tend to perceive instances of L2 vowels as the closest vowel available in their native phonological inventory and produce them accordingly. It follows, then, that as L2 learners more accurately perceive L2 vowel sounds as unique sounds different from the closest L1 match, they will restructure their interlanguage, move further down the interlanguage continuum, and more closely approximate the L2 phonemes of native speakers. The most problematic sounds to produce and recognize are those that have the same graphemic representation in the L1 and the L2 but have a different allophonic value in the L2. For example, the grapheme {a} in Spanish as in *gato* corresponds to the phoneme /a/ whereas in English this same grapheme has different phonemic and allophonic manifestations, e.g., *pat*, *father*.

2.3. L2 Phonological Acquisition

One method to analyze bilinguals' perceptual errors is via their L2 pronunciation. As previously mentioned, when an unfamiliar L2 sound is identified, the L2 learner will often employ the L1 sound in its place. However, difficulties arise in the classification of learners' production of vowels. It is difficult to classify those vowel sounds produced by the L2 learner as English vowels, Spanish vowels, or some approximation of the intended English vowels. Flege (1991: 707) states that L2 learners have problems with sounds that approximate their L1 sounds since the proximity of sounds "blocks their phonetic category formation needed for authentic production". He also found that L2 speakers produced sounds that did not exist in their L1 more accurately than L2 vowels that merely differed acoustically from a vowel in the L1. The results from this study showed that only a few of the Spanish-speaking subjects were able to produce a clear distinction between /i/ and /I/ while those who could not had to divide the continuum between the sounds on the basis of duration. Those speakers who were successful appear to have formed an /I/ category in their L2 phonological system.

One of the problems that some researchers have found when looking at speech samples where the speaker is allowed to talk freely is the avoidance of certain sounds. Piske et al. (2001) found that speakers would avoid not only difficult L2 sounds but also sound sequences and even words that were phonologically taxing for them. This is one of the motivations for having L2 learners produce speech at different levels of formality. Such procedures allow the researcher to isolate the influence of textual

formality, or contextualization, on the accurate production of target sounds at the sentence, word, or syllabic level. In the following study, the relationship between speech style, i.e. conversation, narration, reading, word list naming and minimal pair naming, and accurate L2 phonological production was examined to see how the two interact.

In a study that measured the degree to which L2 speakers could produce and perceive the English vowels as they were intended, Flege et al. (1997) found that experience producing and perceiving the distinction between /i/ and /I/ in Spanish-speaking learners of English did not play a significant role but was a factor with other vowels. This means that causes other than experience must have played a part in speakers' accurate production and recognition of the minimal pair /i/ and /I/. Regarding L2 learners' production of the Spanish /i/ and /I/, Flege et al. further comment that learners' perceptions of the differences between the two sounds may be more native-like than their concrete production. This may likely be the manifestation of different cognitive processes at work when speakers are forced to produce two distinct sounds rather than merely to perceive their differences. Though different factors affect these two skills, they are undoubtedly related. In this same study, it was found that Spanish speakers' production demonstrated several cases of reversals, e.g., pronouncing *bit* for *beat* and vice versa. The complex sound-symbol relationship of English orthography as compared to Spanish's relatively linear sound-symbol relationship presumably confused speakers causing these reversals since words such as *bit* are not pronounced with the Spanish vowel /i/, as they would be in written Spanish, but rather the English /I/.

Wade-Woolley (1999) researched the relationship between the effects of first language on second language word naming. She studied how speakers transfer the orthography and phonology from the L1 to the L2 and offers this conclusion regarding cross-linguist effects:

Language-specific processing parameters may be set in the process of L1 literacy acquisition, and that, depending on the degree of similarity between L1 and L2 orthographies, even highly fluent L2 speakers may continue to employ less-than-optimal underlying strategies in the process of L2 word recognition (Wade-Woolley, 1999: 450).

Wade-Woolley (1999) referred to the dearth of research that explores first language effects on phonological production in L2 reading. She argues that phonological processing in readers depends on when literacy is achieved and that more fluent readers use phonology to support visual and semantic processing of unfamiliar words. Additionally, phonological processing facilitates the storage of information in working memory. Wade-Woolley hypothesizes that poor phonological representations, possibly due to their inexistence in the L1 phonology, may underlie reading difficulties. These

incomplete representations would be particularly problematic for beginning learners of the language who, with limited exposure to the language and practice with it, struggle to recognize cross-linguistic differences. However, it is important to mention that L2 learners may need other clues that help them to decipher complex phono-graphemic relationships of a language like English especially since there is, in many cases, a many-to-one sound-symbol relationship. The activation of phonological and orthographic processes is crucial to achieving accurate and fluid reading comprehension skills.

Other researchers have found that not only is the L2 phonology affected by the L1 but that L2 learners' production of their L1 was also affected, i.e. bi-directional transfer. Flege et al. (1997) found in a study of French and English bilinguals that their speech differed significantly from their monolingual peers. They state (1997:61), "This finding undermines the view that interference and 'universal' effects on production deriving from the nature of the speech production mechanism are the only factors which directly influence how authentically L2 phones are produced". Cross-linguistic interference, they claim, implies a unidirectional effect from the L1 to the L2. This was not reflected in the data, however, as they found that in the highly proficient bilinguals there was a bi-directional effect. Due to this bi-directional transfer of phonology, they hypothesize that there is a phonological merging that takes place and this may "account for what appears to be an upper limit on phonetic properties of similar L2 phones" (1997: 62). They assert that this might prevent L2 learners from developing separate phonetic categories for similar L2 phones and that this would impede them from being able to produce similar phones in the L1 and L2 authentically. This could also lead one to wonder whether or not L2 learners have established a new phonetic category where certain similar sounds in the L1 and L2 have been reclassified using phonological features from both the languages to form a sound that is not completely native-like in either language. Again, many of these differences would not be detectable to the native speaker but rather could be measured through formant analysis. This analysis would be counter to psycholinguistic research that states that bilinguals have access to two different lexical systems as suggested by Kroll and Stewart (1994) and MacNamara and Kushnir (1971).

2.4. Ontogeny Phylogeny Model and Stylistic Variation

Major (2002) describes in his Ontogeny Phylogeny Model the relationship between the L1, L2, and linguistic universals. One of the areas included in his model is that of speech style. According to this proposal as the style of speech becomes more formal the influence of L2 increases while the L1 decreases and the impact of linguistic universals first increase then decrease. He states that transfer between languages lessens with an increase in speech formality. Wode's (1981) findings with

his daughter's use of English and German lend further support to Major's model. He found that his daughter would produce more transfers from her L1 German to her L2 English in informal/spontaneous speech than in more formal contexts. Labov (1994) also found this to be the case in his research as he observed that as speakers moved from more informal speech to more formal speech their accuracy increased.

The formality of speech and production of native-like vowels is often divided by levels ranging from emotional narration as most reflective of a speaker's vernacular variety, and moving along a continuum to conversation, reading, lists and finally minimal pairs where the speaker monitors the language to the greatest degree. This was originally seen in Labov's (1966) ground-breaking work in New York where he demonstrated the relationship between degree of formality and certain prestige variants with native-speaker speech. While Labov studied the impact of formality on native speech, several early researchers also found that the increase in formality in L2 speech led to a greater degree of accuracy in pronunciation (Nemser, 1971; Dickerson, 1975; Gatbonton, 1978). More recently, others have applied this Labovian paradigm to non-native speech as well (Adamson, 1988; Preston, 1989, Major, 1995; 2001). Similar to native speakers, L2 learners' speech presumably becomes more standard as they pay closer attention to their speech. As mentioned previously, Major (2001) claims that the more non-native speakers monitor their speech, or the more formal the style used, the more accurate their speech will be. He attributes the lack of a native-like accent in part to the amount of monitoring that a learner does and the resulting transfer from the L1. Non-native speakers must deal with the issue of proficiency on the one hand and sensitivity to pragmatics and the degree of formality on the other. Corder (1977) has distinguished between two continua—vertical and horizontal—in L2 interlanguage.

According to this theory, learners of a second language must progress along the vertical continuum, or axis, before being able to progress along the horizontal continuum, or axis. The vertical continuum represents the degree of overall proficiency of the second language while the horizontal continuum represents sensitivity to issues of style, register, and pragmatics. The rationale behind such a theory is clear: an L2 learner who struggles to master basic language skills, e.g., grammar, aural comprehension, oral expression, will be less likely to manipulate subtle aspects of language, e.g., phonological variation sensitive to degree of formality.

3. Study

While the aforementioned research has looked at both the production of speech by L2 learners and the recognition of new words and sounds by these same learners, this study provides additional insight into the impact that discourse

context, orthographically-linked transfer and modality may have on learners' accurate articulation of L2 sounds. Some of the studies have shown that learners used contextualized language to derive the meaning of new words, but less is known regarding the way contextual clues facilitate accurate phonological production (Nagy et al., 1997). Most scholars generally accept the notion that as the monitoring of speech increases so will the proximity of the speaker's utterances to those of L1 speakers but the results from the following research demonstrate how this might not always be true. These findings provide new insights in explaining oral interlanguage variation by considering the effect of contextualized language and textual formality on L2 learners' pronunciation.

3.1. Method

3.1.1. Participant

The participant for this study was a 23-year-old native speaker of peninsular Spanish who arrived to the United States at the age of 19; hence, she represents a post-critical-period learner of English. Her prior experience with English before coming to the United States was limited to public-school classes at the primary and secondary level. In spite of this instruction, she arrived in the United States with limited functional ability in American English, especially in the oral/aural modalities. The participant had studied at the university level in Spain and upon arrival in the United States attended an intensive English school. After residing a year in the United States she was able to score high enough on the TOEFL test to gain admission to a private university. At the time of data collection this participant would be considered an advanced speaker of English with extensive exposure to written English as well but with a notable foreign accent. She was chosen due to her relatively high level of proficiency in English and her native language background. She was asked to use English in different contexts, each representing a different speech task in order to surmise the impact of textual formality on her pronunciation of the English /I/. The participant had known both researchers for a number of years prior to conducting this research which helped to contribute to a comfortable environment during all stages of data collection.

3.1.2. Procedures.

Speech was elicited from the participant using five unique speech tasks starting with the most informal or vernacular, narration of memorable life events, to the most monitored style, minimal pair naming. All of the meetings with the Spanish-

English bilingual were audio-recorded so tokens could later be coded and analyzed using the VARBRUL software for multivariate analyses. The data were collected in the following order at the participant's home. First, in an attempt to elicit the least monitored, or vernacular, English of which she was capable, the participant was asked to recount several emotionally charged experiences reflective of the classic Labovian sociolinguistic interviewing style. This first phase of the study consisted of roughly 45 minutes of narration which included several anecdotes considered extremely memorable to the participant. The interviewer participated minimally in this stage of the data collection as he tried to limit his participation to simple questions as a means to elicit and encourage further narration from the participant. The second phase of data collection included a 45-minute conversation between the participant and her husband—an L2 speaker of Spanish—completely in English. Third, the participant was asked to read a passage that contained many instances of the English vowel /I/ and minimal pairs that included /i/ and /I/. The researchers initially gave the participant a different passage than the one found in the appendices to this paper (see Appendix A). Upon questioning the speaker regarding the passage, it was determined that many of the words from the original passage were unfamiliar to her both semantically and phonologically, and, thus, were not a valid measure of her ability to distinguish between vowels. Due to the rather opaque sound-symbol correspondence of English's deep orthography, both native and nonnative English speakers often struggle to correctly pronounce unfamiliar words in text. A second passage was created by the researchers with words that the participant identified as ones she was familiar with (see Appendix A). This passage also contained minimal pairs from the minimal pair list that was used in the study.

The fourth speech task was that of a reading list wherein words were used that contained both target vowels and other distracters (see Appendix B). The subject was again asked after reading the list if there were any words that she did not know and only one token had to be discarded as it occurred in an unknown word. The researchers determined the participant's knowledge of all written items from the reading passage, list, and minimal pair list by asking her to define the word and use it in a sentence in either English or Spanish. If both researchers agreed upon the definition given for a specific word then the token was included, but if the definition was ambiguous or incorrect the token was omitted from the study. The final elicitation of speech was done through the use of minimal pairs where the speaker was asked to pronounce 24 minimal pairs—48 words total (see Appendix C)—presented next to each other in columns. These minimal pairs contrasted the sounds /i/ and /I/ and the word with the target sound /I/ was presented randomly in first or second position so as to not allow the speaker to simply produce the correct sound as a result of having guessed the presentation order. These included tokens such as sleep vs. slip, bit vs. beat, etc.

The participant was familiar with all of the tokens in the minimal pair list. Again, the researchers initially used a different list of minimal pairs but it was found that the participant was unfamiliar with many of the words and so a new list was created using more common words. As the production of minimal pairs is considered the most monitored form of speech, the administration of two lists would not be problematic and may have served to heighten the speaker's consciousness even more concerning potential phonological differences between words. When the researcher asked the participant regarding her understanding of the research objectives, the participant stated that she was not aware of the study's specific purpose but did understand that her speech was being analyzed in some way.

3.1.3 Data Analysis

After recording the five speech samples, both of the researchers coded over two hundred tokens together to establish an inter-reliability quotient of 95%. The remaining tokens from the narration and conversation condition were coded individually by the two researchers but with agreement checks periodically to ensure accurate coding. All of the tokens in the reading passage, word list, and minimal pairs were coded by both researchers together to ensure accuracy. Agreement was reached as to the appropriate coding of all tokens. As an applied study whose focus is on effectiveness of articulation for perceptual and communicative purposes, it was deemed unnecessary and not within the scope of this study to include spectrogram analyses (see Milroy & Gordon, 2003 for a justification of the validity of impressionistic coding with binary variance). That is, for the purposes of this study as an inquiry into applied linguistics, the exact location of the first and second formant was not as important as whether the participant's production sounded like /I/, or some other vowel, to native speakers. Therefore, the researchers, both of whom are native speakers of American English, listened closely to each instance where the vowel /I/ would normally be produced and determined whether they perceived the vowel /I/ or an alternative vowel or sound. If a token contained features of both Spanish and English and was somewhat of a hybrid sound, a decision was made by the researchers as to whether it could be coded as a correct use or not following the coding criteria as explained below in the Method section.

Only those tokens that contained obligatory contexts for the English vowel /I/ were transcribed from the recorded oral data. However, certain words that allow for dialectal and regional variation of the sound /I/ in American English make certain contexts non-obligatory. For example, the third vowel in *ability* may be reduced and produced as a schwa /ə/ or maintained as the high front vowel /I/ depending on one's dialect. A similar phenomenon occurs with the second vowel in *artificial* where

some native speakers prefer to reduce the vowel while others opt for /I/. Also, words containing the string of sounds represented by the string of graphemes “ing” or “ink” were discarded due to variation in American English that does not always require /I/, e.g., /ɪŋg/ or /ɪŋg/; /ɪŋk/ or /ɪŋk/; /ɪn/ or /ɪk/.

In keeping with sound methodological practices within the variationist paradigm, the researchers included all factor groups that they felt might influence the dependent variable. This tendency to overcode allows for factor groups and individual factors to be conflated later should it be discovered that there is no variation within a particular group, i.e., a knock-out factor. Thus, each token was coded according to 11 characteristics, or factor groups, that are listed on the coding sheet in Appendix D.

The dependent variable was included as the first variable and was defined as the use (coded ‘1’) or non-use (coded ‘0’) of the English high front vowel /I/ in obligatory contexts as defined above. The first independent variable has reference to the five degrees of textual formality, or contextualization, of the communicative act so that Narration (N), Conversation (C), Reading (R), Word Lists (L), and Minimal Pairs (M) were included as the second factor group. Some of the other factors that were coded for included the following: part of speech of the word within which the token occurred, the sound immediately following and preceding the target vowel, number of syllables of the word in which the token occurred, and lexical item. The lexical item *it* was initially coded but after more than forty consecutive correct pronunciations, the researchers determined that the speaker’s variation of the target sound was minimal to non-existent within this particular word. Upon coding the remaining tokens, no case of incorrect pronunciation of *it* was encountered. Other common, high frequency words such as *in*, *this*, *with*, *is*, etc., were classified separately under the factor group *lexical item* on the coding sheet in an attempt to examine the influence of frequency on correct production.

After all 665 viable tokens from the recorded speech samples were coded, a cross-tabulation was run using VARBRUL to determine whether any factors resulted in little to no variation and therefore had to be excluded from the multivariate analysis. As a result of this analysis, factor groups 6 and 11 were left out completely and within Factor Group 5 (preceding sound), the factor *vowel* (V) and *none* (N), meaning no preceding sound, were conflated into one factor (N). Also, *adverb* (A) and *conjunction* (C) were omitted from Factor Group 7 as were the lexical items *is* (S) and *his/him* (H) from Factor Group 8. The final adjustment occurred after the initial binomial stepping up and stepping down run indicated that there was an interaction effect between Factor Groups 3 (primary or secondary stress) and 4 (minimal pair available) and Factor Group 1 (textual formality). As VARBRUL assumes no interaction between independent variables, it was necessary to eliminate Factor Groups 3 and 4 to resolve

the mismatch of factor weights with raw percentages of application. The hierarchy of percentages of application did not parallel that of the factor weights. In the final run VARBRUL produced a Chi-square per cell value of .5363, which is less than the maximally acceptable 1.5, and log likelihood value of -128.740, indicating a good fit between the data set and the use of the VARBRUL multivariate analysis. Finally, a traditional Chi-square analysis was run on the frequencies of correct usage of /I/ from the tallies and percentages produced by the cross-tabulation.

4. Results

Once all adjustments had been made to the data set as mentioned previously, a multivariate, binomial stepping up and stepping down procedure was run using the non application, or incorrect use, of /I/ in obligatory contexts as the dependent variable (Factor Group 1) and Factor Groups 2, 5, 7, 8, 9, and 10 as independent variables. The multivariate VARBRUL analysis resulted in a significant p value of .034 (alpha level set at $p < .05$) for Factor Groups 2 (textual formality) and 5 (preceding sound). The respective factor weights of each factor in Factor Group 2 are the following (where a value greater than .50 favors the incorrect use of /I/ in obligatory contexts and values less than .50 favor the correct use of the sound): C (Conversation) = .374, N (Narration) = .448, R (Reading Passage) = .720, L (Word List) = .868, M (Minimal Pairs) = .959. Hence, in Factor Group 2, the factors Narration and Conversation favored the correct production of the target sound /I/ by the speaker while Word List, Reading Passage, and Minimal Pair favored incorrect production. In the case of Factor Group 5 (preceding sound), a vowel or a pause (N=none) highly favored correct pronunciation of the target variant /I/ with a factor weight value of .181, where values closer to 0 favor the use of the target variant. Contrarily, when the preceding sound was a consonant (C) there was only a very slight tendency to favor incorrect pronunciation (.554) as a score of .50 indicates that a factor neither favors nor disfavors the application of the dependent variable.

A closer look at the range of weight values indicates that Factor Group 2 (textual formality) had a range of .585 between the lowest and highest factor value while Factor Group 5 resulted in a value range of .373. This demonstrates that the degree of textual formality, or contextualization as operationalized previously, exerted a greater magnitude of effect on the speaker's incorrect use of the target variant—the high, front English vowel /I/ than any other of the factors.

Similarly, a traditional Chi-square analysis of the cross-tabulation of frequencies for both of these factor groups resulted in a significant difference between cells at an alpha level of $p \leq .05$. Fisher's Exact Test of significance indicated that the p value

for the Chi-square analysis was $p = .000$ for Factor Group 2 (textual formality) while Factor Group 5 (preceding sound) resulted in a p value of .024. Table 1 displays the percentages and frequencies for each cell in the cross-tabulation for Factor Group 2 while Table 2 contains the values and percentages for Factor Group 5.

Table 1: Totals of Correct and Incorrect Uses of /I/ Based on Textual Formality

Style	Number of Correct Uses (% within individual factor)	Number of Incorrect Uses (% within individual factor)	Total Number of Tokens (% of Total)
Narrative	228 (96%)	10 (4%)	238 (36%)
Conversation	291 (97%)	9 (3%)	300 (45%)
Reading Passage	61 (87%)	9 (13%)	70 (11%)
Word List	25 (76%)	8 (24%)	33 (5%)
Minimal Pairs	10 (42%)	14 (58%)	24 (4%)
Totals (% of total tokens)	615 (92%)	50 (8%)	665 (100%)

$p = .000$; Pearson Chi-Square = 117.840; $df = 4$; Fisher's Exact Test = 69.614 (used since 2 cells had expected count less than 5).

As mentioned above, Table 2 displays the results from the only other factor group that produced statistically significant results in the Chi-square analysis (Factor Group 5: preceding sound). Included in the table are the cross-tabulation of results and accompanying Chi-square values.

Table 2: Totals of Correct and Incorrect Uses of /I/ Based on Preceding Sound

Preceding Sound	Number of Correct Uses (% within individual factor)	Number of Incorrect Uses (% within individual factor)	Total Number of Tokens (% of Total)
Consonant	532 (92%)	49 (8%)	581 (87%)
None (Vowel or pause)	83 (99%)	1 (1%)	84 (13%)
Totals	615 (92%)	50 (8%)	665 (100%)

$P = .024$; Pearson Chi-Square = 5.537; $df = 1$

5. Discussion

The results of this study lead to several conclusions, one of which was quite unexpected: first, the degree of textual formality within each of the speech tasks and the nature of the preceding sound significantly influenced the participants' production of the sound /I/ in obligatory contexts; second, the appearance of a vowel or pause immediately preceding the vowel /I/ tended to favor correct pronunciation,

and probably the most unexpected finding was that the participant's performance in articulating the target vowel deteriorated as the degree of textual formality, and presumably, attention to form increased. That is to say that this speaker's degree of accuracy in producing the high, front English vowel /I/ was in the opposite direction that Labov (1994) and others (Nemser, 1971; L. Dickerson, 1975; Major 2001, 2002; Wode, 1981) have theorized it to be. The traditional Labovian hypothesis for L1 speakers argues that monitored styles of speech, such as minimal pairs and word lists, lead to more accurate, standard phonological production while vernacular styles, such as conversation and narration, lead to less monitored, and thus, less accurate speech. Although the Labovian hypothesis pertains to native-speaker speech, others have applied this theory to non-native speech as well (Adamson, 1988; Preston, 1989, Major, 2001). Beebe (1982), however, represents one dissenting voice who has expressed concerns regarding the application of the Labovian paradigm of style shifting to the study of learner language.

As evidence of this speaker's high level of proficiency, the researchers perceived her production of the target variant /I/ to be correct in obligatory contexts at a rate of 92% across the 665 tokens. Of all of the factor groups included in the binomial, multivariate analysis only textual formality and preceding sound affected the participant's production of /I/ to a statistically significant degree. The frequencies and percentages displayed in Table 1 demonstrate how the number of incorrect uses of /I/ in obligatory contexts increased as the discourse context was reduced, thus, according to most scholars, producing more monitored speech. With minimal pairs, she produced more incorrect uses (14) than correct ones (10). In the context of this study, *correct* use refers to the accurate production of /I/ in obligatory contexts, i.e. situations where most dialects of American English would use /I/, and *incorrect* use means the use of any other vowel besides /I/.

The results from this study offer additional insights on the notion of phonological production, textual formality, and contextualized language production. Contextualized language has traditionally been studied in reference to its facilitative effect for learners in deciphering the semantics of lexical items, while less attention has been paid to its impact on phonological accuracy. The participant in this study appears to have used language context, as operationalized above, not only to derive meaning from the words but also as a guide to correct pronunciation. The sound /I/ does not exist in the Spanish vowel system and, hence, L1 Spanish learners of English are forced to restructure their interlanguage phonology to accurately produce the sound at the appropriate times. This speaker appeared to rely on the degree of contextualization accompanying her speech production to give her a phonological clue to produce this foreign phoneme. For example, the researchers perceived a correct instantiation of /I/ when the learner articulated the word "live" in a highly contextualized condition

(conversation/narration) while her production of the target sound in the same word in the decontextualized condition (minimal pair/list) was not accurate.

The data clearly demonstrated that this English language learner had the motor dexterity to manipulate her articulatory organs, specifically the height of and tension in her tongue, in such a way so as to produce the sound /l/ in spite of it being a vowel not included in her L1 vocalic inventory. Nevertheless, the ability to simply produce a sound and to produce it consistently in the appropriate context with varying degrees of textual formality and surrounding contextualization appears to be another matter.

The complex sound-symbol relationship in English orthography was compounded by the presentation of isolated, decontextualized words. As already mentioned, L2 learners of English as well as many native English speakers struggle to pronounce sounds accurately when the pronunciation of new words is not known due to the various phonemes one grapheme may represent in English. Often, speakers know the meaning of the words when presented visually but have never heard them articulated with enough frequency, or have not read them aloud themselves, to correctly recall the phonology at the moment of production (Kolers, 1966). The effect of English's deep orthography and the opaque sound-symbol relationship was apparent when the participant was presented visually with minimal pairs bereft of surrounding context. The participant was not able to produce the proper pronunciation of almost 60% of the minimal-pair tokens, embedded in known words, when presented on paper in isolation in spite of the fact that she had produced some of the same tokens correctly in a reading passage which contained all of the same minimal pairs. Furthermore, her production of some of these minimal pairs was accurate in narration and conversation as well. Evidently, the participant's difficulty in accurately pronouncing English words resides not only in the ability to decipher the orthography of English and its semantics, but also in the level of contextualization. It seemed as though the deeper the learner's analysis of the grapho-phonological relationships in a particular word when presented without surrounding context and meaning, the more problematic the task of accessing the appropriate phoneme and pronouncing it correctly became for the speaker.

Other plausible explanations for this speaker's difficulty articulating the target sound relates to her knowledge of and experience with Spanish spelling conventions when reading aloud and their potential interaction with English spelling conventions. Unlike a monolingual English speaker who only has to deal with the complexities of deciphering the relationship between one set of graphemes and their corresponding phonemes, a bilingual speaker has the additional task of avoiding cross-linguistic interference between orthographic conventions and grapho-phonological relationships from two languages. In cases where the word was stripped of discursive context and required a direct comparison between distinct graphemes representative of two distinct

phonemes, i.e., minimal pairs, it appeared the speaker engaged in a deeper analysis. Additionally, it is also important to note that there is often a parallel between the hypercorrections that native speakers sometimes show (when recruited for linguistic tasks) and the confusions between /i/ and /I/. Participants in a linguistic analysis often change their natural speech pattern due to the fact that they are being observed. While the participant in this study was not aware of the specific purpose of the study, the fact that she was being recorded could have affected the speech and type of corrections produced and even result in hypercorrections.

This deeper analysis of the grapho-phonological relationship became apparent as the researchers found that the participant did not always produce a sound clearly attributable to Spanish or English phonology. Many times the sound would start with one vowel, /I/, and finish with another, e.g., /i/, or vice versa, possibly reflecting an attempt to approximate the English native-speaker norm. Additionally, when she attempted to produce the minimal pairs—ostensibly reflective of the most thorough analysis, or monitoring, of form—she produced the same vowel but varied the vowel length, pitch, or volume in an apparent attempt to differentiate between the two sounds in some way. This lengthening of vowels and change of pitch did not generally change the vowel quality but was a clear reflection of the monitoring that occurred as she tried to distinguish between the two words that she knew were somehow different. She was aware of the difference because of the distinct orthography between the paired words, but she was unable to pinpoint the correct timbre of the vowel, choosing rather to alter other acoustic qualities. These findings are in harmony with Stockwell and Bowen's (1965) predictions as well as Flege's (1991) results where there were reversals in participants' production of sounds. It is assumed that the sound /i/, which exists in Spanish phonology, would be the likely substitute but, in fact, the speaker would at times chose /I/ for both words of a minimal pair as in *still* [stIl] and *steal* [stIl]. The accuracy of this deeper analysis, then, might have been hindered by 1) the complex grapho-phonological relationships of English orthography, and 2) the possibility of orthographically-linked transfer from Spanish (L2) to English (L1). This sensitivity to graphemic signals is likely to have influenced the participant's ability to accurately identify the correct phoneme. The orthographic complexities of English add to the difficulty in identifying the proper sounds.

6. Conclusion

Like many studies of this nature dealing with interlanguage and its development, this study raises more questions than it answers. In the case of this advanced speaker of L2 English and her production of /I/, it was clear that she was capable of producing the sound /I/ but that accurate production interacted with many factors: preceding

sound, degree of textual formality, ability to decipher English's deep orthography (reading ability), degree of contextualization at the word and discourse level, and language modality. It is interesting to note that these factors arose within the context of words that were semantically and phonologically familiar to the speaker. Future studies need to consider what psycholinguistic processes are occurring that cause familiar words, out of context and bereft of visual cues (i.e., orthography), to be pronounced differently than when embedded in contextualized language, e.g. reading passage, conversation, narration. Kroll and Stewart's (1993) revised hierarchical model of lexical and conceptual representation in bilinguals does much in shedding light on bilingual speaker's access to two lexicons. However, this model does not provide much insight into how the degree of contextualization influences the accurate production of specific L2 phonemes and allophones with lexical items from L2. The presence of a larger context, especially in the visual channel, appears to prime the speaker and activate not just lexical features but also phonological components. In spite of demonstrating familiarity with the semantics *and* the phonology of the target words, the subject of the current study achieved greater success when the words were contextualized and produced orally without the mediation of orthography rather than read from a decontextualized, isolated list where deeper analysis of the sound-symbol relationship is required.

Some authors have attributed L2 phonological variation to cross-linguistic transfer and interference implying that future research should look at other languages besides Spanish and English. Additionally, this study looked at only one participant and idiosyncratic variation may have played a role in her production, especially in regard to the influence of transfer. That is, cross-linguistic transfer regardless of the language skill executed, does not interact uniformly with each speaker's burgeoning interlanguage. The analysis offered here concerning this speaker's struggles to accurately articulate the target sound may not be appropriate for another speaker from the same L1 struggling with the same sounds in the same L2. Furthermore, the creation of the reading passage, word list, and minimal pairs focused on the sound /i/ as a potential competitor to /I/ for Spanish speakers, given the former's existence in the Spanish vowel system and the latter's non-existence. Other studies will determine whether greater accuracy is obtained in contrasting other vowels with /I/ whose features maintain a more distant relationship, such as /a/. Future research should include a variety of speakers and sounds as well as cross-linguistic comparisons of their native languages in order to see if L1 transfer, particularly orthographically-linked transfer plays a significant role in L2 production of written stimuli. In addition, the participants' accuracy in pronouncing known words varied greatly between the spoken and written modalities. Future research must parse out the respective influence of modality (speaking, reading), formality, and degree of contextualization on accurate pronunciation.

No attempt was made here to propose a model for phonological variation in L2 speech as a result of these findings. However, both the field of second language acquisition (SLA) and psycholinguistics might benefit from reconsidering the interaction between L2 lexical familiarity, L2 reading processes, cross-linguistic orthographically-related transfer, meaningful L2 contextualization, and L2 production in order to better understand the extremely complex phenomenon that L2 speech represents.

Acknowledgments

An earlier version of this article was presented at the Second Language Research Forum (SLRF), University of Arizona; October 16th – 19th 2003 under the title of *Interlanguage variation: The Influence of Contextualized Language on L2 Phonological Production*.

References

Adamson, H.D. 1988. *Variation Theory and Second Language Acquisition*. Washington D.C.: Georgetown University Press.

Beebe, L. 1981. "Social and situational factors affecting the communicative strategy of dialect code-switching". *International Journal of the Sociology of Language*, 32: 139-149.

Best, C. and W. Strange. 1992. "Effects of phonological and phonetic factors on cross-language perception of approximants". *Journal of Phonetics* 20: 305-330.

Corder, S.P. 1977. "Language continua and the interlanguage hypothesis". *Actes du 5eme: Theoretical models in applied linguistics*. Universite de Berne, May 31- June 3: 11-17.

Dickerson, L. 1975. "The learner's interlanguage as a system of variable rules". *TESOL Quarterly* 9: 401 -407.

Duranti, A. & Goodwin, C. 1992. "Rethinking context: An introduction". In A. Duranti & C. Goodwin (eds.), *Rethinking context*. Cambridge: Cambridge University Press, 1-42.

Eckman, F. 1977. "Markedness and the Contrastive Analysis Hypothesis". *Language Learning*, 27: 315-330.

Flege, J., E. Frieda, E., A. Walley, and L. Randazza. 1998. "Lexical factors and segmental accuracy in second language speech production". *Studies in Second Language Acquisition* 20 (2): 155-187.

Flege, J., O. Bohn, and S. Jang. 1997. "Effects of experience on non-native speakers' production and perception of English vowels". *Journal of Phonetics* 25: 437-470.

Flege, J and M. Munro. 1994. "The word unit in second language speech production and perception". *Studies in Second Language Acquisition* 16: 381-411.

Flege, J. 1987. "The production of 'new' and 'similar' phones in a foreign language: evidence for the effect of equivalence classification." *Journal of Phonetics* 15: 47-65.

_____. 1991. "The interlingual identification of Spanish and English vowels: Orthographic evidence." *The Quarterly Journal of Experimental Psychology* 43A (3): 701-731.

_____. 2007. "Language contact in bilingualism: phonetic system interactions". In J. Cole and J. Hualde (eds) *Laboratory Phonology* 9, Berlin: Mouton de Gruyter, 353-382.

Jongman, A., Wayland, R., and Wong, S. 2000. "Acoustic characteristics of English fricatives". *Journal of the Acoustical Society of America* 108: 1252-1263.

Kolers, P. 1965. "Bilingualism and Biculturalism". *Language and Speech* 8: 122-126.

_____. 1966. "Reading and talking bilingually". *The American Journal of Psychology* 79 (3): 357-376.

Gatbonton, E. 1978. "Patterned phonetic variability in second language speech". *Canadian Modern Language Review* 34: 335 - 347.

Harris, J. 1969. *Spanish Phonology*. Cambridge, Massachusetts: The MIT Press.

Ioup, G. 2005. "Age in second language development". In E. Hinkel (ed) *Handbook of Research in Second Language Teaching and Learning*, Mahwah, NJ: Lawrence Erlbaum Associates, 419-435.

Kroll, J. and E. Stewart. 1994. "Category interference in translation and picture naming: Evidence for asymmetric connections between bilingual memory representations". *Journal of Memory and Language* 33: 149-174.

Labov, W. 1966. *The Social Stratification of English in New York City*. Washington, DC: Center for Applied Linguistics.

_____. 1994. *Principles of Linguistic Change, Vol. 1: Internal factors*. Oxford: Blackwell.

Leather, J. and A. James. 1996. "Second language speech". In W. Ritchie (ed) *Handbook of Second Language Acquisition*, San Diego, CA: Academic Press, 269-326.

Major, R. 1995. "Native and nonnative phonological representations". *IRAL* Vol. XXXIII (2): 109-127.

_____. 1998. "Interlanguage phonetics and phonology". *Studies in Second Language Acquisition* 20 (2): 131-137.

_____. 2001. *Foreign Accent: The Ontogeny and Phylogeny of Second Language Phonology*. Mahwah, N.J. Lawrence Erlbaum Associates, Inc.

_____. 2002. "The phonology of the L2 user". In V. Cook (ed) *Portraits of the L2 User*, Clevedon, UK: Multilingual Matters, 131-137.

McNamara, J. and S. Kushnir. 1971. "Linguistic independence of bilinguals: The input switch". *Journal of Verbal Learning and Verbal Behavior* 10: 480-187.

Mendez, A. 1982. "Production of American English and Spanish Vowels". *Language and Speech* 25 (2): 191-197.

Milroy, L. and M. Gordon. 2003. *Sociolinguistics: Method and Interpretation*. Malden, MA: Blackwell.

Nagy, W., E. McClure, and M. Mir. 1997. "Linguistic transfer and the use of context by Spanish-English bilinguals". *Applied Psycholinguistics* 18: 431-452.

Nemser, W. 1971. *An experimental study of phonological interference in the English of Hungarians*. Bloomington: Indiana University Press.

Piske, T., I. MacKay, and J. Flege. 2001. "Factors affecting degree of foreign accent in an L2: a review". *Journal of Phonetics* 29: 191-215.

Preston, D. 1989. *Sociolinguistics and second language acquisition*. New York: Oxford Press.

Ritchie, W. 1968. "On the explanation of phonic interference". *Language Learning* 18: 183-197.

Scovel, T. 2000. "A critical review of the critical period research". *Annual Review of Applied Linguistics* 20: 213-223.

Stockwell, R. and J. Bowen. 1965. *The sounds of English and Spanish*. Chicago, IL., The University of Chicago Press.

Wade-Woolley, L. 1999. "First language influences on second language wordreading: All roads lead to Rome". *Language Learning* 49 (3): 447-471.

Weinreich, U. 1953. *Languages in Contact*. The Hague: Mouton.

_____. 1957. "On the description of phonic interference". *Word* 13: 1-11.

Whitley, M. 1986. *Spanish/English contrasts: A course in Spanish linguistics*.

Washington, D.C., Georgetown University Press.

Wode, H. 1981. *Learning a Second Language*. Gunter Narr-Verlag, Tübingen.

Young-Scholten, M., M. Akita & N. Cross. 1999.. "Focus on form in phonology: orthographic exposure as a promoter of epenthesis." In P. Robinson & N.O. Jungheim (eds) *Pragmatics and Pedagogy: Proceedings of the Third PacSLRF. Volume 2*. Tokyo: Aoyama Gakuin University. 227-233.

APPENDIX A

The Potato Farmer

Being married is a tough job. There are many differences between my husband and me. I will tell you about some of them. My husband, Tim, grew up on a farm with goats, sheep, cows, and other animals. He lived in Idaho for many years and he hated to leave to go to school. His house was on a hill so they could be seen for miles around. From his home, you could see a green mountain peak nearby and there were many fruit trees such as apple trees, peach trees, and apricot trees. He says that the apricot trees are beautiful all leafed out with their white blossoms. His family had to pick potatoes in order to try to make money but they never got rich. The problem was that after a day of picking potatoes his feet would feel really sore from walking and so would his back because he had to lift the potatoes into a tractor and fill it up. After picking the potatoes, he would have to go to his home and peel them. No one lives close so at night it is so still and quiet that it is hard to sleep but at least you do not have to worry whether anyone will steal your car or not like in a big city. It is too quiet for me and sometimes I have to take a pill just to sleep.

When I would visit him, we would sit on his porch and read together. I first thought that he was just cheap and didn't want to spend money but I realized that he was sore from so much work and was trying to heal his sore back. He had a big grin on his face when he explained that picking potatoes was not as easy as it might seem. It requires several people who work together as a team. He explained that each person had a list of tasks to perform and that he would lead them all out to the field to begin the labor. You have to set the potatoes in the tractor and you can't pitch them in. Each potato has to fit in a particular spot and sometimes they slip into the wrong spot and you move them. This is hard because the back of the tractor is very deep and they can be hard to reach.

He said that you have to be careful about the potatoes that you harvest because it is a sin to sell bad potatoes. If you have bad potatoes, you get rid of them by feeding them to the pigs. He bit into one to show me what a bad potato looked like on the inside. I thought it was disgusting. The tractor that they used was very old. It had only one wheel on the front and two on the back. The window had a chip in it and it was hard to see. In addition, the driver's seat was cracked and had a big dip in the middle that made it really uncomfortable. The roof had many dents in it and looked as if someone beat it with a baseball bat. After all the potatoes were picked, he would put them in a big container with a lid to keep them from falling out. They were then

transported to a port and went by ship to different countries across the world. I have decided that I do not want to be a potato farmer. I prefer to live in the city.

APPENDIX B

Lists (33 tokens)

Activity	give
telephone	extreme
improvement	funds
school	it
artificial	which
computer	will
his	local
academic	scientific
teach	and
video	population
important	mother
some	picture
different	because
during	digitized
ill	clip
technology	knowledge
principle	project
if	inch
difficult	is
book	still
politics	simulation
win	help
within	continue
money	refrigerator
trick	paper
authenticity	particular
poverty	college

APPENDIX C

Minimal Pairs

APPENDIX D

Coding Sheet for /I/

Factor Group 1: Dependent Variable

0: No use of /I/ in obligatory contexts

1: Use of /I/ in obligatory contexts

Factor Group 2: Style

N: narrative

C: conversation

R: reading

L: lists

M: minimal pairs

Factor Group 3: Stress

P: primary

S: secondary

Factor Group 4: Minimal Pair

0: no minimal pair available

1: minimal pair available

Factor Group 5: Preceding Sound

C: consonant

V: vowel

N: none (pauses, start of sentence)

Factor Group 6: Following Sound

C: consonant

V: vowel

N: none (pauses, start of sentence)

Factor Group 7: Part of Speech

V: verb

N: noun
A: adverb
P: preposition
J: adjective
R: pronoun
O: other
C: conjunction

Factor Group 8: Lexical Item

T: this
I: it
N: in
S: is
H: his/him
D: did/didn't
W: with

Factor Group 9: Number of syllables

1:1
2:2
3:3
4:4
5:5+

Factor Group 10: Background/Foreground

B: background
F: foreground
O: other

Factor Group 11: Speaker knows/does not know the word

K: Knows the word
D: Does not know the word