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Developing English Prosody Using Technology and Pronunciation Reformulation Techniques

Pronunciation is challenging for many international students, but particularly important for those going onto college and university level studies where they need to do professional presentations. According to the Institute of International Education [IIE] (2020), California hosted 160,592 students in 2019/2020, and is one of the top destinations for internationals seeking education in the U.S. (IIE, 2020). Given the large number of international students entering California universities each year, viable methods of teaching pronunciation are essential. The authors of this paper undertook a pilot study focused on improving the comprehensibility of English learner pronunciation via raising awareness of underlying prosodic nuances of English. Seven international student participants took part in the study. The authors relied on a noticing-reformulation technique to raise the participants' awareness to prosodic features (Smith & Beckman, 2005). *Audacity* 2.1.2 (Audacity Team, 2020) and *WASP* 1.54 (Huckvale, 2013) were also utilized for audiovisual feedback. To collect data, the authors used a pretest–treatment–posttest methodology. Two non-expert raters conducted a blind analysis of the pretest and posttest impromptu speeches. Additional data was collected from the observations of the classroom teacher. The student participants also provided data by responding to a questionnaire and then elaborating on their responses in a subsequent focus group. The results of the study showed some notable results related to intonation. Furthermore, the participants themselves greatly valued the training on thought groups because it gave them an understanding of how to use slight pausing and intonation to chunk thoughts at natural "phrasal breaks"(Celce-Murcia, Brinton, & Goodwin, 2010). This process helped them to regulate the speed and flow of their speech. The positive reactions of the participants encouraged the classroom teacher to continue using the approach for subsequent classes.

The Research Process

The development of clear pronunciation is a commonly expressed concern among international students, yet it is often overlooked in language teaching. Language administrators and educators of university Intensive English Programs tend to focus on the more apparent need of developing writing and reading skills, which these students are often expected to perform at a native-speaker level. Presentation skills are also focused upon in IEP programs, in

anticipation of the traditional classroom speeches required of college level students. While these skills of organization, content development, memorization, and delivery are all essential for presenting a subject, if one is unable to clearly articulate thoughts comprehensibly, the message is completely lost on the audience. According to Busa (2010), "because non-native use of speech pauses, volume, pitch, and intonation have important pragmatic effects on how the speaker's message is received by the listener", comprehensibility can best be achieved through prosody—an aspect of pronunciation that focuses on stress, rhythm, and intonation (p. 59). For these reasons, we decided to explore new approaches and techniques that could aid in the development of comprehensible English prosody in the speech of second language learners. This paper describes a pilot study, which explored methods for teaching prosody. The results showed improvements in intonation and student appreciation, in particular, as it pertained to the use of thought groups (Liu, 2017). This paper highlights the techniques used, shares some positive results of the implementation, and describes the continued use of the approach in the classroom.

Phonemic development, which focuses on the pronunciation of specific sounds of language, has been a common approach for improving L2 speech (Celce-Murcia, Brinton, & Goodwin,2010). By contrast, current research has highlighted the importance of prosody in developing comprehensibility (Pickering, 2004; Busa, 2010). Although attention to individual phonemes may bring clarity to pronunciation, attention given to prosodic features such as stress, rhythm, and intonation can have a greater effect on the clarity of the meaning being conveyed (Gilbert, 2008). Thus, the focus of this research was to examine practical techniques for teaching pronunciation skills in the ESL classroom and to determine the impact of the intonational paragraphing on student presentations. Since this study was the result of a dissertation project (Liu, 2017), one of us took on the dual tasks of developing the methodology for putting together a curriculum to be implemented in a pronunciation lab setting and collecting data on student progress. The second author served as the classroom teacher of an IEP presentation skills class. She acted as a teacher participant whose role was to observe and record the effects of the pronunciation training in the speeches of the students

As classroom practitioners who teach pronunciation, the authors are well aware of the many pronunciation products available for developing L2 learners' speech; nevertheless, no matter how beneficial these tools may be to a general audience, our experience has proven that many are very costly, require updates, or simply do not provide the flexibility needed to address the specific needs of our students. Therefore, we searched for techniques and audiovisual tools that were user-friendly and required no extra cost to implement. Although a computer lab is an ideal place to implement these techniques, we sought programs and audiovisual tools that could be downloaded free from the Internet so that any classroom ESL teacher could implement the techniques as presented here or adjust them to their own classroom environments. As part of our Intensive English Program, we focused on preparing students for college level presentations in an IEP presentation skills class, a setting that proved to be an ideal environment for investigating the use of prosody.

In order to present academic speeches, one must be able to use stress, rhythm, and intonation appropriately to relay a message. Pickering (2004) refers to this as *intonational paragraphing.* Just as punctuation is used in writing to mark sentence structure, pauses, pitch changes, prominence, and rhythm have a similar effect in speech. Each language uses these features in different ways; thus, if an L2 speaker wants to relay a message clearly, English prosody must be taken into consideration for comprehensibility to be established (Hincks & Edlund, 2009). To accomplish this, the research presented focused on the use of a noticing-reformulation technique and audiovisual feedback (Liu, 2017).

Teaching Techniques and Tools

The *noticing-reformulation technique* was developed by two teacher practitioners as a means of assessing students' English pronunciation (Smith & Beckman, 2005). Although Smith and Beckman (2005) focused on phonemic development in their action research study, we decided to modify this technique and use it as a teaching tool to develop English prosody. The basic premise of this technique comes from Schmidt's (1992) noticing hypothesis in which he "proposed that the subjective experience of 'noticing' is the necessary and sufficient

condition for the conversion of input to intake" (p. 209). Applying this concept to our research required raising the students' awareness to English prosody by explaining, modeling, and then practicing the prosodic features of stress, rhythm, and intonation. Students would then listen to a model of the targeted aspect and reformulate it in their speech with the purpose of adjusting their own prosody as closely as possible to the model.

To further enhance the intake of the prosodic features, we also made use of audiovisual feedback. Recent research has shown that a visual representation of pitch movement and stress can have a positive result in L2 intake of intonation patterns, particularly since intonation patterns can be difficult to hear (Hincks & Edlund, 2009; Lane, 2010). We found two applications that captured what we were after and that were free and user-friendly.

Audacity (Audacity, 2016) has been increasingly used by ESL instructors for audiovisual feedback (for examples of output, see Appendix A). The advantage of this software is that one can make use of dual recordings. This allows the instructor to prepare model sound recordings that can be distributed to all students. In addition, it allows each student to then make their own recordings which displays directly beneath the model for comparison. Not only can one hear the two samples together or separately, one can also see wave patterns that provide the opportunity for analysis to determine specific changes needed in one's speech.

Although *Audacity* works very well when training students to recognize and mimic English stress and rhythm, the one drawback is that it does not clearly display pitch, which is necessary for understanding intonation patterns. Thus, the other application we made use of was *WASP* (Huckvale, 2013). This particular software was developed by the University College London and owned by Mark Huckvale (for example output, see Appendix A). The product not only displays wave patterns, but also provides pitch analysis. As mentioned earlier, pitch is a complicated feature that can be difficult for L2 learners to hear. Providing a visual representation of pitch allows additional senses to be involved in the analysis. Unlike *Audacity*, *WASP* does not provide dual recordings; on the other hand, two windows can be opened simultaneously so that model and student recordings can be compared.

Research Methodology

The researchers used a mixed methods approach that followed a pretest–treatment–posttest design (see Appendix B). The intervention group consisted of seven international student participants from an IEP presentation skills class. For the pretest, the students give impromptu speeches, which were recorded. After the pretest, the participants were taught and trained over 12 weeks to recognize English stress, rhythm, and intonation as a form of treatment to improve shortcomings in speech and comprehensibility. Each prosodic feature was presented and dealt with separately but built upon one another. The lab instructor would give an explanation of how the feature functions in English, using examples and comparisons to the languages spoken by the participants. Then the participants were given an opportunity to practice noticing and reformulating their own speech to match a model using the audiovisual technology. These samples were submitted to the lab instructor for review. Upon completion of the 12-week training, the participants again presented impromptu speeches. To further check for validity, these samples were randomly added to the pretest recordings for the study.

At the end of the semester, two non-expert raters, who were trained to give a blind analysis of each recording, reviewed these recordings and rated each prosodic feature on a prepared Likert scale. The purpose for choosing non-expert raters was to determine if individuals who have little experience with L2 speakers could still find the message comprehensible. This was an important consideration given the fact that IEP students transition into university programs in which the likelihood of being in classrooms with mostly native English speakers is high. Furthermore, to check the validity of the results, a third set of recordings was added to the data pool. These comparison recordings consisted of archived data from seven former participants who gave impromptu speeches in the same class during an earlier semester. To clarify how the blind analysis worked, the raters did not know the identity of the speakers whose speeches they were rating, nor did they know which speeches were from the pretest, posttest, or comparison group.

To further check the validity of the results, a method of triangulation was used. First, additional data was collected from the classroom teacher who did not address pronunciation in her instruction. Unlike the lab, only presentation techniques were taught in this classroom. Attention to prosody was only paid within the lab treatment

to confirm whether the techniques and tools used were making a difference in the comprehensibility of the speeches that the classroom teacher assessed. Students presented speeches approximately every 2-3 weeks in the class. During this time, the instructor rated the students on the various aspects of prosody, recording them on a Likert scale, and adding comments as needed. In addition, at the end of the lab treatment, the student participants were given an 18–question survey in which they responded to their reactions to the lab treatment (see Appendix C). Students were further able to express their thoughts about the lab work by verbally discussing particular aspects of the training in a focus group (see Appendix D). These responses were recorded and analyzed with the survey.

Field Research Results

A careful assessment of the rating results of the two raters showed that they were consistent in their overall assessment of the recordings. In regards to each of the prosodic features, student rankings given by the raters showed an increase in the mean scores of the posttest ratings. In other words, both raters noted some improvement in one or more of the prosodic features, but most notably with regard to intonation (Liu, 2017). These results, although small, were encouraging since the main focus of the study was to impact intonational paragraphing in the students' presentations.

In terms of the participants' perceptions regarding how much the treatment helped to make a noticeable difference in their own prosodic patterns, the questionnaire revealed that they felt the training on rhythm had the greatest impact on their speech. This perception was reiterated in the focus group discussion. Participants indicated that the understanding of thought groups (Liu, 2017), which involves slight pausing between phrases and chunking of speech, greatly helped them to notice and adjust their own speech patterns, particularly when giving presentations. They were able to break up, or "chunk", phrases in sentences to help regulate the speed of their sentences and how they wanted to say them (Liu, 2017). This awareness of chunking thought groups may have affected the results that the raters noted in the participants' intonation patterns for the posttest. According to Celce-Murcia et al (2010), each thought group carries its own intonation pattern. By giving attention to when and how to break up sentences, the participants appeared to be inadvertently adjusting their own pitch patterns for each thought group.

The data collected from the classroom teacher's observations of the student participants' speech appeared to confirm the effect on intonation by raising awareness to thought groups before and after the intervention. Her post treatment results were similar to that of the raters, indicating that there was an observed improvement by the teacher regarding the intonation patterns of the students' speech. The teacher practitioner also noted that students were making a conscious effort to adjust their speech according to thought groups in order to present a more natural speech in English, thus unconsciously improving their intonation. As noted by Liu (2017), "thought groups affect rhythm in that a rhythm is created when words are chunked together with slight pausing between them. Additionally, each thought group carries its own pitch pattern and stress" (p. 126). Consequently, the speech of the students was clearer, allowing for greater comprehension of their presentations. Thus, the evidence from this pilot study seems to indicate that the use of noticing-reformulation techniques, along with audiovisual feedback, can have a positive effect on improving comprehensibility in overall L2 speech.

Application Beyond the Study

After the completion of the research study, the classroom teacher continued to make use of the lab techniques, by adding 1 ½ hours/week of focused attention on prosody using laptops within the classroom setting. In fact, the same pattern of teaching strategies, scope, and sequence were used over the course of five 16-week semesters in a Preparation for Academic Presentation Skills class in an Intensive English Program as well as during three 8-week summer sessions. The lesson plans developed in the original field research project were slightly modified to suit each group of students. Modifications were typically made for the purpose of targeting a specific aspect of speech in which students were more or less confident in one skill over another. Students in these classes were from China, India, France, Kenya, Chile, South Korea, Japan, and Columbia, and their age range was roughly 18-35 years. The course

itself had three class periods a week, with one day dedicated to a pronunciation lab session. The course was designed to have this weekly 120-minute class session on pronunciation without homework, because pronunciation was not the main purpose of the course. Students spent the majority of their time on assignments associated with delivering presentations in class. As part of those preparations, they were required to record an audio of their speech, listen to the recording, and send a self-evaluation report on how they did and what needed to be improved before delivering the presentation in class.

Within the pronunciation lab class period, the teacher would first deliver a lesson reviewing a pronunciation point—such as word stress—and then involve the whole class in marking symbols on handouts and/or repeating phrases to practice the purpose of the lesson together. Typically, the first half of the lesson was used for teaching and interacting with the material or classmates, while the second half of the class time was designated for students to work independently. During this time of working independently, they listened to an audio that provided the model speech of a planned activity and made marks on a corresponding worksheet with the words they were listening to. After they were confident in their marks, they practiced speaking by using the handout on which they had made pronunciation marks.

Once they were comfortable with their practice, they used the software designated for recording the activity, whether it was *Audacity* or *WASP*. It is important to note that the software was a needed aid, especially for students who could not audibly hear their own mistakes, particularly in stress and intonation. They used the software to visually see when their recording did not match the model speech, despite feeling they were matching the same sound. Many times, this resulted in a teaching moment that confirmed the authors' initial purpose of choosing these programs, which was *customization*. Having the opportunity to customize the lesson to suit the learners' needs allowed for a specific speech sound to be addressed immediately. Students who noticed their own mistakes could make corrections and record again until they were confident in their own pronunciation or pronunciation skill. The teacher can assist in any part of the process by checking the learners' work, whether by reviewing the pronunciation marks on the handout or by listening to the recorded speech.

The Action Research Results

The students' motivation tended to vary throughout the semester. Because it was not always clear during the lesson if students were benefitting from the approach, they were given a survey at the end of each semester to check their perspective. This was the same questionnaire given during the research process (see Appendix C). The responses from each group of students were positive, with the exception of a few highlighting that they were unable to choose the best version of their speech after recording their own speaking. However, the lesson on thought groups was consistently marked as a pronunciation strategy that students felt helped them gain a deeper understanding of how to produce clearly spoken presentations. This result was also noted in the initial survey responses from the original class of research participants, and the same sentiment was continually expressed in subsequent class surveys. In fact, the appreciation of thought groups was communicated both as feedback on the surveys and during the semester. Improvement was evident in classroom participation, and students continued to remark on the positive impact of thought groups in helping them produce speech that was more evenly paced. Once this lesson within the sequence was taught, the motivation to use this method for speaking was given greater focus when students planned their presentations. The improvement was also evident within the delivery of the presentations in class.

Why Continue Using This Approach?

Even though the initial intention to use this method was for research purposes during one semester, the classroom teacher, as well as the students, saw these lessons as a much-needed practice for improving student speaking skills. It was clear that this approach was a creative solution to a unique problem. Students wanted to be understood by native speakers in their daily life and future classes in their traditional university programs. This resulted in a desire to continue focusing on pronunciation development.Thus, the pronunciation lab utilized in the

research study continued to be included as lessons within the regular class schedule of the Preparation for Academic Presentations Skills class.

Although students cycled through various levels of motivation throughout the semester, their survey responses at the end of the semester were consistently positive. Those who recognized they were learning an invaluable skill came to the pronunciation lab eager to ask questions and ask for assistance. One notable student who had been living in the US for nearly 12 years said this was helping him communicate better with coworkers. Although he had been in an English-speaking environment, he did not have the opportunity to focus on these types of speaking skills, despite being highly qualified in his career. These responses give more credibility to the use of technology programs for university students and other adult programs where strategies of noticing and improving prosody has been a need. Based on feedback like this and the positive outcomes from the initial research, it is clear that the application of cost-effective audiovisual software coupled with raising awareness to prosodic features creates greater comprehensible L2 speech. We encourage ESL educators of other programs to explore the use of these technologies and attempt a similar approach as an add-on to their programs. We can honestly say that the increased confidence that our international students expressed and exhibited was well worth the effort.

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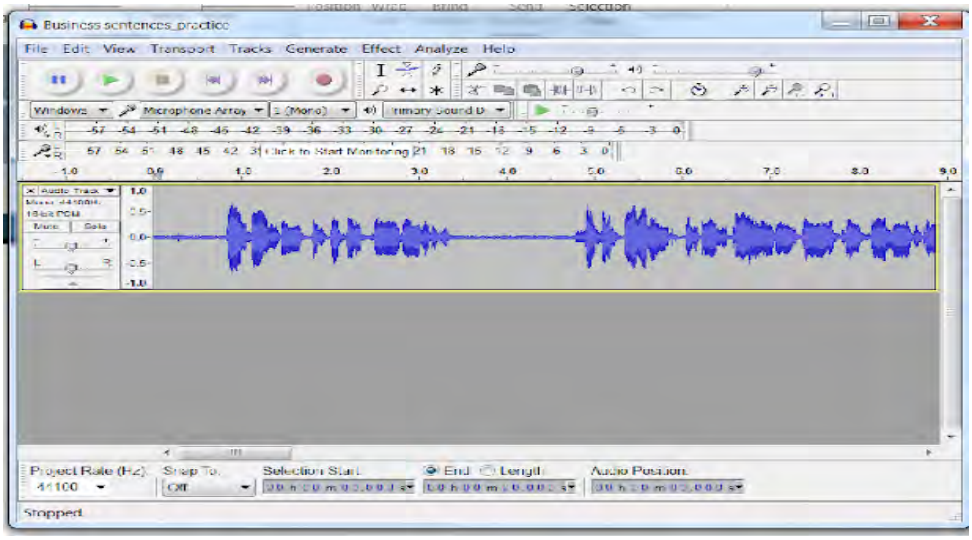
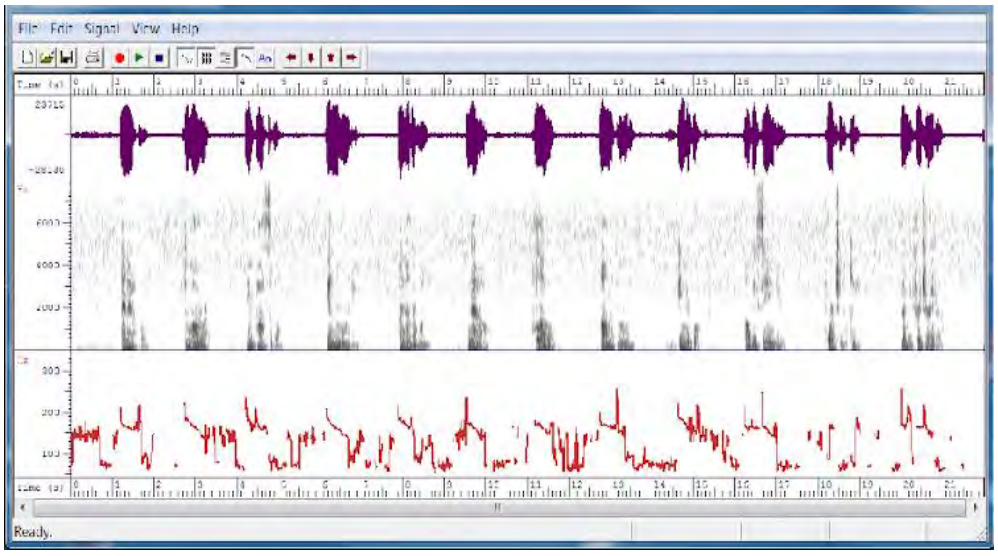
Appendix A

Snapshot of waveform from sentence samples recorded on *Audacity*.



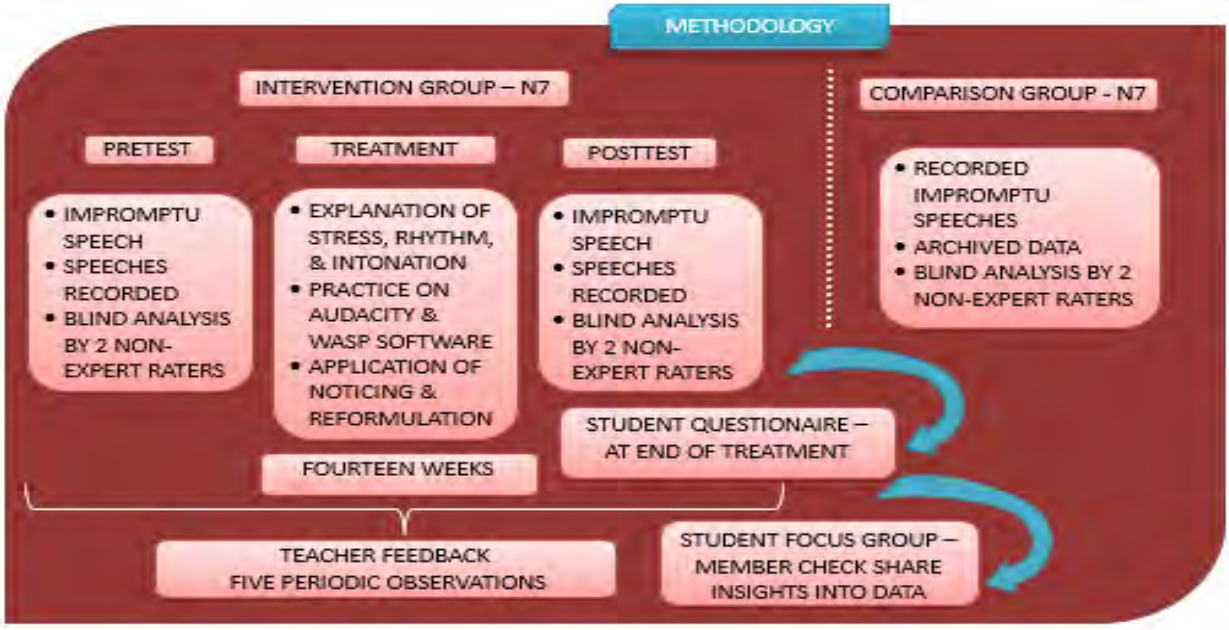
Note: Audacity(R) software is copyright (c) 1999-2014 Audacity Team. [Web site: http://audacity.sourceforge.net/. It is free software distributed under the terms of the GNU General Public License.] The name Audacity(R) is a registered trademark

Snapshot of waveform, spectrogram, and pitch contours recorded in *WASP*.



Note: WASP is not public domain software, its intellectual property is owned by Mark Huckvale, University College London. However, WASP may be used and copied without charge as long as the program and help file remain unmodified and continue to carry this copyright notice.

Appendix B
Design of the Research Project



Appendix C
Speech Lab Training Questionnaire

The following statements refer to the Speech Lab Training that you took. Please indicate your level of agreement with each statement by placing a check mark in the appropriate box.

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1.	The background information on stress patterns helped me to understand the concept.	☐	☐	☐	☐	☐
2.	The practice exercises and examples on stress helped me to understand how stress works in English.	☐	☐	☐	☐	☐
3.	The background information on rhythm patterns helped me to understand the concept.	☐	☐	☐	☐	☐
4.	The practice exercises and examples on rhythm helped me to understand how rhythm works in English.	☐	☐	☐	☐	☐
5.	The background information on intonation patterns helped me to understand the concept.	☐	☐	☐	☐	☐
6.	The practice exercises and examples on intonation helped me to understand how intonation works in English.	☐	☐	☐	☐	☐
7.	Seeing the waveform of the model's speech and my own gave me a better understanding of how prosodic patterns work.	☐	☐	☐	☐	☐
8.	Seeing the pitch of the model's speech and my own gave me a better understanding of how prosodic patterns work.	☐	☐	☐	☐	☐

	Agree	Agree	Neutral	Disagree	Disagree
9. Listening to the model's utterances helped me to improve my pronunciation.	☐	☐	☐	☐	☐
10. Repeating the model's utterances helped me to improve my pronunciation.	☐	☐	☐	☐	☐
11. Shadowing the model's utterances helped me to improve my pronunciation.	☐	☐	☐	☐	☐
12. Comparing my recording to the model's utterances helped me to improve my pronunciation.	☐	☐	☐	☐	☐
13. Analyzing my own speech helped me to recognize the prosodic patterns.	☐	☐	☐	☐	☐
14. I was able to notice the gap between my version and the model's when analyzing the utterances of both.	☐	☐	☐	☐	☐
15. Listening to my version and comparing it to the model's helped me to improve my pronunciation.	☐	☐	☐	☐	☐
16. Choosing my best version of the reading required me to listen carefully to my own prosodic patterns.	☐	☐	☐	☐	☐
17. I feel that my English pronunciation has improved because of my participation in this project.	☐	☐	☐	☐	☐
18. I feel that my presentation skills have improved because of my participation in this project.	☐	☐	☐	☐	☐

Appendix D
Focus Group Questions

1. How familiar were you with the concepts of stress, rhythm, & intonation before you participated in the lab?
    - What kind of training have you had in pronunciation?

2. What did you feel was most helpful about the training? Why?
    - Lab sessions involved: explanation of concepts, practice, listening/recording

3. What aspects of the training did you find frustrating or not as beneficial?
    - Was there anything, in particular, that you feel could have been done differently to help you more?

4. Can you give examples of finding yourself paying more attention to how you speak in English?
    - In what ways have you become more aware of the way Americans speak?

5. In terms of pronunciation, how do you feel you have improved in your classroom presentations?
    - In which aspect of pronunciation, do you feel you have improved the most—stress, rhythm, or intonation?