

Describing Distinctive Phonological Features in Young Adult Mexican Students Learning English

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Abstract

This work aimed to observe the production of consonant clusters in final position and the placement of lexical main stress of suffixed four-syllable words in thirty young adult Mexican undergraduates learning English as a foreign language in the English Language program of the Universidad de Quintana Roo, Mexico. Participants were individually interviewed and samples were collected by recording these sessions. The results indicated that consonant clusters in final position and lexical main stress of suffixed four-syllable words showed frequent phonological variations for this group of students. These findings are relevant to teachers as they help foresee the kind of varied features they may find in the area of pronunciation in their young adult students when planning their courses.

Keywords: Consonant, cluster, lexical, stress, placement, suffixation.

1. Introduction

This study concentrates on the area of pronunciation in the EFL classroom, since oral performance may be one of the adult learners main sources of worries when making the attempt of mastering a foreign language. Ken worthy (1987), Richards & Renandya (2002) and Tarone (1978) adopt a positive approach to learner difficulties in this area. According to Richards & Renandya (2002) one of the difficulties learners face is the influence of first language (L1) pronunciation, and the authors hold that sound system transfer from the L1 is both natural and valuable in acquiring the second language (L2) sound system. In the same vein, the terms problem, mistake, error are not used in the present study since its objective is not to prescribe but merely describe.

On the other hand, it is pertinent for this study to use the term *phonetic variations*, as acknowledging that the problematic features of non-native learners' oral performance may be seen as an important component of the process of learning a foreign language. All the information gathered in this study is used for descriptive purposes, and may be useful in course planning and in assessing learners in segmental and supra segmental aspects of pronunciation. According to Richards & Renandya (2002) it may be more helpful to draw learners' attention to the differences between L1 and L2 sound systems than to correct pronunciation errors. Similarly, they suggest that differences between learners' inter language and the target language need to be pointed out, but not necessarily corrected. Richards & Renandya (2002) also note the need for realistic teaching aims for the acquisition of intelligible pronunciation, and maintaining a positive image of L2 learners' achievements. Learners must be aware that pronunciation variations in the English as a foreign language (EFL) context are expected as a natural part of a process conditioned by different factors such as age, motivation, and ethnic background. According to Richards & Renandya (2002) this approach acknowledges the cultural identity of learners and encourages them to feel comfortable with showing their origins through their L2 pronunciation.

This study goes along with this concept of the learners accepting themselves as competent users of a foreign language and eradicates all those worries and infertile attempts to sound like a native speaker since this is neither a realistic goal nor an obligation for those mastering a foreign language. An error correction approach to teaching L2 pronunciation tends to concentrate on individual segmental sounds, but from a more inclusive perspective that accepts learner diversity, supra segmental features of the L2 sound system are of increasing interest to educators focusing on communication and connected speech (Richards & Renandya, 2002; Seidlhofer, 2001; Brazil, Coulthard, & Johns, 1980; Brown & Yule, 1983). This change of perspective has revived interest in pronunciation teaching (Celce-Murcia et al., 2010), formerly a rather neglected area of language teaching (Kelly, 1969). However, there continues to be a need for research into the acquisition of both segmental and supra segmental features of the L2 sound system. Spanish speakers in particular may have specific variations with particular aspects of pronunciation, both segmental and supra segmental due to features of their mother tongue.

1.1 Possible sources of segmental variations for Spanish speakers

Helman (2004) suggests that learners may find difficulty in producing sounds that are not present in their L1 sound system. It may be expected that different sound repertoires in English and Spanish may be a source of variations for EFL students. Not only may different sound repertoires be a source of distinctive features, but also the combination of familiar sounds following unfamiliar sequences in a foreign language, such as the wider range of possible consonant clusters in English compared with Spanish (Helman, 2004). This possible combination of sounds and their positional occurrence may also be expected to be among the pronunciation distinctive features encountered in Mexican students that took part in this study.

1.2 Types of variations in consonant clusters in final position

In spoken English, double, triple and quadruple consonant clusters are possible, for example: *bird* (CC), *parked* (CCC) and *lengths* (CCCC) (Yule (2010)). On the other hand, Spanish allows fewer sound combinations in word endings. Only five consonants may appear in final position in Spanish (l, r, d, n, and s), and to articulate some of the English consonant clusters at the end of words will be difficult for Spanish speakers (Helman, 2004). Spanish has a limited set of possible consonant sounds in final position in comparison with the over 200 word final consonants and clusters in English (Hultzén, 1965). One possible approach to producing unfamiliar consonant blends is to reduce them (Goldstein, 2001). Spanish speakers may respond to these challenges by deleting sounds with which they are uncomfortable. Simplifying consonant clusters and substituting permissible consonant and vowel endings in words are logical actions in this process. In the present study, three types of difficulties are expected to be found in the area of consonant clusters in final position: sound substitution, deletion and addition.

1.3 Possible sources of suprasegmental variations for Spanish speakers

Communicative approaches to language teaching highlight intelligibility as an attainable goal in the area of teaching pronunciation in the EFL classroom, leading to a consideration of the prosodic aspects of speech that are now part of this instruction. Stress placement in words is one of the prosodic features identified as a key element in the intelligibility of L2 speech (Aitchison 1994; Benrabah 1997; Field 2005). According to Celce-Murcia et al. (2010), this is because listeners focus on stressed syllables to process meaning. Celce-Murcia et al. (2010) identify strongly stressed and unstressed syllables in their analysis of word stress. Word stress for Kingdon (1958) and Ming (2006) concerns the relative force used in the different syllables of a word with two or more syllables.

At the lexical level, then, stress needs to be taught as a syllable timed language such as Spanish differs in important and not self-evident ways from a stress timed language such as English. According to Seidlhofer (2001) stress timing in English means that stressed syllables maintain a rhythm no matter how many unstressed syllable come between the stressed ones. Further, in English the difference in force of the pronunciation of stressed and unstressed syllables is particularly marked (Celce-Murcia et al., 2010). Another possible source of variations may be lexical stress based on suffixation. One belief strongly rooted in native Spanish speakers learning English is that English stress rules are arbitrary and part of the language use (Celce-Murcia et al., 2010). Although stress timing is clearly of interest, the stress patterns of individual words are more amenable to investigation and have a higher impact on intelligibility.

1.4 Research questions

The literature suggests that teaching pronunciation is pertinent in the EFL classroom, and that Spanish L1 speakers may have particular variations with the acquisition of certain segmental and suprasegmental features of English as a L2. Two research questions were identified:

1. Do final consonant clusters and lexical stress present pronunciation variations for Spanish speaking learners of English as a foreign language?
2. What are the specific variations encountered by Spanish speaking learners of English as a foreign language in pronouncing final consonant clusters and lexical stress in suffixed four-syllable words?

3. Method

2.1 Design of study

The two research questions were explored using recorded samples of English pronunciation from 30 voluntary participants, all speakers of L1 Spanish. Participants were asked to read aloud a series of unrelated sentences containing final consonant clusters and suffixed four-syllable words, and the variations encountered were identified and analyzed. The study produced quantitative data related to the research questions.

2.2 Participants

All the participants were matriculated in the *Universidad de Quintana Roo* in the English Language undergraduate program. The sample group consisted of thirty EFL learners studying in either second or sixth semester when participating in the study and participants shared Spanish as their mother tongue. There were twenty one female participants and nine males, the mean age of the group was twenty two, and the mean number of years of English instruction was seven. Table 1 details the characteristics of the participants.

2.3 Instruments

Speech samples were elicited by using a non-related list of sentences that included words with final consonant clusters that were the focus of one part of the present study. The forty six words that were used in this study are given in Table 2. The consonant clusters in final position in this study are formed by up to four sounds. In the list of forty six words, 46% contained a three-sound cluster, 43% a two-sound cluster and 11% a four-sound cluster. Four-syllable suffixed words were chosen to explore participants' lexical stress accuracy as these are fairly frequent in English. The pronunciation of stress in four-syllable words was explored using the words in Table 3. Twenty six words were included in this study. In this set of words, the most frequent occurrence of syllable stress was on the second syllable with 46% of the total, followed by first-syllable stress with 27%, third-syllable stress with 19% and finally fourth-syllable stress with 8%.

2.4 Procedures

Consecutive sampling was used to recruit participants. Then, speech samples from thirty undergraduates were collected in individual interviews. Each interview, with no time limit set, was recorded using Audacity, a program for editing and registering sound files in a computer. Segments of the recording were extracted for analysis including the 46 words for the segmental aspect (consonant clusters) and 26 for the suprasegmental part (lexical stress). The speech samples were then converted into MP3 files and coded (S1...S30) to protect the confidentiality of the information. After identifying the segments of the recordings for this study, both consonant clusters in final position and lexical stress in suffixed four-syllable words were analyzed and tabulated.

4. Findings

In the case of the segmental part of this study (consonant cluster), the participants' strategies in the face of pronunciation variations were identified. Three strategies were used by participants. Sound deletion (SD) occurs where a sound that presents difficulties is omitted, sound addition (SA) occurs where a sound is added to facilitate pronunciation and sound substitution (SS) occurs where a pronounceable sound is substituted for one which the participant perceives to be difficult. Of the 46 words in this part of the study, the first two in the list are analyzed in detail to identify learners' specific difficulties. Table 4 shows the percentage and number of participants who found pronunciation of the words difficult and records the strategies used to overcome the difficulties. The first word in the chart, *bathed*, contains a two-sound final cluster formed in its coda by a fricative dental voiced sound (/ð/) and a stop alveolar voiced sound (/d/). The observed difficulties for the segmental part were sound substitution, sound deletion and sound addition. This word had a frequency of 87%; in other words, twenty six out of thirty participants in this study presented some kind of variation in their samples. Of these, 22 participants registered a sound substitution, three participants registered a sound deletion, and one person voiced a sound addition to the two-sound cluster in final position in this word. The second word in the chart, *forecasts*, contains a three-sound final cluster formed in its coda by a fricative alveolar voiceless /s/, a stop alveolar voiceless sound /t/ and another fricative alveolar voiceless /s/. This word had an occurrence rate of 73%; in other words, twenty two out of thirty participants presented a variation in their samples. Of these, 21 participants erased a sound and one participant added a sound to the three-sound cluster in final position in this word.

The other words in the list presented variations for learners to different degrees, and the results are given in the following chart. For supra segmental variations (lexical stress), a set of twenty six words was analyzed. Of the 26 words in this part of the study, the first two in the list are analyzed in detail to identify learners' specific variations. Table 5 shows the percentage and number of participants who found pronunciation of the words difficult and records the numbers of participants who placed the stress on different syllables. The first word in the chart, *leg·is·la·ture*, is a four-syllable word that receives its main stress in the first syllable. This word had an incidence rate of 100%; in other words, all the participants in this study presented a stress shift in their samples. 83%, twenty five participants, shifted the stress to the second syllable. 10%, three subjects moved the stress to the fourth syllable and 7%, two participants, moved it to the third syllable. The second word in the chart, *de·vi·ous·ness*, is a four-syllable word that receives its main stress in the first syllable too. This word had an incidence rate of 70%; in other words, twenty one participants presented a stress shift in their samples. 86%, eighteen subjects, shifted the stress to the third syllable and 14%, three participants, moved the stress to the second syllable. The other words in the list presented difficulties for learners to different degrees, and the results are given in chart 2.

4. Discussion

Regarding the **segmental** part of this study, the word *bathed*, exemplifies a rule of the production of the –ed ending, with the combination of a final voiced sound, in this case a fricative dental voiced sound (/ð/) plus –ed ending, resulting in a voiced sound like the stop alveolar (/d/). As it was previously mentioned, twenty two subjects registered a sound substitution. Fifteen participants, 58% of the total (twenty six), replaced the final sound, /d/ with /Id/. This difficulty suggested that these participants showed knowledge about pronunciation rules for –ed endings by producing the /Id/ ending; but at the same time, it also showed that they did not distinguish when to use those norms so they decided to use it in a phonetic environment that does not follow that rule since the fricative dental (/ð/) is a voiced sound. Closely related to this observation, it is the fact that 11% of twenty six, three participants, substituted /d/ for /əd/, applying another rule for –ed endings in a different phonetic environment. This suggests something similar about the same phonological rule: participants that know this rule but they do not recognize the phonological environment to use it. In the same category of sound substitution, 16% of twenty six, four participants substituted the fricative dental voiced sound /ð/ for the stop alveolar voiceless sound /t/.

This evidence suggests that these participants opted for a more familiar sound like /t/ in final position since the other sound is not part of the repertoire of sounds in Spanish. For sound deletion, 11%, that means three participants, deleted the final sound of the cluster, /d/. This provides evidence to what authors like Helman (2010) had mentioned about the Spanish speakers' likely expected reduction of consonant clusters in final position.

In the case of sound addition, 4%, one participant, added the liquid alveolar voiced sound, /r/. Since the occurrence number of this difficulty was low, it can be suggested that it was a problem with the actual production of the cluster since the evidence did not suggest more than that and the literature review did not identify this particular occurrence as one expected. It can be inferred from this observation the tendency of this subject to include a sound like /r/ in the cluster in final position since this sound is an allowed phonotactic in Spanish.

In the second word, *forecasts*, there is a combination of three sounds in the clusters: a fricative alveolar voiceless sound (/s/), a stop alveolar voiceless sound (/t/) and a fricative alveolar voiceless (/s/). As it was mentioned, twenty one subjects registered a sound deletion. The results coincided with Helman (2004) about the possibility of Spanish speakers trying to simplify consonant clusters since 95% of the total (twenty two), deleted the final sound, /s/. This evidence also suggested that a pattern of regularity in sound deletion can be observed in this word since twenty one participants erased the same final sound in the cluster.

In the same category of sound deletion, 5% of twenty two, one participant added a vowel sound /e/ between the two final sounds in the cluster (*forecastes*). Even with this low incidence, this difficulty may suggest that the subject tried to reproduce a more familiar articulation, inserting a vowel sound to a sound sequence that is not expected in L1. For the suprasegmental aspects in this study, the word *legislature* (**leg**·is·la·ture), that according to the Online Etymology Dictionary, contains the suffix *-ure* that is used to “form abstract nouns of action, and it comes from Old French *-ure* (Latin *-ura*)”, registered the following observations. As it was mentioned before, this word had the maximum frequency with 100%. It means that the thirty participants in this study shifted the stress in this word. 83%, twenty five subjects moved the main stress from the first syllable to the second. 7%, two subjects moved the main stress to the third syllable. Finally, 10%, four subjects moved the stress to the fourth syllable. Teschner and Whitley (2006) contributed with the interpretation of these results in subjects changing the main stress to the second syllable: “Once stress has been assigned to a vowel in a base word, the rest of the words in that base word’s family usually keep the strong stress on that very same vowel”. In the same word family of *legislature* are: *legislate* (**leg**·is·late), *legislator* (**leg**·is·la·tor), the two maintaining the stress in the same first syllable, showing the rule mentioned above about assigning the main stress to vowel in a base word and how the related words often follow the same pattern. These results suggested that the subjects shifting the main stress to the second syllable may not know this rule of pronunciation of words based on suffixation. Some variations to Teschner and Whitley’s rule (2006) should be included in regard of the case of the subjects shifting the main stress to the third syllable. Words of the same family, like *legislation* (leg·is·la·tion) and *legislative* (leg·is·la·tive) do change their main stress to the penult (the next-to-the-last syllable from the end of the word).

But these variations obey a rule about the suffixes *-tion* and *-ive*: they are stress changing suffixes, precisely moving the stress to the penult (Celce-Murcia et al., 2010). These results suggested that the subjects may know this pronunciation rules based on suffixation but they do not recognize the types of suffixes that produce a stress shift in words and they tend to change the stress indistinctively. The case of the subject changing the main stress to the fourth syllable may have indicated that the result of moving the stress to this syllable is a case of L1 orthographic interference with the word *legislatura* and how this word is stressed in Spanish. *Legislatura* is a five-syllable word (feminine noun) that receives its main stress in the penult syllable without a *tilde* (orthographic stress in Spanish). So it is evident that these subjects may be reproducing stress patterns from L1 in L2 words. In the case of the second word, *deviousness* (**de**·vi·ous·ness), that according to the Online Etymology Dictionary, contains the suffix *-ness*, that is “a word-forming element denoting action, quality, or state, that comes from the Old English *-nes(s)*, (cf. Old Saxon *-nissi*)”, had a frequency of 70%. It means that twenty one participants in this study shifted the stress in this word. 86%, eighteen subjects moved the main stress to the third and 14%, three subjects, moved the main stress to the second syllable. The results in both cases, stress shift to the second and third syllable, make a similar suggestion to the first word in the chart: subjects may not know the rule about the effect of suffixation in pronunciation, in this case, the suffix *-ness*. According to Teschner and Whitley (2006), “adding *-ness* to a word does not cause the position of its stress to change. This suffix is like most native Anglo-saxon suffixes, which do not alter where stress falls on the stem, whereas most other Romance suffixes, typically alter stress position”.

This rule is clearly observed in more words related to *deviousness*, like *devious* (**de**·vi·ous) and *deviate* (**de**·vi·ate), which keep the stress in the same syllable as *deviousness*, following the same pattern of avoiding shifting the main stress given to a vowel in a base word since “English is a language that prefers not to shift the position of strong stress once it has been established” (Teschner and Whitley, 2006).

Another remark about the results in this word, mainly about the predominant shift to the third syllable, is that this may suggest a kind of L1 interference too. In a consultation of the *Diccionario Panhispánico de dudas* of *La Real Academia Española* (accessed on line 11-10-13, 2005), “predominant stress in Spanish falls into words receiving the main stress in the penult position (*palabras graves o llanas*)”. So this predominant case of shifting the main stress to the third syllable may obey rules from Spanish phonology, transferred to English pronunciation.

5. Conclusion

For the first cluster, the results showed that although 85% of twenty six participants substituted a sound in the cluster, being the most frequent the replacement of /d/ for /Id/ with fifteen cases, not all the subjects substituted the same sound, so even though all can be classified under the category of sound substitution, different sounds in the cluster were substituted by the subjects. In terms of regular patterns in sound substitution, the results are not conclusive since there were variations in sound replacement. Some suggestions that derived from the evidence collected about segmental aspects is that participants proved to know about pronunciation rules for -Ed endings, by replacing /d/ for /Id/ and /ed/; but at the same time, they also showed a lack of ability to recognize the phonetic environment to accurately use those rules. They have not mastered the rules concerning the production of -Ed endings and how to properly use them according to the sound ending the verb and they seem to use it indistinctively, despite having an average of seven years of instruction. This can be a line to be explored in future similar studies: students’ mastery of -ed endings. For the second cluster, the results showed that 95% of twenty two participants deleted the same final sound in the cluster (a fricative alveolar voiceless (/s/)). This coincided with previous studies cited in this proposal about possible difficulties in Spanish speakers learning English as a foreign language.

This evidence also suggested a regular pattern in the sample group, a tendency for replacing the same sound in the clusters, the third one. It is pertinent to mention that two-sound consonant clusters are common in Spanish, but they all are common in initial position, not in final so another observation is that the subjects presented some evidence of possible L1 interference precisely in this tendency to shorten the three-sound cluster into a two-sound cluster, to make it more familiar to their mother tongue perhaps, even though when the final sound /s/, is a consonant sound permitted in final position in Spanish but not in the sequence it appeared in the English word. In the case of stress shift in suffixed four-syllable words, the most frequent difficulties were found in the words legislature and deviousness. The most frequent words are both quadri-syllabic that receive the main stress in the first syllable. A pattern that was observed in these words was the tendency in participants’ stress shifting to the second syllable, with 55% of the total cases, followed by stress shifting to the second syllable, with 43% and just leaving a 2% of stress shifting to the fourth syllable. So the dominant pattern in stress shifting for both words was on the second syllable. For the first word, legislature (*leg·is·la·ture*), the frequency of stress shift was the highest in the study with 100%. The results showed that although all the participants in this piece research have received a mean of seven years of English instruction as a foreign language, they have not mastered pronunciation rules, especially the ones concerning with suffixation.

In this case, students shifting the main stress to the second and third syllable showed evidence of not identifying that the main stress given to a vowel in the base form follows the same pattern in words of the same family like legislate, legislator, being the exceptions suffixes like -tion and -ive that change the stress to the penult position, another rule related to stress shift by suffixation (Teschner and Whitley, 2006). A suggestion derived from observations is that: “pronunciation still tends to be the neglected component of many language programs (Derwing, 2010)”, although this cannot be concluded from the data but it opens a line for future proposals revising instruction on prosodic aspects of pronunciation in EFL lessons. Another aspect that cannot be concluded based on the results is to what extent students shifting the main stress to the third syllable were aware of this rule and its exceptions and tried to apply it to the word legislature. About the students changing the main stress to the fourth syllable, the present researchers considered this as particular evidence of possible L1 interference since one equivalent word for legislature in Spanish is legislature, a five-syllable word that coincidentally follows the pattern of putting the main stress in the penult position (fourth syllable).

In the case of deviousness (*de·vi·ous·ness*), there is similar evidence that showed that the students by shifting the main stress, both to the second and third syllables, are not demonstrating mastery of the rule about avoiding shifting the main stress of the word when adding the suffix -ness, since it is a stress-neutral one; in other words, it is a suffix that does not change the main stress when added to a word due to its Anglo-Saxon origin, another prosodic rule unknown for these students, or not properly applied to the word.

Particularly in this word, one suggestion derived from the results and the predominance of stress-shifting to the third syllable, is that this stress-change is a result of L1 interference since the majority of words in the Spanish lexicon receive the main stress in the penult position. This is an interesting aspect to be developed in future studies: orthographic interference in student's oral performance. Finally, this study, by describing the varied features of pronunciation mentioned above, attempted to help students and teachers in the EFL context understand the importance of setting a balance in teaching and studying both segmental and suprasegmental aspects of pronunciation.

According to Celce-Murcia et al. (2010): "Kelly (1969) states that pronunciation is the "Cinderella" area of foreign-language teaching. By comparing pronunciation teaching to the tale of Cinderella, Kelly is alluding to the fact that Cinderella's stepsisters did not allow her to show herself in public—thereby implying that many teachers neglect pronunciation." This work is an invitation to reflect as teachers if pronunciation is being excluded from teaching practices and how this impacts in students' confidence when using the language for communicative purpose since "both empirical and anecdotal evidence indicates that there is a threshold level of pronunciation for nonnative speakers of English" (Celce-Murcia et al., 2010). This proposal also represents a call for researchers to contribute to this ongoing discussion about teaching pronunciation "[focused on] a more realistic goal [that] is to enable learners to surpass the threshold level so that their pronunciation will not detract from their ability to communicate" (Celce-Murcia et al., 2010). The goal is generating information that may help teachers foresee the possible difficulties in pronunciation that adult Spanish speakers may experience in their classroom and to incorporate these difficulties as indispensable data to be spirited promoters of incorporating more activities to teach pronunciation in this process of learning English as a foreign language.

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Tables and Charts

Table 1: Sample group description

Subject	Gender (M/F)	L1 background	English (years)	instruction	Age
1	M	Spanish	6		19
2	F	Spanish	5		21
3	M	Spanish	8		21
4	F	Spanish	6		21
5	M	Spanish	5		19
6	F	Spanish	12		22
7	F	Spanish	7		19
8	F	Spanish	4		20
9	F	Spanish	8		19
10	F	Spanish	9		21
11	F	Spanish	9		21
12	F	Spanish	9		21
13	M	Spanish	7		21
14	F	Spanish	4		22
15	F	Spanish	8		22
16	M	Spanish	8		28
17	M	Spanish	3		34
18	M	Spanish	7		22
19	F	Spanish	8		19
20	M	Spanish	5		23
21	F	Spanish	8		23
22	F	Spanish	7		22
23	F	Spanish	7		19
24	F	Spanish	7		22
25	F	Spanish	10		24
26	F	Spanish	5		21
27	M	Spanish	10		22
28	F	Spanish	8		22
29	F	Spanish	8		34
30	F	Spanish	7		19

Table 2 Consonant clusters in final position

warmth (liquid alveolar voiced + nasal bilabial voiced + fricative dental voiceless)	depths (stop bilabial voiceless + fricative dental voiceless + fricative alveolar voiceless)	abrupt (stop bilabial voiceless + stop alveolar voiceless)	opts (stop bilabial voiceless + stop alveolar voiceless + fricative alveolar voiceless)	bump (nasal bilabial voiced + stop bilabial voiceless)
cabs (stop bilabial voiced + fricative alveolar voiceless)	triumphed (nasal bilabial voiced + fricative labiodental voiceless + stop alveolar voiceless)	tempts (nasal bilabial voiced + stop bilabial voiceless + stop alveolar voiceless + fricative alveolar voiceless)	depth (stop bilabial voiceless+ fricative dental voiceless)	accepts (stop bilabial voiceless + stop alveolar voiceless + fricative alveolar voiceless)
drifts (fricative labiodental voiceless + stop alveolar voiceless + fricative alveolar voiceless)	laughs (fricative labiodental voiceless + fricative labiodental voiceless)	bathed (fricative dental voiced + stop alveolar voiced)	breathes (fricative dental voiced + fricative alveolar voiced)	months (nasal alveolar voiced + fricative dental voiceless + fricative alveolar voiceless)
length (nasal velar voiced + stop velar voiceless + fricative dental voiceless)	breadth (stop alveolar voiced + fricative dental voiceless)	birds (liquid alveolar voiced + stop alveolar voiced + fricative alveolar voiced)	crisps (fricative alveolar voiceless + stop bilabial voiceless + fricative alveolar voiceless)	pests (fricative alveolar voiceless + stop alveolar voiceless + fricative alveolar voiceless)
twelfths (liquid alveolar voiced + fricative labiodental voiceless + fricative dental voiceless + fricative alveolar voiceless)	worlds (liquid alveolar voiced + liquid alveolar voiced + stop alveolar voiced+ fricative alveolar voiced)	milks (liquid alveolar voiced + stop velar voiceless + fricative alveolar voiceless)	instincts (nasal velar voiced + stop velar voiceless + stop alveolar voiceless + fricative alveolar voiceless)	think (nasal velar voiced +stop velar voiceless)
context (stop velar voiceless + fricative alveolar voiceless + stop alveolar voiceless)	length (nasal velar voiced + stop velar voiceless + fricative dental voiceless)	spends (nasal alveolar voiced + stop alveolar voiced + fricative alveolar voiced)	forecasts (fricative alveolar voiceless+ stop alveolar voiceless + fricative alveolar voiceless)	results (liquid alveolar voiced + stop alveolar voiceless + fricative alveolar voiceless)
commonwealth (liquid alveolar voiced + fricative dental voiceless)	offered (liquid alveolar voiced + stop alveolar voiced)	products (stop velar voiceless + stop alveolar voiceless + fricative alveolar voiceless)	acceptance (nasal alveolar voiced + fricative alveolar voiceless)	scripts (stop bilabial voiceless + stop alveolar voiceless + fricative alveolar voiceless)
perhaps (stop bilabial voiceless + fricative alveolar voiceless)	crashed (fricative palatal voiceless + stop alveolar voiceless)	reports (liquid alveolar voiced + stop alveolar voiceless + fricative alveolar voiceless)	research (liquid alveolar voiced + affricate palatal voiceless)	enhanced (nasal alveolar voiced + fricative alveolar voiceless +stop alveolar voiceless)
developed (stop bilabial voiceless + stop alveolar voiceless)	gangs (nasal velar voiced + fricative alveolar voiced)	strengths (nasal velar voiced + stop velar voiceless + fricative dental voiceless + fricative alveolar voiceless)	threatened (nasal alveolar voiced + stop alveolar voiced)	largest (fricative alveolar voiceless + stop alveolar voiceless)
development (nasal alveolar voiced + stop alveolar voiceless)				

* The consonant cluster description was based on Yule (2006).

Table 3 Main stress in suffixed four-syllable words

de·vel·op·ment (stress in 2nd syllable)	cap·i·tal·ize (stress in 1st syllable)	ad·vis·a·ble (stress in 2nd syllable)	la·bo·ri·ous (stress in 2nd syllable)	char·ac·ter·less (stress in 1st syllable)
de·vi·ous·ness (stress in 1st syllable)	in·ter·view·ee (stress in 4th syllable)	ob·so·les·cence (stress in 3rd syllable)	mo·not·o·ny (stress in 2nd syllable)	a·pol·o·gized (stress in 2nd syllable)
sus·tain·a·ble (stress in 2nd syllable)	me·dic·i·nal (stress in 2nd syllable)	ex·em·pla·ry (stress in 2nd syllable)	as·ser·tive·ness (stress in 2nd syllable)	per·ma·nent·ly (stress in 1st syllable)
leg·is·la·ture (stress in 1st syllable)	re·me·di·al (stress in 1st syllable)	de·bat·a·ble (stress in 2nd syllable)	ac·ci·den·tal (stress in the 3rd syllable)	in·ter·view·ee (stress in 4th syllable)
in·dic·a·tive (stress in 2nd syllable)	pho·to·graph·ic (stress in 3rd syllable)	in·de·pen·dence (stress in 3rd syllable)	in·no·va·tive (stress in 1st syllable)	her·biv·o·rous (stress in 2nd syllable)
ap·pre·hen·sive (stress in 3rd syllable)				

* The syllabification and stress syllable was assigned based on Webster's Online Dictionary.

Table 4. Common segmental difficulties*Clusters in final occurrence*

1 **bathed** /beɪðd/(fricative dental voiced + stop alveolar voiced)

Frequency	Cases	Types of difficulties
87%	26/30	Sound substitution (SS)/ deletion (SD)/ addition (SA)

Case (Subject #)	Type of difficulty (SS, SD, SA)	Description
S1	SS	S1 replaced /d/ with /Id/
S3	SA	S3 added /red/
S4	SS	S4 replaced /ð/ with /t/
S5	SS	S5 replaced /ð/ with /t/
S6	SS	S6 replaced /d/ with /ed/
S7	SS	S7 replaced /d/ with /Id/
S8	SS	S8 replaced /d/ with /ed/
S9	SS	S9 replaced /ð/ with /t/
S10	SS	S10 replaced /d/ with /Id/
S11	SS	S11 replaced /d/ with /Id/
S12	SS	S12 replaced /d/ with /Id/
S14	SS	S14 replaced /d/ with /Id/
S15	SS	S15 replaced /d/ with /ed/
S16	SS	S16 replaced /d/ with /Id/
S17	SS	S17 replaced /d/ with /Id/
S18	SS	S18 replaced /d/ with /Id/
S19	SD	S19 deleted /d/
S20	SS	S20 replaced /d/ with /Id/
S22	SS	S22 replaced /d/ with /Id/
S23	SS	S23 replaced /d/ with /Id/
S24	SS	S24 replaced /d/ with /Id/
S25	SS	S25 replaced /d/ with /Id/
S26	SS	S26 replaced /d/ with /Id/
S27	SS	S27 replaced /ð/ with /t/
S28	SD	S28 deleted /d/
S29	SD	S29 deleted /d/

S21	SS	S21 moved the stress to the 2 nd syllable
S22	SS	S22 moved the stress to the 2 nd syllable
S23	SS	S23 moved the stress to the 2 nd syllable
S24	SS	S24 moved the stress to the 2 nd syllable
S25	SS	S25 moved the stress to the 2 nd syllable
S26	SS	S26 moved the stress to the 2 nd syllable
S27	SS	S27 moved the stress to the 2 nd syllable
S28	SS	S28 moved the stress to the 2 nd syllable
S29	SS	S29 moved the stress to the 2 nd syllable
S30	SS	S30 moved the stress to the 2 nd syllable

2 de·vi·ous·ness (stress in 1st syllable)

Frequency	Cases	Type of difficulty
70%	21/30	Stress shift (SS)

Case (Subject #)	Type of difficulty (SS)	Description
S1	SS	S1 moved the stress to the 2 nd syllable
S2	SS	S2 moved the stress to the 3 rd syllable
S5	SS	S5 moved the stress to the 3 rd syllable
S6	SS	S6 moved the stress to the 3 rd syllable
S7	SS	S7 moved the stress to the 3 rd syllable
S8	SS	S8 moved the stress to the 3 rd syllable
S9	SS	S9 moved the stress to the 3 rd syllable
S10	SS	S10 moved the stress to the 3 rd syllable
S11	SS	S11 moved the stress to the 3 rd syllable
S14	SS	S14 moved the stress to the 3 rd syllable
S15	SS	S15 moved the stress to the 3 rd syllable
S18	SS	S18 moved the stress to the 3 rd syllable
S19	SS	S19 moved the stress to the 3 rd syllable
S20	SS	S20 moved the stress to the 2 nd syllable
S21	SS	S21 moved the stress to the 3 rd syllable
S23	SS	S23 moved the stress to the 3 rd syllable
S25	SS	S25 moved the stress to the 3 rd syllable
S27	SS	S27 moved the stress to the 2 nd syllable
S28	SS	S28 moved the stress to the 3 rd syllable
S29	SS	S29 moved the stress to the 3 rd syllable
S30	SS	S30 moved the stress to the 3 rd syllable

Chart 1

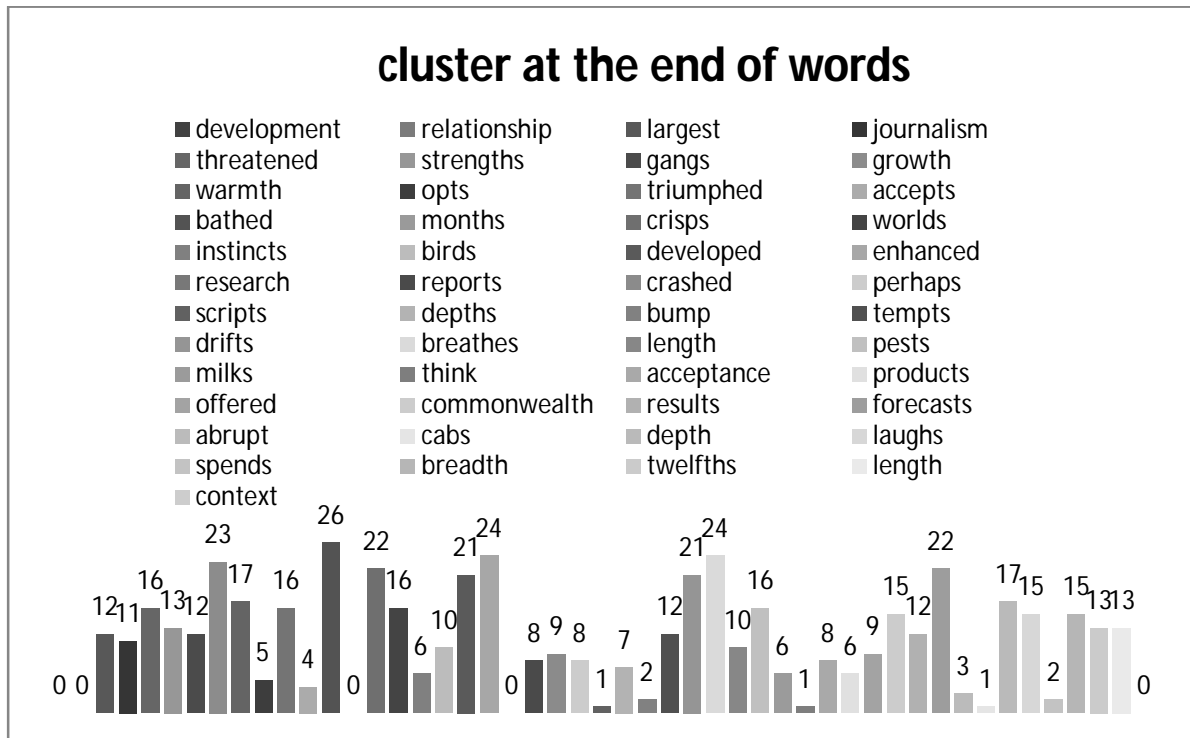


Chart 2

