3-2014

Phonetics and Technology in the Classroom: A Practical Approach to Using Speech Analysis Software in Second-Language Pronunciation Instruction

Daniel J. Olson
Purdue University, danielolson@purdue.edu

Recommended Citation
Olson, D. J. (2014). Phonetics and technology in the classroom: A practical approach to using speech analysis software in second-language pronunciation instruction. *Hispania* 97(1), 47-68. http://dx.doi.org/10.1353/hpn.2014.0030

Phonetics and Technology in the Classroom: A Practical Approach to Using Speech Analysis Software in Second-Language Pronunciation Instruction

Daniel J. Olson

Purdue University
640 Oval Dr., West Lafayette, IN 47907
danielolson@purdue.edu

Abstract: While speech analysis technology has become an integral part of phonetic research, and to some degree is used in language instruction at the most advanced levels, it appears to be mostly absent from the beginning levels of language instruction. In part, the lack of incorporation into the language classroom can be attributed to both the lack of practical pedagogical methods for implementation, as well as objections to the complex design of the software itself. The present study first seeks to create a brief picture of phonetic instruction at lower levels of language instruction. The second, and main aim, is to address the dearth in practical implementations by presenting one possible pedagogical application of speech analysis software called Praat with attention given to key considerations to facilitate student self-analysis. Lastly, to assess the previous objections to such software, this study provides empirical, student-driven pilot data for the usability of speech analysis software in the classroom. In addition to confirming that speech-analysis software is largely absent at the lowest levels of language instruction, the findings demonstrate that, with a carefully designed approach to self-analysis, students indicate that the program is both beneficial and highly usable.

Keywords: instruction/enseñanza, phonetics/fonética, Praat, pronunciation/pronunciación, second language/segunda lengua, technology/tecnología

1. Introduction

Within the fields of Second Language Acquisition (SLA) and Applied Linguistics, pronunciation, or phonetics, has for many years been relegated to a secondary role. Derwing and Munro (2005) go as far as to say that the study of pronunciation has been "marginalized," and as a result instructors are left to draw on intuitions with little direction or guidance (382). While a steadily growing body of research has begun to establish the benefits of pronunciation instruction, many have noted a disconnect between lab-based empirical research and pedagogical, classroom implementations (e.g., Wang and Munro 2004). Moreover, the focus of the few extant pedagogical approaches to pronunciation instruction has been primarily on the pronunciation of advanced learners, continuing to leave a dearth of information about possible methods for pronunciation instruction at beginning levels of language instruction. As technology rapidly advances with the advent of widely available speech analysis software, we are left to question whether such technology has a place in language instruction, and if so, in what ways such technology can be practically adapted for the language classroom.

In addressing the need for practical pedagogical applications, the goals of the current study are threefold. First, this article provides a brief overview of the current state of pronunciation instruction in the lower-level language classroom, defined here as the first four semesters of university-level language instruction, and couples previous literature with new, limited survey data drawn from instructors in the second-language (L2) classroom. Second, constituting the principle aim of this work, a practical classroom application of the speech analysis software Pratt (Boersma and Weenink 2011) is presented, highlighting the possible benefits of such technology for language learners of any level. Lastly, as an initial attempt to address concerns of previous researchers regarding the feasibility of and difficulties related to speech analysis software (e.g., Setter and Jenkins 2005), preliminary survey data is used to evaluate student reactions to the use of this pedagogy and technology in the language classroom. As such, this current study seeks to demonstrate that speech analysis technology is, in fact, accessible to students, paving the way for subsequent work that can begin to quantify its benefits.

2. Pronunciation Instruction

Arguing for the importance of L2 pronunciation, Hurtado and Estrada (2010) claim that pronunciation is potentially one of the "most important aspects in learning a second language" (74), being that it both improves communication and creates a positive image of the learner's abilities (Morley 1994). While there is a long, robust tradition of research on L2 pronunciation, there is a gap between laboratory research and implementation in the L2 classroom. Many authors have noted this lack of emphasis on pronunciation pedagogy, with less research dedicated to the teaching of phonetics than other domains, such as morphology and syntax (Derwing and Munro 2005; Elliot 2003; Leather 2000; Lord 2005; Major 1998). Levis (1999) goes as far as to state that current research on intonation is "almost completely divorced from modern language teaching and rarely present in teaching materials" (37). Supporting this claim, Arteaga (2000), in her review of introductory level Spanish textbooks, highlights the lack phonetic instruction in the majority of texts surveyed, with inaccuracies and shortcomings in those that do address pronunciation.

However, there is a growing body of literature that addresses the potential benefits of including pronunciation instruction in L2 curricula. The primary goal of this line of research has been to establish whether training provides benefits to L2 pronunciation. While there has been some variability in the results, taken as a whole, such research provides strong evidence that phonetic instruction can in fact assist learners in improving their L2 pronunciation. Providing support for the claim that phonetic training does improve learner pronunciation in the L2, a number of studies have attempted to isolate the effect of training and evaluate learners' performance pre- and post-training (Archibald 1998; Arteaga 2000; Elliot 1995; González-Bueno 1997; McCandess and Winitz 1986; Simões 1996; Zampini 1996). This research has examined pronunciation of a wide variety of phonetic features of a learner's L2, including vowel quality, rhotics and trills, voice onset time, liquids, etc., and has found varying, yet measurable improvement for many segments. Additionally, these studies have shown benefits from a variety of different types of treatments, including auditory exposure (Neufeld 1977, auditory discrimination training (Rosenman 1987), explicit articulatory instruction (Castino 1996), and a multimodal conglomeration of different types of training (Elliot 1999; González-Bueno 1997; Lord 2005, 2010; Santos Maldonado 1994).

Other research has addressed the effect of context, at home (AH) versus study abroad (SA) and has found that students show improvement in L2 pronunciation in both contexts (Díaz-Campos 2004, 2006; Segalowitz and Freed 2004; Stokes 2001). Crucially, research demonstrates that explicit phonetic instruction plays a significant role in improving pronunciation in both AH and SA contexts (Hurtado and Estrada 2010; Lord 2010), with students receiving some form of pronunciation instruction showing greater gains than those who do not.

While a few studies have found no significant effect of training on phonetic production (e.g. Macdonald, Yule, and Powers 1994; Suter 1976), they are far outweighed by the much larger body of research that has found a positive correlation between instruction and pronunciation outcomes. This finding is echoed in Elliot's (2003) review of the state of phonetic instruction, leading the author to state, "Formal instruction in L2 pronunciation appears to relate significantly to improvement in pronunciation, or at least with regard to the production of individual sounds" (33).

2.1 Phonetics Instruction in Lower-Level Language Classrooms

It certainly bears noting that the vast majority of research investigating the benefits of phonetic instruction has focused on more advanced learners, often the equivalent of students pursuing language majors at the university level or completing coursework on the phonetics of the L2. There are a few exceptions that have looked at phonetic instruction in the lower-level language classroom, the equivalent of the first two years of L2 instruction.

González-Bueno (1997), for example, examined the effect of formal pronunciation training on the voice onset time (VOT) of stop consonants in a fourth-semester university level Spanish course. Pronunciation instruction for the course combined explicit articulatory instruction, perceptual discrimination tasks, and minimal pair production. Results, based on waveform analysis of the VOT, demonstrated an improvement for all L2 produced stop consonants, reaching significant levels for a subset, namely /p/ and /g/. While González-Bueno demonstrated improvement on a particular segment, Elliot (1995) investigated pronunciation at a more holistic level.

Elliot's (1995) work investigated the effect of formal instruction, including articulatory instruction, oral repetition, and auditory identification tasks, on a global pronunciation rating in beginning L2 learners of Spanish. Results indicated that formal instruction on pronunciation significantly improved L2 productions relative to control L2 learners not receiving instruction, as judged by native Spanish speaking raters.

The results of these studies are as equally promising as those conducted at the more advanced levels of language learning, with significant improvement found for both specific phonetic segments, as well as a global accent improvement. Taken together, this research indicates that phonetic instruction serves to improve L2 pronunciation, even at the lower-levels of language instruction.[1]

2.2 Technology, Phonetic Instruction, and Objections

Parallel to the growth evidenced in research regarding phonetic training in the classroom, there have also been significant technological advances in speech analysis software. While early speech analysis systems had limited accessibility and functions, more recent developments such as Praat (Boersma and Weenink 2011) are powerful, free to download, and extremely versatile. The question remains as to whether and, if so, how such technology can be incorporated into the language classroom.

As early as the late 1970s, with the advent of *Visi-Pitch* software (Kay Elemetrics 1986), researchers investigated the potential benefits of learner visual analysis of self-produced speech and comparison with native speaker productions (Abberton and Fourcin 1975; Chun 1998; Molholt 1988). Representing one of the early uses of software to provide visual representations of intonation contours, Bot (1983) showed the potential benefits for visual cues in intonation pronunciation instruction (see also Bot 1980; Bot and Mailfert 1982; Weltens and Bot 1984). In their laboratory-based instruction task, speakers were auditorily presented with a prerecorded utterance and the corresponding visual representation of the intonation contour. Speakers then attempted to imitate the utterance, and subsequently their own intonation contour was presented below the target intonation contour. Results, based on native speaker ratings, were significantly better for those speakers receiving both auditory and visual feedback when compared to a control group receiving only auditory feedback. More recently, Levis and Pickering (2004) also suggest that such a paradigm can be used for L2 instruction of both local and discourse level intonation contours.

While these early innovations were limited to analysis of pitch contour, further developments have provided the opportunity to examine speech sounds at a more segmental level, including consonants, vowels, and syllable duration. Lambacher (1999) described an electronic visual feedback (EVF) software package and its potential applications in an English as a Second Language classroom setting. Using spectrograms, Lambacher's EVF provided learners with visual images for a wide variety of consonantal segments, including stops, fricatives, and liquids. While Lambacher (1999) detailed the EVF paradigm without a subsequent analysis of the benefits, a more recent investigation (Hardison 2004) employing a similar paradigm with real-time visual representations, showed benefits quantifiable for L2 pronunciation. Specifically, when rated by native speakers of French, L2 learners were judged to be more accurate at both the segmental and suprasegmental level following the training period. Likewise, Saito (2007), using Praat speech analysis software, showed an increase in vowel pronunciation accuracy for

Japanese learners of English who were presented with visual images of their own productions as well as those of native-English speakers.

Although the majority of studies have reported benefits deriving from the visual representation paradigm, Ruellot (2011), in contrast, demonstrated no significant improvement of the /y/ and /u/ phonemes produced by L2 learners of French. Although no significant improvement in native speaker ratings of L2 productions was found, the author notes that students responded positively and that benefits may be found in both long-term production acquisition as well as perceptual accuracy.

It should be noted that the above body of research has been primarily limited to a laboratory research setting, with few studies looking at the classroom implementation of this speech analysis technology. Lord (2005) presents one such effort, examining the improvement of native-English speaking learners of Spanish over the course of an advanced-level phonetics course. Crucially, this study took place in a language classroom, as opposed to a speech laboratory. Pronunciation instruction was comprised of a variety of different approaches, including explicit articulatory instruction, oral practice, transcription, and student use of Praat speech analysis software. Results showed improvements in the productions of voiceless stops, diphthongs, and fricatives over the course of the semester of instruction. Seferoglu (2005), too, demonstrated positive pronunciation effects of the speech analysis software Pronunciation Power in an English as a Foreign Language (EFL) course. Specifically, through a combination of visual waveform analysis and place of articulation demonstrations, EFL students given the pronunciation software were rated as generally "less accented" in post-test native listener judgments as compared to those who did not receive the speech analysis software. More recently, Lord (2010) in her investigation of the interaction between the phonetic instruction and immersion experience on the acquisition of Spanish intervocalic stops, used speech analysis software as one component of phonetic instruction. Results indicated benefits of both immersion and phonetic training, with students benefiting maximally from a combination of both.

Although the above research shows great promise for incorporating speech analysis software into the classroom, there have been a limited number of researchers who have objected to their incorporation. Crucially, their objection has *not* been on a theoretical basis, but a practical one. These authors have claimed that speech analysis software was designed with researchers in mind and "require[s] a sophisticated level of understanding which may be lacking in many teachers or learners" (Setter and Jenkins 2005: 10; For commentary specific to the use of Praat see Derwing 2010; For Klatt see Wang and Munro 2004). While one can only endorse the call for more "learner friendly" resources, the claims that this speech analysis software is beyond the grasp of students have yet to be carefully evaluated. As such, the final goal of this paper is to evaluate such claims, assessing student perceptions of such speech analysis software.

While there have been some specific criticisms of the usability of speech software for L2 learners, the above survey of phonetic instruction literature provides a solid preliminary indication that visual representations of learners' productions may be beneficial for acquisition of both segmental and suprasegmental features. It should be noted, however, that these classroom-based approaches to speech analysis software have investigated impacts only at more advanced levels of language instruction. This observation led Lord (2005) to note, "In the future, L2 classes should strive to incorporate these types of activities into our curricula, not just in a Phonetics course, but also in any L2 classroom" (565).[2] As such, the current study seeks to address this call.

3. Pronunciation in the Introductory Level Classroom

While the brief above review of studies represents a growing body of research on pronunciation training, they do not provide a holistic picture of the state of phonetic instruction and speech analysis software in the lower-level university classroom. Addressing this lack of information, the first goal of this paper is to shed light on the current state of pronunciation training during the first two years of university level language instruction. Specifically, is pronunciation being included in the lower-level language classroom? And if so, how much time is dedicated to pronunciation, what sorts of activities are used, and does speech analysis software play a significant role? To begin to investigate these questions, a preliminary survey regarding pronunciation instruction practices was developed.

In assessing the practices of pronunciation instruction, a survey was administered to 30 language instructors, drawn from four major public universities in the United States. All universities surveyed were state universities with a minimum of 20,000 undergraduate students and were located in the south, southwest, and midwest regions of the United States. The survey was administered online and all responses were anonymous. All instructors were currently teaching at least one course in the first four semesters of language instruction (first semester = 38%; second semester = 35%; third semester = 24%; fourth semester = 28%), giving a broad range of what is traditionally considered the lower-division language courses. Instructors taught a variety of different languages, including Spanish, Portuguese, German, French, Dutch, Tagalog, and Burmese. Paralleling the size of the language programs at the various universities, the largest percentage of survey respondents were instructors of Spanish.

3.1 Time Spent on Pronunciation

Of initial consideration was the question of how much time instructors actually dedicate to phonetic or pronunciation instruction. This question was first addressed in concrete terms, in which instructors were asked to estimate how many minutes per class or per week were dedicated to pronunciation. Results indicated that, as a whole, instructors spent approximately eight minutes per week ($M = 8.1$; $SD = 4.6$) or 2.6 minutes per class dealing with the issue of pronunciation. It should be noted that, if respondents provided an approximation based on a per week basis, it was assumed that the course met three hours per week. In reality, the number of hours per week that a class met varied from 3–6 hours, most likely leading to an overestimation of the amount of time actually spent on pronunciation per class period.

Addressing the same question from a more relative approach, instructors were asked to evaluate whether they felt that they spent a sufficient amount of time on pronunciation instruction. Respondents rated the amount of time spent on a scale from 1–9, with 1 signifying “Not Enough,” 5 signifying “Just Right,” and 9 signifying “Too much.” Overall, subjects reported that they did not spend enough time on pronunciation ($M = 3.2$), with 77% claiming they spent less than the “Just Right” amount.

3.2 Methods Used to Teach Pronunciation

The second major consideration was the type of activities instructors used to teach pronunciation. Specifically, instructors were asked to select one or more of a series of predetermined activity types. In addition, there was a space to include activities that fell outside the bounds of the available categories. Drawing both on methods highlighted in previous literature, as well as informal conversations with experienced instructors, categories included: 1) Explicit pronunciation lessons, such as contrastive or articulatory instruction; 2) Occasional feedback during speaking activities; 3) Student self-monitoring and self-correcting; 4) Student other-monitoring and other-correcting; 5) Other.

Results (see Figure 1) indicated that instructors most commonly provide occasional feedback during speaking activities (70%), often consisting of correct modeling of pronunciation. As noted by one respondent in an optional commentary section, this method seems to be an "ad-hoc" approach that occurs without a significant plan or structure. Also, 53% of instructors included some form of explicit pronunciation lessons. It should be noted that the vast majority of these approaches are considered to be teacher-centered, with the instructor dominating the analysis and correction of pronunciation errors.[3]

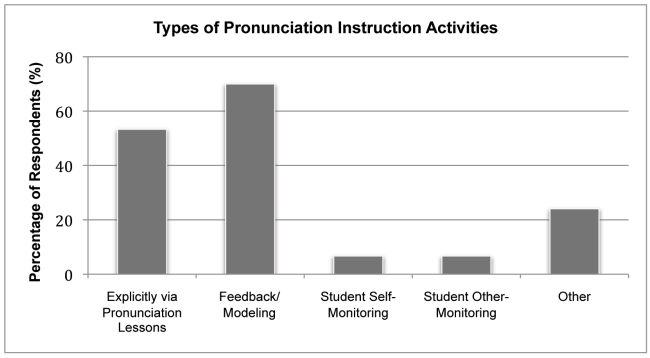


Figure 1. Types of Pronunciation Activities Used in Lower-Level Language Classes

Pertinent to the current study, the survey also asked respondents if they had used any form of speech analysis technology as part of their pronunciation curriculum. None of the respondents indicated that they had used such software in their classroom, supporting the findings from the previous literature that the use of such programs are limited to more advanced levels of language instruction.

3.3 Instructor Uncertainty

Equally telling were the types of comments included in an open-ended response category. Respondents were encouraged to comment on their own approach to pronunciation in their classrooms or describe activities that they use for phonetic instruction. The responses indicated a degree of uncertainty, not about the benefits of phonetic instruction, but more specifically about implementation.

Respondents included comments such as:

Instructor 5: "I don't have specific lessons on this topic."

Instructor 6: “A pronunciation section would be a great idea, but the logistics of it I just don’t know [how].”
Instructor 9: “I don’t spend much time on pronunciation because I don’t know how and there is no material provided [for pronunciation instruction].”
Instructor 17: “I don’t really have an organized way of doing it.”

These findings are supported by other researchers, who have generally claimed that instructors lack training and confidence to teach pronunciation (Breitkreutz, Derwing, and Rossiter 2002; Burgess and Spencer 2000; Derwing 2010; MacDonald 2002). “L2 teachers are often worried that they aren’t well prepared to teach pronunciation or even to incorporate some pronunciation activities into their regular language classrooms. They feel as though they don’t know where to start” (Derwing 2010: 27). While instructors value pronunciation, there is a need for structured pedagogical materials and training.

Thus, while there is a growing body of research that clearly supports the claim that phonetic training does significantly improve L2 pronunciation, there is a clear gap between the research and implementation. Although the above findings are drawn from a relatively small sample of universities and instructors, they provide empirical support for previous claims regarding the general lack of pronunciation teaching in the classroom (Levis 2007), particularly for lower-level university language courses. This holds especially true for implementation of newly developed speech analysis software. While such software routinely plays a role in phonetic research, linguistics courses, and occasionally advanced language instruction, it is largely absent from the beginning levels of language instruction. Moving forward, there is a need for more practical, pedagogical classroom-oriented approaches.

4. Praat—A Practical Approach

Speech analysis software, such as Praat, by providing a visual method of conceptualizing pronunciation, offers a unique opportunity to allow students to self-analyze in the face of such teacher-centered pronunciation instruction. More specifically, this sort of speech analysis software has the potential to play a significant role in the development of self-monitoring and comparing one’s own productions with productions of native speakers. The advent of such new technology, coupled with the already documented uncertainty regarding phonetic instruction, has left instructors struggling with if such technology is applicable to the language classroom, and if so, how to go about implementing it. The second goal of this paper is to provide a practical approach for integrating the Praat speech analysis software into the lower-level language course.

4.1 Praat

Praat is free, downloadable software, available for Mac, PC, and Linux (Boersma and Weenink 2011). Broadly, Praat allows for the recording of speech sounds, provides a visual representation of the speech sound (through spectrograms and wave-forms), and allows for analysis at the segmental and suprasegmental level. While Praat is exceedingly versatile and flexible with a multitude of features, given the goal of providing a practical interpretation of this software, this paper discusses the program within a substantially limited scope.

4.2 Sample Activity

The activity detailed here derives from several different types of pronunciation activities piloted over the course of various semesters in both second- and third-semester Spanish classes at the university level. Generally, this type of activity can be divided into three parts, further detailed below: 1) Initial Self-Recording; 2) Guided Visual and Auditory Analysis; 3) Practice and Re-recording. The design allows students to analyze their own recordings, compare their productions with the productions of a native Spanish speaker, and attempt to produce the target sounds in a more native-like manner.[4] A full sample lesson is available in Appendix I.

The activity is loosely designed within the framework of a guided inductive method (Craig 1956; Shulman and Keisler 1966; among many),[5] with a particular nod to the notion of self-monitoring and self-assessment (Arteaga 2000; Crawford 1987; Stevick 1982). The overall learning objective is to encourage students to analyze visual and auditory representations of L2 sounds, identify segmental pronunciation differences between native-speaker and non-native speaker productions, and have students practice producing more native-like pronunciations. Thus, this activity involves both visual and auditory perception, as well as production. It also should be noted that, given the student-centered nature of this activity, students were never given any explicit articulatory instruction.

In addition, to facilitate student use of this potentially complex software, several key considerations were made in the development of this activity. First, as noted by Arteaga (2000), care is taken to avoid unnecessarily technical language. For example, spectrograms are generally referred to as "visual representations," and discussion of terms such as "phoneme," "occlusive," and "approximant" is avoided. Second, given the complexity of Praat and the variety of features it offers, effort is made to avoid discussion of extraneous features, instead focusing on the few commands and features truly necessary for self-analysis. Lastly, the directions are designed to provide students with clear, concise, written instructions to facilitate use. Each step in the process is detailed sufficiently to give the student autonomy.

The current lesson focuses on one specific Spanish sound commonly mispronounced by native speakers of English, the intervocalic stop /VdV/. In Spanish, /d/ is produced as an approximant [ð] in intervocalic positions, as opposed to occlusive [d]. As shown by Lord (2010, among many), native English-speaking learners of Spanish almost exclusively produce the full occlusive [d] in intervocalic position, generally attributed to L1 transfer. In addition to being commonly mispronounced, this sound has been specifically chosen for its relation to other aspects of the curriculum, as students were addressing the present perfect tense, presenting ample opportunity for the practice of the target sounds in all regular past participles (e.g., *he comido*, 'I have eaten'). It should be noted that this is certainly not the only pronunciation feature that can be addressed, but rather is intended to serve as a token example of what is possible.

4.2.1 Initial Recordings

As part of a pre-activity (see Appendix I), completed prior to class, students are given instructions on how to record a single sound file in PRAAT. Specific written, detailed, instructions are given in the target language (Spanish), and are completed for

homework. Students receive the assignment two class periods prior to the homework being due to allow time to address any issues. In brief, students are directed to download PRAAT, open the program, and record a list of vocabulary words containing the target sound of intervocalic /d/. They are then instructed to print the "visual picture" and attempt to mark the individual "sounds" in each of their visual pictures. Students accomplish this primarily by listening repeatedly to their own recordings in PRAAT, which progressively highlights the visual picture as the audio unfolds. Again, technical language, such as *spectrogram* and *phonemes*, is avoided in an attempt to make the material more accessible to students.

This pre-activity serves a dual purpose. First, it serves as a hands-on introduction to some of the basic features of PRAAT, including recording and visual presentation of speech sounds. Second, this activity serves to prepare students for the in-class analysis of their own speech sounds.

4.2.2 In-class Guided Analysis

The goal of the in-class analysis is first to have students focus on their own productions of the target sounds, coupling visual analysis to subsequent auditory stimuli. Second, students are given the opportunity to examine the productions of native speakers of Spanish. Lastly, students are encouraged to compare their productions with those of a native Spanish speaker. In total, students are given approximately 30 minutes to complete their in-class analysis with roughly equal time distribution to the three phases of analysis.

4.2.3 Self-Analysis

To that end, students are first guided through a series of questions, presented in either the target language (Spanish) or English dependent upon proficiency level, regarding the visual characteristics of their own productions, focusing on the target sound (Example 1).

(1) a. What are the visual characteristics of your "d"?
b. Is your "d" darker or lighter than the sounds around it?
c. Is your "d" longer or shorter than the sounds around it?
d. Is your "d" easy or hard to distinguish from the surrounding sounds?

Figure 2 shows the sample target word *comido* containing an intervocalic /d/, produced by a native English speaking L2 learner of Spanish. Through the above guiding questions, students' attention is drawn to the fact that the "d" is visually much lighter than the sounds around it and easy to distinguish from the surrounding vowels. Lacking technical vocabulary, students may refer to this as a "hard 'd'," a "closed 'd'," or note that there is "silence" within the bounds of the "d". All of these descriptions point to the fact that the /d/ produced by the English speaker represents a full stop closure [d].

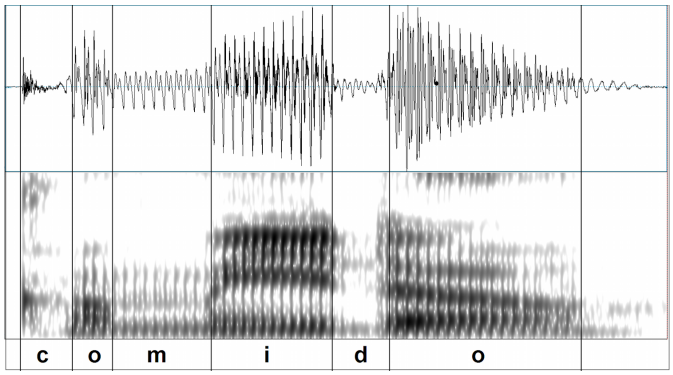


Figure 2. Wave form of *Comido* Produced by an English Speaking Learner of Spanish

4.2.3 Native Analysis

Having established that their /d/ is easy to distinguish from surrounding sounds, as it is significantly lighter in color, the second step is for the learner to analyze the visual representation of the same word produced by a native Spanish speaker (Example 2). The guiding questions parallel those used in the analysis of the learner-produced tokens.

(2) a. What are the visual characteristics of the Spanish speaker's "d"?
b. Is it lighter or darker than the sounds around it?
c. Is it easy or hard to distinguish from the surrounding sounds?

Figure 3 shows the target token *comido* produced by a native Spanish speaker. Students note that the "d" produced by the native speaker is roughly as dark as the sounds around it and is difficult to distinguish from the surrounding sounds.

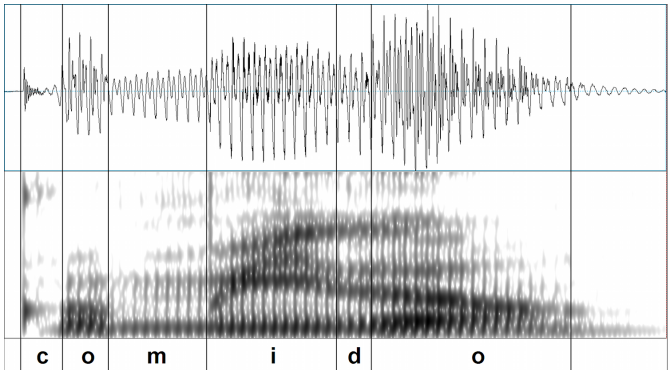


Figure 3. Wave Form of *Comido*, Produced by Native Speaker of Spanish for Comparison

4.2.4 Comparison

Combining the analyses of their own productions and that of the native Spanish speaker, students are asked to make a direct comparison of the visual evidence (Example 3a). Once students establish *visual* differences between their own productions and those of a native speaker, they are then asked to extrapolate and hypothesize about the *auditory*

differences between their productions and the productions of the native Spanish speakers (3b).

(3) a. Describe the visual difference between your “d” and the “d” produced by a native Spanish speaker.
b. What do you think the *auditory* difference is between your “d” and the “d” produced by that native speaker?

In visual comparison, students note that their “d” is much lighter and easy to distinguish from the surrounding sounds than the “d” produced by the native Spanish speaker. They often speculate that their “d” is more “closed,” is “harder,” and is not as “connected” to the vowels as the “d” produced by a native Spanish speaker. This non-technical description corresponds to the full stop [d] typically produced by English speakers. Correspondingly, they conjecture that the /d/ produced by the Spanish speaker is “noisy” and that there is no “silence” in the /d/, describing the approximant [ð] produced by native Spanish speakers. While their descriptions vary, it is important to note that students are able to visually distinguish their /d/ from the native speaker /d/ and hypothesize about the auditory differences between the two pronunciations. Lastly, they are able to test their hypotheses by listening to repetitions of productions by an English speaker and native Spanish speaker. Auditory repetitions consist of repetitions of the entire word as well as the VCV segment. Inherent in this last step, students who were unable to extrapolate correctly from visual to auditory stimuli are more explicitly lead to this understanding through this joint presentation of audio and visual representations, and as such correct any incorrect hypotheses.

To further test their analysis of the pronunciation differences, students are given a series of pairs of spectrograms, with each pair containing one native speaker production and one non-native speaker production. Students then must decide which of the pair was produced by the native English speaker and provide a justification for their answer. Increasing in difficulty, students first examine pairs of spectrograms that have been marked with the individual sounds (Figure 4) and then examine words that have not been sub-divided (Figure 5). Again, the purpose of this activity is to actively encourage students to compare the visual and, as a consequence, the auditory productions of native and non-native speakers, highlighting the pronunciation differences.

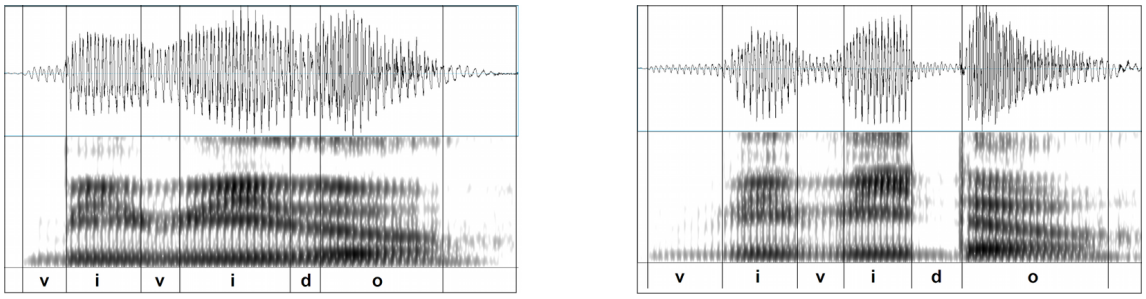


Figure 4. Pair of Marked Spectrograms, the Left Corresponding to *Vivido* Produced by a Native Spanish Speaker, the Right Produced by a Native English Speaker

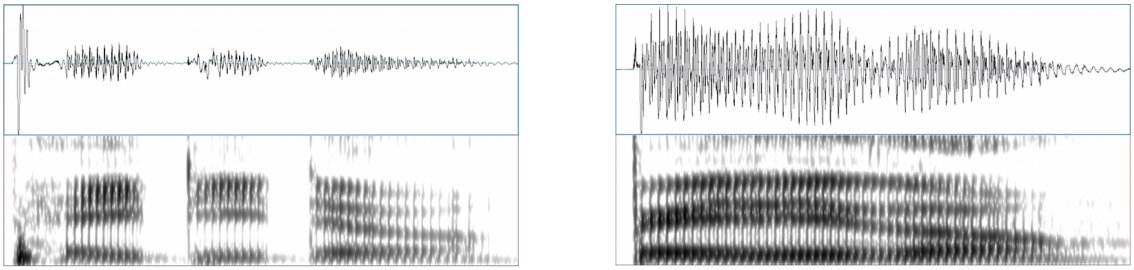


Figure 5. Pair of Unmarked Spectrograms, the Left Corresponding to *Pedido* Produced by a Native English Speaker, the Right Produced by a Native Spanish Speaker

4.2.5 Practice and Re-recording

As a follow-up to the in-class portion of the activity, students are asked to re-record the list of target words as an at-home assignment, attempting to model their productions after the native speaker productions they have heard and seen. Both spectrograms and sound files are provided to students via online course resources (i.e. Blackboard). Students are encouraged to record and analyze as many times as necessary to attempt to create productions that are more native-like (see Future Directions for further discussion). Given the familiarity gained with the software, students were given only the time between two class meetings to re-record their productions and turn in copies of their new and old spectrograms. The real-time visual feedback from the PRAAT recording program, coupled with the native Spanish speaker productions, gives students a tool for self-monitoring that is otherwise not available. Dual feedback, both auditory and visual, allows students to make a more detailed analysis of their own productions.

4.2.6 Recycling

As stated previously, the above activity addressing pronunciation of intervolcalic /VdV/ is certainly not the only sound that can be targeted using this methodology. Subsequent activities may also address sounds represented orthographically as "v" and "h", pronounced [b] and [∅] respectively. During such subsequent activities, it may benefit students to have them consider previous lessons, such as the /VdV/, as a method of reinforcing these lessons, as well as elaborating on distribution patterns.[6]

5. Assessing the Accessibility

The final goal of this paper is to assess some of the previous claims (Derwing 2010; Setter and Jenkins 2005) that current speech analysis software may be too sophisticated or complicated for L2 learners. To assess the potential difficulties associated with this tool, following the implementation of the activity detailed above, a survey was issued to twenty-five L2 learners of Spanish (Appendix II). All respondents were enrolled in a 2nd semester Spanish course at a major public university. Their participation was completely voluntary, and they received no compensation or credit for their participation. One subject reported daily use of Spanish at home with family and/or friends, and was subsequently excluded from the analysis based on the fact that Spanish

may be considered an L1.[7] The survey was designed to assess the ease of use and overall perceived benefits of the Praat speech analysis program.

First, students were asked to evaluate the ease of use experienced with a variety of aspects of the Praat program. All responses were presented on a Likert scale from 1–9; with 1 signifying "strongly agree," 5 signifying "neutral," and 9 "strongly disagree." Students indicated no difficulties downloading, recording, and creating a visual picture of their production. Overwhelmingly, students reported few if any problems with any aspect of this program, calling in to question previous claims on the inaccessibility of Praat to second language learners. Results are presented below in Table 1.

Table 1. Learner Perceived Ease of Use of Praat

	M	SD
Downloading the program was easy.	1.22	0.7
Using the program to record my voice was easy.	1.18	0.5
Creating the visual picture was easy.	1.73	1.5
Visually differentiating between my own pronunciation and native speaker productions was easy.	2.32	1.8
Overall using this program was easy.	1.64	1.2
I had NO major difficulties using this program.	1.14	0.4

Second, students were asked to evaluate the usefulness of the activity and specifically Praat speech analysis software. Again, all responses were presented on a Likert scale from 1–9; with 1 signifying "strongly agree" and 9 signifying "strongly disagree." Taken as a whole, students indicated that, in addition to being easy to use, Praat presented a good method for them to conceptualize pronunciation and would ultimately be beneficial to them.

Table 2. Learner Perceived Benefits of Pratt

	M	SD
The PRAAT activity was a good way for me to think about my own pronunciation.	2.18	1.5
I think that visualizing pronunciation will help me improve my pronunciation in Spanish.	2.4	1.8
I liked the activity using PRAAT.	2.4	1.5
I would recommend that the instructor use PRAAT again.	2.3	1.4

The results of the preliminary survey assessing student perceptions of the Pratt software shows that learners, far from being intimidated by the complexity of the software, were fully capable of downloading, recording, and self-analyzing using Pratt. Additionally, learners judged that this type of activity represented a unique, useful method for analyzing their own pronunciation.

6. Discussion

Addressing extant gaps in both research and pedagogy related to the use of speech analysis technology in the lower-level L2 classroom, the aims of this paper were three-fold and are summarized here in turn. The first goal was to provide a general picture of the state of pronunciation training in the lower-level university language classroom. Results from this pilot survey showed that most instructors surveyed deal with pronunciation in an ad-hoc manner, with repetition and modeling forming the bulk of pronunciation instruction, while speech analysis technology is entirely absent. Such a system puts the burden of pronunciation training entirely on the instructor, while denying students the tools to analyze their own productions. In addition, survey results indicated that the majority of instructors believe that they do not spend a sufficient amount of time on pronunciation training, a finding partially motivated by uncertainty and a lack of available materials for pronunciation instruction. Thus, while there is a body of research emerging showing the benefits of pronunciation training and the potential for speech analysis software, there is a clear gap between the research and pedagogical implementation. The field is ripe for work that seeks to bridge this gap, providing practical pedagogical approaches to incorporating speech analysis technology into the language classroom at every level, especially at the beginning levels of instruction.

The second, and principle, aim was to present one possible method of integrating Praat speech analysis software into the lower-level classroom. Drawing on a guided inductive framework, students are able to record their own pronunciations, analyze specific segmental features, compare with native speaker productions, and then practice producing more native-like target pronunciations. The general design of this activity encourages students to engage in active self-monitoring (Arteaga 2000) and self-analysis, effectively giving them tools to improve their pronunciation. Also, several key factors for practical design of activities and implementation of speech analysis software in the classroom were proposed. Specifically, avoiding technical jargon, limiting the scope of the activity, and providing concise instructions were offered as important considerations. With these points in mind, Praat and other similar software programs may not seem as technically difficult as previous researchers have claimed.

The final goal was to evaluate whether such computer-aided pronunciation training is truly beyond students' capabilities, as has been claimed in previous research (e.g. Setter and Jenkins 2005). Results, based on a limited survey of students who participated in such an activity, indicated, that contrary to previous claims, with appropriate guidance, students have minimal technological difficulties using such speech technology. In addition, the vast majority of students surveyed found visualizing and real-time feedback to be a beneficial method of conceptualizing pronunciation differences between native and non-native speakers. While these findings should not negate the call for further development of user-friendly speech analysis software, they provide preliminary evidence that students are able to effectively use programs that were initially designed with researchers in mind.

This paper demonstrates that, although largely lacking from lower-level language instruction, speech analysis tools, such as Praat, have the potential to be successfully incorporated into the L2 classroom. Through careful design of pedagogical activities, Pratt can become a useful tool for pronunciation instruction and learner self-analysis at any level.

7. Future Directions

The goal of this work was principally to present one possible pedagogical implementation for this emerging speech analysis software and demonstrate that, contrary to some claims, with carefully designed activities, such software can be easily accessible and understandable to beginning language learners. However, the next step, beyond the scope of this work, is to begin to quantify the benefits of such exercises on learner pronunciation. That is, only once we have established that students in the lower levels of language instruction are capable of using speech analysis technology, can we begin to evaluate its effectiveness.

Although previous research has shown the overall benefits of pronunciation instruction, with a few including a speech analysis component, there is a clear need to begin to tease apart the benefits of different pedagogical methodologies, including the use of speech analysis software. For example, González-Bueno (1997), in her study illustrating the benefits of pronunciation for intermediate language learners, employed a multi-faceted approach involving explicit instruction regarding articulatory and acoustic characteristics, perceptual discrimination training, and spectrographic characteristics. Similarly Lord (2005), giving students a fairly "traditional course" in Spanish phonetics and phonology, included explicit instruction on articulation and sound contrasts, and employed transcription, oral pronunciation, as speech analysis software (see also Lord 2008, 2010). While both of these studies showed measurable pronunciation benefits through this multi-faceted approach, it remains unclear what the contributions of each type of task were to the students' improvement. Subsequent work should attempt to quantify contributions of explicit articulatory instruction, speech analysis software, transcription, etc.

Second, while this paper provides a possible method of incorporating such speech analysis technology in the classroom, it is clear that this is not, nor should it be considered to be, the only or ideal method for including such software in the classroom. Further research, coupled with the creativity of language instructors, should begin to create a variety of possible implementations for this speech analysis technology in the language classroom.

NOTES

[1]An additional finding that begs further development of pronunciation instruction in beginning L2 classrooms is Flege's (1988) finding that, for immigrants immersed in an L2 environment, the most significant phonetic and phonological changes occur within their first year of immersion. While acquisition in an immersion setting cannot be equated with acquisition in an L2 classroom, this finding poses the possibility that such acquisition patterns may be applicable in the L2 classroom. As such, the first years of language instruction may represent a crucial time period for pronunciation development.

[2]A quick Google search demonstrates that Praat is sometimes used in advanced level language courses, specifically L2 phonetics courses, which are generally taken during the third and fourth year of L2 instruction. In addition, Praat has become an indispensable tool for linguistics classrooms. Yet the fact remains that its use has yet to permeate down to the lower-level university language courses.

[3]Responses in the "Other" category included addressing dialectal variation, reading aloud, and answering student questions. Several instructors reported not having an "organized" approach to address pronunciation.

[4] It is worth noting that, although dependent upon both individual and institutional aims, for most learners intelligibility rather than "native-like" phonetic production is the principle objective (e.g., Levis 2007). As such, the use of "native" or "native-like" productions for comparison in the current paper should not be taken as an endorsement for learner achievement of "native-like" pronunciation, rather the opportunity to move closer towards a production that facilitates intelligibility (e.g., Hurtado and Estrada 2010).

[5] A crucial distinction should be made between the concepts of inductive learning and guided inductive learning. Beyond the scope of this paper, a large body of research on inductive/discovery learning and guided inductive learning has provided evidence that, depending on subject matter, guided inductive learning may be more effective than a more "pure" inductive learning (see Mayer 2004; Shulman and Keisler 1966 for reviews), although the topic is subject to some ongoing debate. The key difference lies in the "guided" nature of the task, with an instructor drawing learners' attention to specific aspects of the problem, hypothesis or data set. While Praat and phonetic analysis may be beyond students' abilities in a "pure" discovery task, with appropriate guidance towards specific features, Praat can be a useful, accessible tool for pronunciation learning.

[6] As noted by an astute reviewer, subsequent lessons may also address issues of distribution, as /d/ is generally produced as an approximant in all contexts except: 1) following a pause; 2) following a nasal consonant; and, 3) following /l/ (e.g., Hualde 2005). Given that this pronunciation lesson was coupled with the introduction of the past participle forms, regularly containing the /VdV/ context, such discussion was omitted from the initial presentation in favor of generality. A potential extension of this activity could include having students themselves, via analysis of native speaker pronunciations of /d/ in variable contexts, attempt to determine distribution of [d] and [ð] variants.

[7] Two other speakers reported use of a different language at home (Hindi and Gujarati), but were included in the analysis based on the fact that Spanish represented an L3.

WORKS CITED

Abberton, Evelyn, and Adrian Fourcin. (1975). "Visual Feedback and the Acquisition of Intonation." *Foundations of Language Development: A Multidisciplinary Approach.* Vol. 2. Ed. Eric H. Lenneberg and Elizabeth Lenneberg. New York: Academic. 157–65. Print.

Archibald, John. (1998). *Second Language Phonology*. Amsterdam: John Benjamins. Print.

Arteaga, Deborah. (2000). "Articulatory Phonetics in the First-year Classroom." *The Modern Language Journal* 84: 339–54. Print.

Boersma, Paul, and David Weenink. (2011). *Praat: Doing Phonetics by Computer* [Computer program]. Version 5.2.16. Web. 20 Feb. 2011.

Bot, Kees de. (1980). "Evaluation of Intonation Acquisition: A Comparison of Methods." *International Journal of Psycholinguistics* 7: 81–92. Print.

---. (1983). "Visual Feedback of Intonation: Effectiveness and Induced Practice Behavior." *Language and Speech* 26: 331–50. Print.

Bot, Kees de, and Kate Mailfert. (1982). "The Teaching of Intonation: Fundamental Research and Classroom Applications." *TESOL Quarterly* 16: 71–77. Print.

Breitkreutz, Judy, Tracey Derwing, and Marian Rossiter. (2002). "Pronunciation

Teaching Practices in Canada." *TESL Canada Journal* 19: 51–61. Print.
Burgess, John, and Sheila Spencer. (2000). "Phonology and Pronunciation in Integrated Language Teaching and Teacher Education." *System* 28: 191–215. Print.
Castino, Joe. (1996). "Impact of a Phonetics Course on FL Learners' Acquisition of Spanish Phonology." *Selecta: Journal of the Pacific Northwest Council on Foreign Languages* 17: 55–58. Print.
Chun, Dorothy. (1998). "Signal Analysis Software for Teaching Discourse Intonation." *Language Learning and Technology* 2.1: 61–77. Print.
Craig, Robert. (1956). "Directed Versus Independent Discovery of Established Relations." *Journal of Educational Psychology* 47: 223–34. Print.
Crawford, William. (1987). "The Pronunciation Monitor: L2 Acquisition Considerations and Pedagogical Priorities." *Current Perspectives on Pronunciation: Practices Anchored in Theory.* Ed. Joan Morely. Washington, DC: TESOL. 103–21. Print.
Derwing, Tracey (2010). "Utopian Goals for Pronunciation Teaching." *Proceedings of the First Pronunciation in Second Language Learning and Teaching Conference.* Ed. John Levis and Kimberly LeVelle. Ames: Iowa State U. 24–37. Print.
Derwing, Tracey, and James Munro. (2005). "Second Language Accent and Pronunciation Teaching: A Research-based Approach." *TESOL Quarterly* 39: 379–97. Print.
Díaz-Campos, Manuel. (2004). "Context of Learning in the Acquisition of Spanish Second Language Phonology." *Studies in Second Language Acquisition* 26: 249–74. Print.
---. (2006). "The Effect of Style in Second Language Phonology: An Analysis of Segmental Acquisition in Study Abroad and Regular-classroom Students." *Selected Proceedings of the 7th Conference on the Acquisition of Spanish and Portuguese as First and Second Languages.* Ed. Carol Klee and Timothy Face. Somerville: Cascadilla Proceedings. 26–39. Print.
Elliot, Raymond. (1995). "Foreign Language Phonology: Field Independence, Attitude, and the Success of Formal Instruction in Spanish Pronunciation." *Modern Language Journal* 79: 530–42. Print.
---. (1999). "On the Teaching and Acquisition of Pronunciation within a Communicative Approach." *Hispania* 80.1: 95–108.
---. (2003). "Staking out the Territory at the Turn of the Century: Integrating Phonological Theory, Research, and the Effect of Formal Instruction on Pronunciation in the Acquisition of Spanish as a Second Language." *Spanish Second Language Acquisition: State of the Science.* Ed. Barbara Lafford and Rafael Salaberry. Washington, DC: Georgetown UP. 19–46. Print.
Flege, James. (1988). "Factors Affecting the Degree of Perceived Foreign Accent in English Sentences." *Journal of the Acoustical Society of America* 91: 370–89. Print.
González-Bueno, Manuela. (1997). "The Effects of Formal Instruction on the Acquisition of Spanish Stop Consonants." *Contemporary Perspectives on the Acquisition of Spanish: Production, Processing, and Comprehension.* Vol. 2. Ed. Ana Teresa Pérez-Leroux and William R. Glass. Somerville: Cascadilla Proceedings. 57–75. Print.
Hardison, Debra. (2004). "Generalization of Computer Assisted Prosody Training: Quantitative and Qualitative Findings." *Language Learning and Technology* 8.1: 34–52. Print.

Hualde, José Ignacio. (2005). *The Sounds of Spanish*. New York: Cambridge UP. Print.
Hurtado, Luz Marcela, and Chelsea Estrada. (2010). "Factors Influencing the Second Language Acquisition of Spanish Vibrants." *Modern Language Journal* 94: 74–86. Print.
Kay Elemetrics. (1986). *Visi–Pitch/Apple Applications Manual.* Pine Brook: Kay Elemetrics.
Lambacher, Stephen. (1999). "A CALL Tool for Improving Second Language Acquisition of English Consonants by Japanese Learners." *Computer Assisted Language Learning* 12.2: 137–56. Print.
Leather, James. (2000). "Second-language Speech Research: An Introduction." *Language Learning* 49, Supplement 1. 1–56. Print.
Levis, John. (1999). "Intonation in Theory and Practice, Revisited." *TESOL Quarterly* 33: 37–63. Print.
---. (2007). "Computer Technology in Teaching and Researching Pronunciation." *Annual Review of Applied Linguistics* 27: 184–202. Print.
Levis, John, and Lucy Pickering (2004). "Teaching Intonation in Discourse Using Speech Visualization Technology." *System* 32: 505–24. Print.
Lord, Gillian. (2005). "Can We Teach Foreign Language Pronunciation? The Effects of a Phonetics Class on Second Language Pronunciation." *Hispania* 88: 557–67. Print.
---. (2008). "Podcasting Communities and Second Language Pronunciation." *Foreign Language Annals* 41: 364–79. Print.
---. (2010). "The Combined Effects of Instruction and Immersion on Second Language Pronunciation." *Foreign Language Annals* 43.4: 488–503. Print.
MacDonald, Shem. (2002). "Pronunciation—Views and Practices of Reluctant Teachers." *Prospect* 17.3: 3–18. Print.
Macdonald, Doris, George Yule, and Maggie Powers. (1994). "Attempts to Improve English L2 Pronunciation: The Variable Effects of Different Types of Instruction." *Language Learning* 44: 75–100. Print.
Major, Roy. (1998). "Interlanguage Phonetics and Phonology: An Introduction." *Studies in Second Language Acquisition* 20.1: 131–37. Print.
Mayer, Richard. (2004). "Should there be a three strike rule against pure discovery learning? The case for guided methods of instruction." *American Psychologist* 59.1: 14–19. Print.
McCandless, Peter, and Harris Winitz. (1986). "Test of Pronunciation Following One Year of Comprehension Instruction in College German." *The Modern Language Journal* 70.4: 355–62. Print.
Molholt, Garry. (1988). "Computer Assisted Instruction in Pronunciation for Chinese Speakers of American English." *TESOL Quarterly* 22.1: 91–111. Print.
Morley, Joan. (1994). "A Multidimensional Curriculum Design for Speech Pronunciation Instruction." *Pronunciation Pedagogy and Theory: New Views, New Directions.* Ed. Joan Morley. Alexandria: TESOL. 66–91. Print.
Neufeld, Gerald. (1977). "Language Learning Ability in Adults: A Study on the Acquisition of Prosody and Articulatory Features." *Working Papers on Bilingualism* 12: 46–60. Print.
Pronunciation Power. (2011). Computer Program. English Computerized Learning Incorporated. Alberta, Canada. Print.

Rosenman, Alba. (1987). "The Relationship between Auditory Discrimination and Oral Production of Spanish Sounds in Children and Adults." *Journal of Psycholinguistic Research* 16.6: 512–34. Print.
Ruellot, Viviane. (2011). Computer-assisted Pronunciation Learning of French /u/ and /y/ at the Intermediate Level. *Proceedings of the 2nd Pronunciation in Second Language Learning and Teaching Conference*. Ed. John Levis and Kimberly Levelle. Ames: Iowa State U. 199–213. Print.
Santos Maldonado, Carmen. (1994). "Some Aspects of 'Foreignness' in the Pronunciation of Upper Intermediate English Students of Spanish." *Edinburgh Working Papers in Applied Linguistics, 5.* Ed. Alan Davies and Brian Parkinson. Edinburgh: Edinburgh U. 78–97. Print.
Saito, Kazuya. (2007). "The Influence of Explicit Phonetic Instruction on Pronunciation Teaching in EFL Settings: The Case of English Vowels and Japanese Learners of English." *The Linguistics Journal* 3.3: 16–40. Print.
Seferoglu, Gölge. (2005). "Improving Students' Pronunciation through Accent Reduction Software." *British Journal of Educational Technology* 36.2: 303–16. Print.
Shulman, Lee, and Evan Keisler. (1966). *Learning by Discovery.* Chicago: Rand. Print.
Segalowitz, Norman, and Barbara Freed. (2004). "Context, Contact and Cognition in Oral Fluency Acquisition: Learning Spanish in at Home and Study Abroad Contexts." *Studies in Second Language Acquisition* 26: 173–99. Print.
Setter, Jane, and Jennifer Jenkins. (2005). "State of the Art Review: Pronunciation." *Language Teaching* 38: 1–17. Print.
Simões, Antônio. (1996). "Assessing the Contribution of Instructional Technology in the Teaching of Pronunciation." *Proceedings of the International Conference on Spoken Language Processing.* Ed. H. Timothy Bunnell and William Idsardi. New Castle: Citation. 161–64.
Stevick, Earl. (1982). *Teaching and Learning Languages.* Cambridge: Cambridge UP. Print.
Stokes, Jeffery. (2001). "Factors in the Acquisition of Spanish Pronunciation." *I.T.L. Review of Applied Linguistics*. 63–84. Print.
Suter, Richard. (1976). "Predictors of Pronunciation Accuracy in Second Language Learning." *Language Learning* 26*.* 233–53. Print.
Wang, Xinchun, and Murray Munro. (2004). "Computer-based Training for Learning English Vowel Contrasts." *System* 32: 539–52. Print.
Weltens, Bert, and Kees de Bot. (1984). "The Visualization of Pitch Contours: Some Aspects of its Effectiveness in Teaching Foreign Intonation." *Speech Communication* 3.2: 157–63. Print.
Zampini, Mary. (1996). "Voiced Stop Spirantization in the ESL Speech of Native Speakers of Spanish." *Applied Psycholinguistics* 17. 335–54. Print.

APPENDICES

Sample Activity I

Lesson: Pronunciation guided self-analysis of intervocalic /d/

Objective: To guide students towards improvement of segmental pronunciation of the target sounds through self-analysis and comparison with native speaker productions.

Instructor Notes:

1. The general structure (Initial Self-Recording; Guided Visual and Auditory Analysis; Practice and Re-recording) may be repeated with a variety of different sounds.
2. Timing: Students were given each section (I–III) at the appropriate time in the lesson. Section I was given as homework two class meetings before students were to bring anything to class. Section II was done during class time, lasting approximately 30–45 minutes, with *Paso 1–3* each lasting approximately 7 minutes, and *Paso 4–5* approximately 5 minutes. Subsequent use of similar activities can be done in less time. Section III was given to students to do as homework, turned in the following class meeting, as it was assumed that they were familiar enough with the software and requirements to complete the assignment in less than 30 minutes.
3. Depending on the students' level, instructions may be provided in English or the target language. The example provided below, in Spanish, was successfully implemented in 2nd and 3rd semester university level courses.
4. The list of words used (see *Pre-actividad, Paso 3*) should vary depending on the sound addressed and the current grammar and vocabulary needs of the course. The example of /VdV/ may be addressed when learning the past perfect verb tense, as regular past participles all contain the structure /VdV/. Similarly, intervocalic /b/ was addressed when discussing the imperfect verb tense.
5. The final critical thinking questions (see *Práctica de Pronunciación, Paso 2)* were given here in English to allow students to express more complex concepts. Language for this section may vary.

I. Pre-actividad: Para Hacer en Casa

Paso 1. Bajar del internet el programa PRAAT (praat.org). (Hay versiones para Mac, Windows, Linux, etc).

Paso 2. Grabar unas palabras.

1. Abre el programa PRAAT, y cierra todas las ventanas MENOS la ventana titulada "Praat Objects."
2. Haz clic en el botón "*new*" y selecciona "*Record Mono Sound*."
3. En la ventana "*Sound Recorder*," no hay que cambiar nada, solo presiona "Record."
4. Pronuncia de forma natural la primera palabra en la lista abajo. Es importante que solo grabes un poquito de silencio antes o después de la palabra.
5. Presiona "*stop*."
6. Presiona "*save to list*."
7. Cierra la ventana "*Sound Recorder*," y vuelve a la ventana "*Praat Objects*."
8. Selecciona tu nueva grabación (*Untitled Sound*), y presiona "*Edit*."

(¡Ahora tienes una representación visual de la palabra que grabaste!)

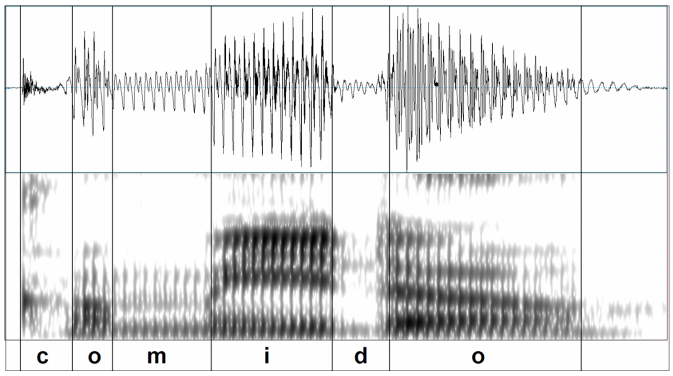
Truco: Puedes hacer un "*zoom*" seleccionando una parte de las ondas (*waves*), y haciendo un clic en el botón "*Sel*."

9. Imprime la representación visual de la palabra.

Truco: Si no puedes imprimirlo, puedes hacer un "*screenshot*" y imprimir la imagen.

10. A mano, marca todas las letras (sonidos) en la representación.
    Truco: Para escuchar tu palabra, haz un clic en las palabras "*Visible Part*." (Tendrás que escuchar tu grabación MUCHAS veces para marcar las letras)

Hay un ejemplo de la palabra *comido* abajo.



Paso 3. Repite Paso 2 con el resto de las palabras de las palabras de la lista abajo.

a. Hablado
b. Comido
c. Bebido
d. Vivido
e. Regalado

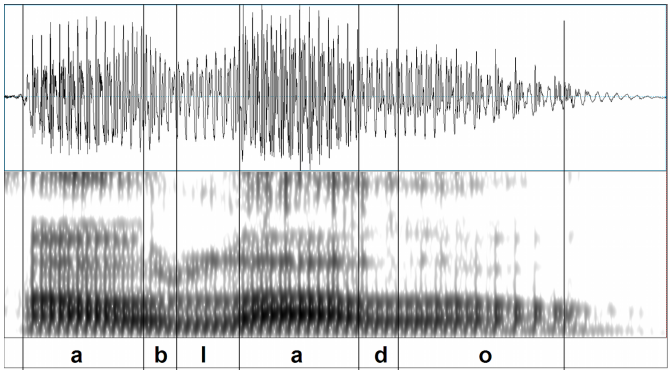
Paso 4. Trae las 5 imágenes de tus palabras a clase.

II. Análisis en Clase

Paso 1. Compara, en grupos de 3–4, las imágenes de tus palabras "Hablado."

¿Cómo decidiste marcar los limites (boundaries)? _____
_____
¿Qué características visuales tiene la "d"? _____
¿Es muy oscura o clara? _____
¿Es larga o corta comparado con la "a"? _____

Paso 2. Ahora, analiza la palabra "Hablado" abajo, producida por un hablante nativo de español.



¿Qué características visuales tiene la “d”?
¿Es larga o corta comparado con la “a”? _____
¿Es más, menos (o igual) de oscuro que la “a”?_____
¿Es difícil o fácil de distinguirla de la “a”? _____

Paso 3. Compara tu producción de “hablado” con la producción de “hablado” por un hablante nativo de español.

Describe la diferencia <u>visual</u> entre tu “d” y la “d” producida por un hablante nativo. _____
¿Qué crees que es la diferencia <u>auditoria</u> entre tu “d” y la “d” producida por un hablante nativo?

_____
_____
Ahora escuchamos la diferencia. ¿Cómo describes la diferencia <u>auditoria</u>?

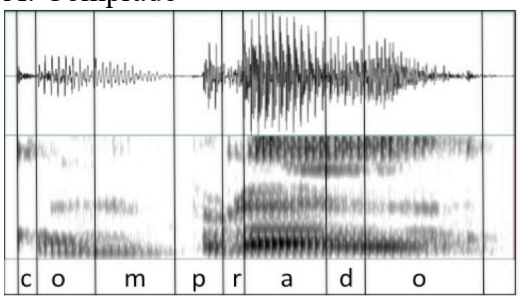
_____
_____

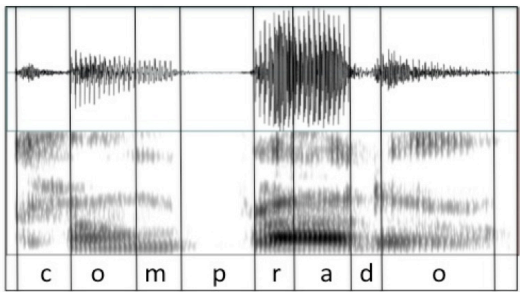
Paso 4. Por último, escuchamos dos palabras:

a. “*though*” producida por un hablante de inglés
b. “*do*” (como *hablado*) producida por un hablante de español
¿Hay una diferencia? _____

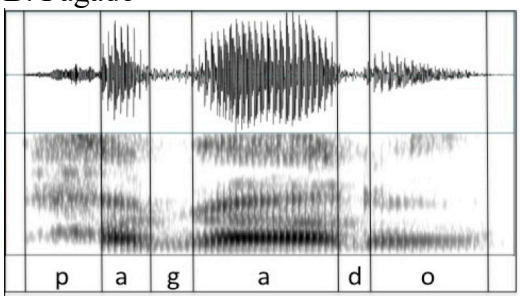
Paso 5. Pruebita.
¿Puedes decidir cuál palabra es producida por un hablante de inglés y cuál por un hablante de español?

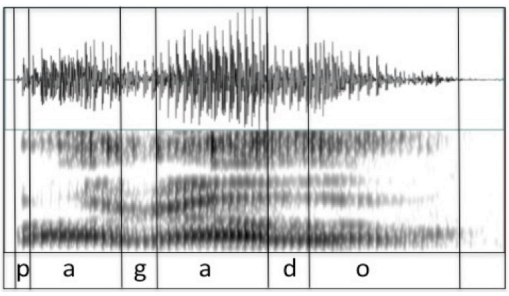
A: Comprado



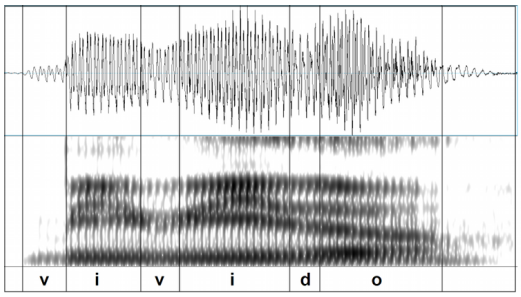


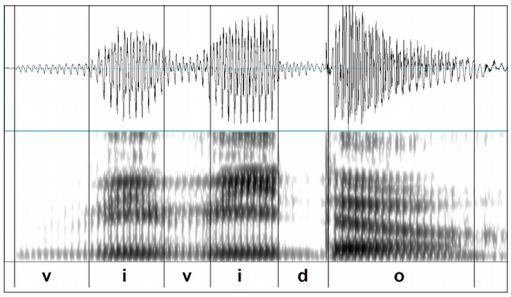
B: Pagado



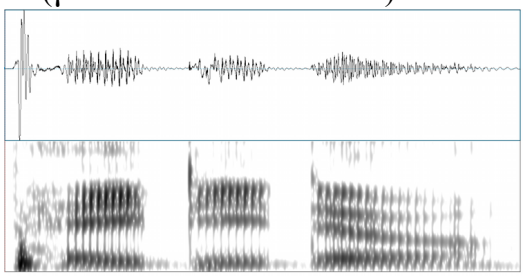


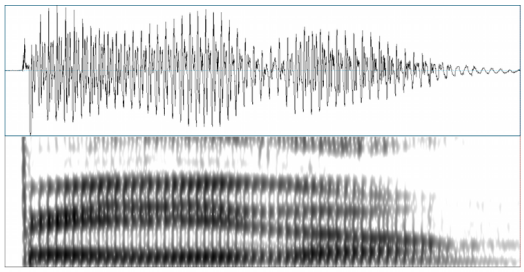
C: Vivido





D: (¡Más difícil! Sin las letras)





¿Cómo sabes cuál es de un hablante de inglés y cuál es de un hablante de español?

III. Práctica de Pronunciación—Tarea para Hacer en Casa

Paso 1. Re-graba, marca e imprime las cinco palabras, intentando aproximar tus palabras a las palabras producidas por hablantes nativos de español. Puedes grabarte muchas veces y elegir tu mejor intento.

Paso 2. Contesta de forma escrita las siguientes preguntas en inglés. Quiero que contestes de una forma completa, y para algunas preguntas una frase no es suficiente:

a. What is the difference between "-ado" produced by an English speaker and "-ado" produced by a Spanish speaker?
b. What did you learn by seeing this "visual" representation of the Spanish words? (If you feel that you didn't learn anything, talk about why you didn't!)
c. Can you think of other aspects of Spanish you might like to analyze with this type of software?
d. Can you imagine how a Spanish speaker might produce "-aba"? Explain what you think the difference might be between an English-speaker and a Spanish-speaker saying the word "Hablaba."

Sample Activity II

Survey Regarding the Usability of Praat Software

<u>A Short Survey About your Experience with the Praat Voice Analysis Activity</u>
Instructions: Please rate the following statements on a scale of 1–9 by circling the number you feel is appropriate.

I. Usefulness:

(1) The Praat activity was useful to me.

1 2 3 4 5 6 7 8 9

Agree Neutral Disagree

Please explain how you feel it was or was not useful (optional):

(2) The Praat activity was a good way for me to think about my own pronunciation.

1 2 3 4 5 6 7 8 9

Agree Neutral Disagree

(3) A visual representation of my pronunciation is useful.

1 2 3 4 5 6 7 8 9

Agree Neutral Disagree

(4) I think that visualizing pronunciation will help me improve my pronunciation in Spanish.

1 2 3 4 5 6 7 8 9

Agree Neutral Disagree

(5) A program like Praat allows me to improve pronunciation without the instructor correcting me.

1 2 3 4 5 6 7 8 9

Agree Neutral Disagree

II. Ease of Use:

(6) Downloading Praat was easy.

1 2 3 4 5 6 7 8 9

Agree Neutral Disagree

(7) Using the program to record my voice was easy.

1 2 3 4 5 6 7 8 9

Agree Neutral Disagree

(8) Creating the visual picture was easy.

1 2 3 4 5 6 7 8 9

Agree Neutral Disagree

(9) With the tutorial in class, understanding the visual representation was easy.

1 2 3 4 5 6 7 8 9

Agree Neutral Disagree

(10) Visually differentiating between my own pronunciation and native speaker productions was easy.

1 2 3 4 5 6 7 8 9

Agree Neutral Disagree

(11) Overall, using this program was easy.

1 2 3 4 5 6 7 8 9

Agree Neutral Disagree

If you think this program was NOT easy to use, please explain why (optional):

(12) I had some <u>minor</u> technical difficulties with the program.

1 2 3 4 5 6 7 8 9

Agree Neutral Disagree

(13) I had some <u>major</u> technical difficulties with the program.

1 2 3 4 5 6 7 8 9

Agree Neutral Disagree

If you had major/ minor technical difficulties, please explain what the problems were (optional):

III. Overall:

(14) I liked this activity.

1 2 3 4 5 6 7 8 9

Agree Neutral Disagree

(15) I would recommend that the instructor use PRAAT again.

1 2 3 4 5 6 7 8 9

Agree Neutral Disagree

(16) I would like to use this tool again to analyze my own productions.

1 2 3 4 5 6 7 8 9

Agree Neutral Disagree

(17) I wish I could have done this sort of activity in previous Spanish courses.

1 2 3 4 5 6 7 8 9

Agree Neutral Disagree

IV. Your Language Information:

Did you grow up hearing/speaking Spanish at home? ___yes _____no

Do you speak a language other than English/Spanish? ___yes _____no

If you answered yes, what other language(s) do you speak?