

McGregor, A., Zielinski, B., Meyers, C. & Reed, M. (2016). An exploration of teaching intonation using a TED Talk. In J. Levis, H. Le., I. Lucic, E. Simpson, & S. Vo (Eds). *Proceedings of the 7th Pronunciation in Second Language Learning and Teaching Conference*, ISSN 2380-9566, Dallas, TX, October 2015 (pp. 143-159). Ames, IA: Iowa State University.

## **AN EXPLORATION OF TEACHING INTONATION USING A TED TALK**

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With the intent of researching the phenomenon of American English intonation to inform classroom practices, this study investigated the intonation of a TED Talk in a multi-layered approach – interpretatively, perceptually and acoustically (Vaissière, 2005). To identify the features produced in the monologic speech sample of a speaker of North American English, the analysis included 1) interpretative judgments of the speaker’s syntactic and information structure and attitude; 2) perceptual judgments of thought groups, key, prominence, salience and tone choice and 3) acoustic analysis of pauses and features identified in the perceptual analysis. PRAAT was used for the acoustic analysis of pauses, pitch range, and prominence (Levis & Pickering, 2004). Triangulated results show an integrated view of language and intonation highlighting relationships between component aspects of intonation and among the interpretative, perceptual, and acoustic layers. Findings support the contextualized teaching of intonation as well as pedagogical use of rich TED Talk speech samples. Findings also indicate a pedagogical shift from teaching functions of intonation in isolation toward an integrative approach, which embraces the overlapping layers that create meaning-making.

## **INTRODUCTION**

Over a decade ago, Levis (1999) argued that the treatment of intonation in textbooks had remained the same for 30-50 years due to materials being based on an inadequate view of intonation and a focus on decontextualized sentence-level practice. A lack of connection between intonation research, teaching, and textbook inclusion may have stemmed in part from the historically different views by British and American scholars in terms of the definition, assumptions, terminology, purpose (describe versus prescribe), methods and approaches (Levis, 2005). Despite contemporary advances in the field, however, Reed and Michaud (2015) still observe some 15 years later that, “intonation remains a challenge for teachers and students alike” (p. 454). Paunović and Savić (2008) argue that “teachers do not seem to be theoretically or practically well - equipped to explain and illustrate its significance” (pp. 72-73) and it stands to reason that teacher cognition (Baker & Murphy, 2011), a teacher’s belief and knowledge about intonation teaching and learning, will directly impact classroom practices revolving around intonation. Teacher training textbooks also undoubtedly influence the conundrum. One of the most popular teacher training books *Teaching Pronunciation* (Celce-Murcia, Brinton, and

Goodwin, 2010), for example, is rich in information yet represents intonation to teachers as a descriptive list of mechanical parts and functions.

Consequently, two significant gaps exist in (i) combining different approaches to the research on intonation (namely, interpretative, perceptual, and acoustic approaches) and (ii) applied research to inform classroom practices in the teaching and learning of intonation in a practical way. To fill these gaps, this study employed a multi-layered integrative approach to the analysis and description of discourse-level intonation to inform classroom practice.

This study focused on intonation because it contributes significantly to a speaker's communicative effectiveness; that is, the extent to which s/he engages with the audience in a range of speaking contexts (Hincks, 2005; Hincks & Edlund, 2009; Pickering, 2001, 2004; Slater, Levis & Muller Levis, 2015). Like Levis and Wichmann (2015), we define intonation as “the use of pitch variations in the voice to communicate phrasing and discourse meaning in varied linguistic environments” (p. 137). We focused on TED Talks because they provide readily available models of effective speakers and serve as a rich, authentic, and contextualized resource for ESL classrooms. Furthermore, publishers are now utilizing TED Talks and incorporating them into their English language teaching materials (e.g., World English series published by National Geographic Learning and Cengage Learning; see for example, Chase, Milner, & Johannsen, 2015). However, as yet there has been no systematic integration of pronunciation related to TED Talks into these texts. It is therefore difficult for teachers to capitalize on the potential teaching resource that TED Talks and other online materials offer in regard to the teaching of intonation.

The aim of the study was to use a 3-layered framework (interpretative, perceptual, acoustic levels of analysis) proposed by Vaissière (2005) to analyze the intonation of a TED Talk by a native North American, Matt Cutts (Cutts, 2011). The following research questions were addressed.

1. How does an interpretative, perceptual, and acoustic analysis of Matt Cutts' intonation elucidate the perceived impact of his TED Talk?
2. How do the results of an interpretative, perceptual, and acoustic analysis of intonation inform teaching practices?

## **METHODS**

### **Segmentation and Trial Analysis**

We chose the TED Talk by Matt Cutts (Cutts, 2011) because we felt it provided a good example of an inspiring, persuasive talk delivered by a native North American speaker. For the analysis, we used the online transcript of the talk provided by TED with paragraphs and grammatical marks (periods and commas) removed, and used verbal pauses to identify and mark utterances (/) and thought groups (/). Pitch range (key) and topic changes were also used as indicators of the speech paragraphs. This generated a working script for the interpretative and perceptual analysis (see Appendix A for marked-up transcript).

For calibration and reliability purposes, we performed a trial analysis and moderation on the first speech paragraph of the TED Talk (Cutts, 2011, 0:12 - 0:42). This trial employed the 3-layered framework proposed by Vaissière (2005), and was conducted by three researchers (two American and one Australian) performing independent interpretative and then perceptual analyses, followed by collation and moderation. The final step of the trial analysis was an acoustic analysis using the software program PRAAT.

### Coding and Analysis

We analyzed the second speech paragraph of the TED Talk (Cutts, 2011, 0:43 - 1:27) at the interpretative, perceptual, and then acoustic levels. Elements of each level of analysis are presented in Tables 1, 2, and 3 respectively.

Table 1

#### *Interpretative Analysis Components*

<b>Functions of intonation</b>	<b>Elements</b>
1. Syntactic structure <sup>a</sup>	Speech paragraph Utterance Thought group
2. Mode	A: Assertion/statement/claim O: Order/directive Q: Question
3. Information structure	N/G: New/given Toward content (e.g., reflective, disclosing, ironic,)
4. Perceived attitude	Toward audience (e.g., earnest, ironic, convincing)

<sup>a</sup>. Vaissière proposed the syntactic structure function of intonation to be “the segmentation of continuous speech into syntactic units of different size” (p. 237). Accordingly, we identified three levels of analysis: the speech paragraph, utterance, and thought group

As shown in Table 1, the interpretative analysis of the second speech paragraph included, in the order indicated, syntactic structure (speech paragraph, utterance, thought group), mode (assertion, order, or question), information structure (new/given), and perceived attitude (toward content, toward audience).

The goal of the perceptual analysis was to identify the “local intonational phenomena” (Vaissière, 2005, p. 254). As shown in Table 2, these included the identification of key, pauses, and prominent and salient syllables.

Table 2

*Perceptual Analysis Components*

<b>Intonational phenomenon</b>	<b>Elements</b>
Key	High pitch to signifying new speech paragraph
Prominence (pitch, duration, intensity)	Syllable carrying focus/primary stress/nuclear accent
Salience (pitch, duration, intensity)	Somewhat prominent syllables or syllables carrying word-level stress
Tone choice	Falls, rises, level

Prominent syllables were identified as the most prominent syllable in a thought group, while salient syllables were perceived as less prominent. Chun (2002), quoting Cruttenden (1997), states that, “It is generally agreed that the three features of pitch, length, and loudness form a scale of importance in bringing syllables into prominence, with pitch being the most significant, duration next, and loudness the least important factor (cf. Cruttenden, p. 13).” Prominence was coded with bold capitalization (**FEW**) and salient syllables were underlined (e.g. learned) (see Table 3). Because of the importance of tone choice, “the prominent syllable on which the maximum, sustained pitch movement is identified” (Pickering, 2010) in discourse intonation (Cauldwell, 2015; Wells, 2006), this feature was also coded.

The acoustic analysis included measurement of pauses (Brown & Yule, 1983) and prominence (Boersma & Weenink, 2015; Chun, 2002; Cruttenden, 1997). According to Chun (2002), *pitch*, *length*, and *loudness* termed frequency, duration, and intensity, respectively are the physical properties of prominence. We measured prominence in terms of F0, duration and intensity of both prominent and salient syllables. Based on Figueroa (personal communication) and information obtained from the PRAAT manual, the acoustic measures were done using the dynamic menu, rather than editor window, to ensure greater reproducibility (Boersma & Weenink, 2015).

After completion of the separate analyses, a master spreadsheet was created to facilitate triangulated and cross-layer evaluation. There was considerable agreement amongst the researchers in most aspects of the interpretative and perceptual analyses. At the interpretative

level, at least two of the three researchers agreed on at least 96% of utterance and thought groups, mode, and informational structure judgments. Although the researchers used a range of different adjectives for the speaker's perceived attitude, there was always some agreement for both the attitude toward the content and toward the audience. At the perceptual level, at least two of the three researchers agreed on 100% of pause placement and prominence judgments. However, tone choice was eventually dropped from the analysis due to different interpretations and use of the coding scheme.

## **RESULTS**

Speech paragraph 2 comprises seven utterances and 24 thought groups. These were analyzed to answer how Cutts' intonation contributed to the perceived impact of his TED Talk (RQ 1) and how these results inform the teaching of intonation (RQ 2).

### **Research Question 1: How does an interpretative, perceptual, and acoustic analysis of Matt Cutts' intonation elucidate the perceived impact of his TED Talk?**

#### **Interpretative and Perceptual Analysis**

Table 3 presents the interpretative and perceptual analysis of all seven utterances. The perceptual analysis included key as well as prominent and salient syllables. Interpretative analysis includes thought groups (/), new/given information and perceived attitude of speaker toward the content and audience. Since all seven sentences were coded as assertions, mode is not listed.

#### **Acoustic Analysis Results**

The acoustic analysis added measurement of pauses, pitch range, prominent and salient syllables, as well as overall F0 and overall pitch contour. In the entire speech, mean pauses for utterances were 1.52 seconds while mean pauses for thought groups were .31 seconds demonstrating a general ratio of 1:5 (Table 4) between utterances and thought group pauses. These results show an expected role of pauses in parsing speech but more importantly a direct connection to the syntactic structure segmentation created through utterances and thought groups produced with consistent ratio within the parsing.

Table 3

*Interpretative and Perceptual Analysis Results Summary for Speech Paragraph 2*

#	Utterance/perceptual analysis	Interpretative analysis			
		New information	Given information	Perceived attitude toward content	Perceived attitude toward audience
1	//There's a <b>FEW</b> things I <u>learned</u> while doing these <u>thirty day challenges</u> //	few	while doing these thirty day challenges	reflective disclosing	sincere, relating
2	//The <b>FIRST</b> <u>was</u> /instead of the <u>months flying by</u> for <b>GOT</b> ten/the <u>time</u> was <b>MUCH/MORE/MEM</b> orable//	first, flying much, more, memorable		passionate	heartfelt
3	// <b>THIS</b> was part of a <u>challenge</u> I did to take a <u>picture</u> /every <u>day</u> for a <b>MONTH</b> /and I remember <b>eX</b> actly/ <b>WHERE</b> I <u>was</u> /and <u>what</u> I was <b>DO</b> ing that <u>day</u> //	take picture everyday exactly, where, what	part of a challenge for a month	factual	convincing
4	//I <b>AL</b> so <u>noticed</u> /that as I <u>started</u> to do <b>MORE</b> and <b>HAR</b> der thirty day <u>challenges</u> /my self- <b>CON</b> fidence <u>grew</u> //	also noticed more and harder self confidence	thirty day challenges	proud	honest and heartfelt
5	//I went from <b>DESK</b> dwelling computer nerd to/the <u>kind</u> of guy who <b>BIKES</b> to <u>work</u> /for <b>FUN</b> //	desk, computer kind of guy, bikes, fun		surprise, ironic	ironic
6	// <b>EV</b> en last <u>year</u> /I ended up hiking up <u>Mount KilimanJARo</u> /the <b>HIGH</b> est <u>mountain</u> in <u>Africa</u> //	last year, Mount Kilimanjaro, highest		proud	inspiring
7	I would <b>NEV</b> er/have <b>BEEN</b> /that <b>adVEN</b> turous/be <b>FOR</b> E I <u>started</u> my <u>thirty day challenges</u> //	never, been adventurous	thirty day challenges	proud, disclosing	honest, inspiring, doable

*Note.* Results reported indicate agreement of at least two of the three researchers. Thought group boundaries (/); prominent syllables (**BOLD**); salient syllables (underline).

Table 4

*Pause Results of Utterances and Thought Groups in the Entire Talk*

	<b>Sentence finals (seconds)</b>	<b>Thought groups (seconds)</b>
Mean	1.52	0.31
Range	.78-1.90	.1-.80
Standard Deviation	0.41	0.20

In terms of pitch range, speech paragraph 2 was strongly representative of the entire talk (Table 5). The entire speech had a maximum pitch range of 489.1 Hz and minimum of 75.3 Hz with a 413.8 Hz spread. Consistency of pitch range seems indicative of its relevance for creating speech paragraphs and providing a clear structure for the audience to follow not only at the paragraph level but also across utterance and thought group levels, thus contributing to engaging discourse.

Table 5

*Pitch Range Results by Level of Analysis*

	<b>Maximum (Hz)</b>	<b>Minimum (Hz)</b>	<b>Spread (Hz)</b>
Entire Speech	489.13	75.3	413.8
Speech Paragraph (SP) 2	489.0	75.8	413.2
Utterances in SP2	491.1	78.5	412.6
Thought Groups in SP2	487.9	75.8	412.1

The results for pitch, duration, and intensity for prominent words and salient words (Table 6) indicated that F0 was the most differentiating indicator of these syllables. The mean pitch of prominent words was 200.44 Hz versus 144.46Hz for salient words, while duration and intensity varied little between the two categories.

Table 6

*Prominent and Salient Syllable Measures*

	Prominent syllables			Salient syllables		
	Pitch (Hz)	Duration (s)	Intensity (dB)	Pitch (Hz)	Duration (s)	Intensity (dB)
Mean	200.44	.12	69.24	144.56	.12	65.81
SD	46.43	.05	1.00	31.74	.04	4.49
Max	309.20	.24	71.40	236.20	.24	68.70
Min	140.50	.04	67.60	92.40	.05	49.10

**Integrated Results for Utterance 1**

Cutts starts speech paragraph 2 with a graphic organizer: “There’s a few things I’ve learned while doing these 30 day challenges.” Several things were immediately apparent from the interpretative analysis. The sentence is clearly an assertion/statement with FEW as new information and “while doing these thirty day challenges” as given information. The perceptual analysis of this utterance, shown in Table 3 above, ties to the interpretative structure through FEW being identified as prominent and the given information not being highlighted as prominently. The acoustic results revealed that F0 made the biggest difference between prominent and salient syllables with little variation in duration and intensity. As an example, the pattern for utterance 1 can be seen in Table 7.



Table 7

*Measurements of Stress Variables in Prominent & Salient Words for Utterance 1*

Words	Mean pitch (Hz)	Duration (s)	Intensity (dB)
<b>FEW</b>	278.00	0.04	70.80
<b>learned</b>	154.60	0.15	68.40
<b>thir</b>	137.60	0.10	67.80
<b>chal</b>	117.80	0.11	67.00

The results in Table 7 illustrate the marked difference in mean pitch between the word identified perceptually as most prominent (**FEW**) as compared to the words identified as salient in this utterance. In addition, the decreasing pitch over the course of the utterance is apparent in both the numbers and the PRAAT printout showing F0. Figure 1 shows the pitch contour with clear declination in this opening sentence, which was perceived as reflective and disclosing in Cutts’ attitude toward the content as well as sincere and relating toward his audience.

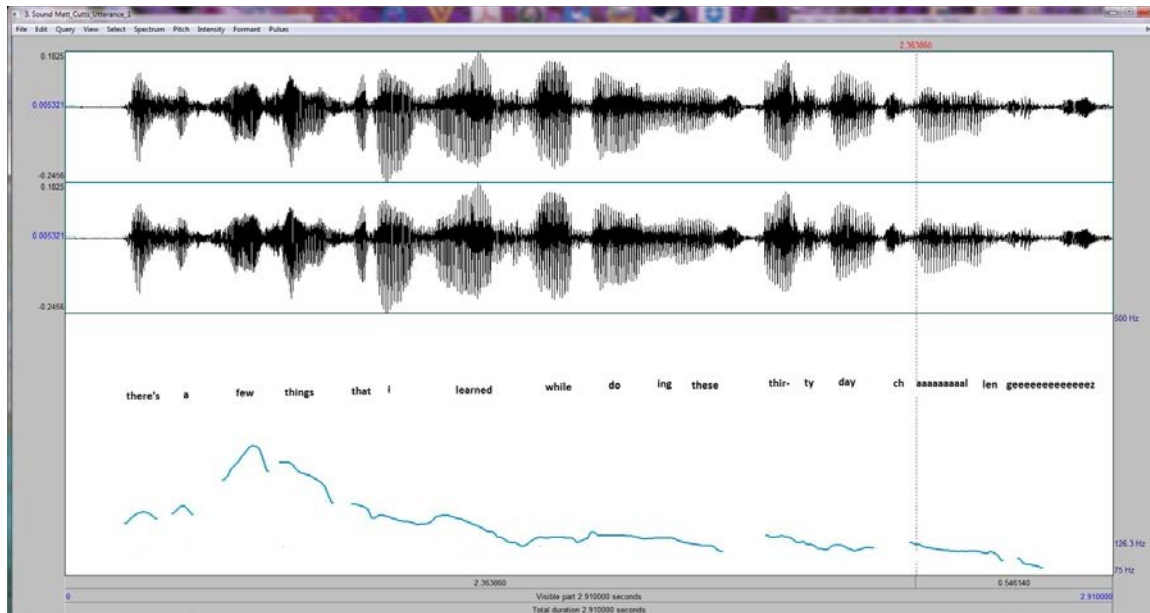


Figure 1. Acoustic analysis: speech paragraph 2-utterance 1

**Research Question 2: How do the results of an interpretative, perceptual, and acoustic analysis of intonation inform teaching practice?**

Three key pedagogical implications emerged. A sample syllabus based on these implications for teaching intonation using a TED Talk is included in Appendix B.

**1) Start with meaning-making**

TED Talks serve as authentic resources for more advanced level learners, and are examples of engaging monologic speech (Scotto di Carlo, 2014). Based on the layered approach to researching intonation of a TED Talk, we could apply this approach to enhance instructional effectiveness of using TED Talks for intonation training. Teachers could first focus students' attention on the engaging meaning-making; that is, the intended communicative outcome created by the speaker. Simply asking students what impression they get from a TED speaker begins the process of focusing students on the overall impression created. Following this with "how does the speaker do this so effectively?" forges language awareness (Borg, 1994) of both the discourse and the intonation features, and opens the door to the overlapping nature of these components. The paradigm shift for instructors might be from thinking of teaching intonation to thinking about teaching communicative effectiveness.

**2) Use a layered approach**

Instead of diving directly into the functions or parts of intonation, students can be guided in a type of noticing exercise (Schmidt, 1990) on overall organization, speech paragraphs, grammatical structures, formulaic language, and new versus given information, for example. Highlighting these aspects links meaning-making to the structures; this prepares students for connecting the next layer of intonation cues, which need to overlap simultaneously in oral production. After review of the language, teachers can scaffold working systematically through the role of intonation to parse and highlight (Sardegna & McGregor, 2013). Finally, students can use acoustic feedback from PRAAT to identify strengths and weaknesses in their executed intonation features or in comparison to a model.

**3) Highlight the integrated systems**

In addition to meaning-making and a layered approach, the arrows in Figure 2 show an interplay within the systems and also between their elements. Pauses create thought groups with prominent and salient syllables building pitch contours.

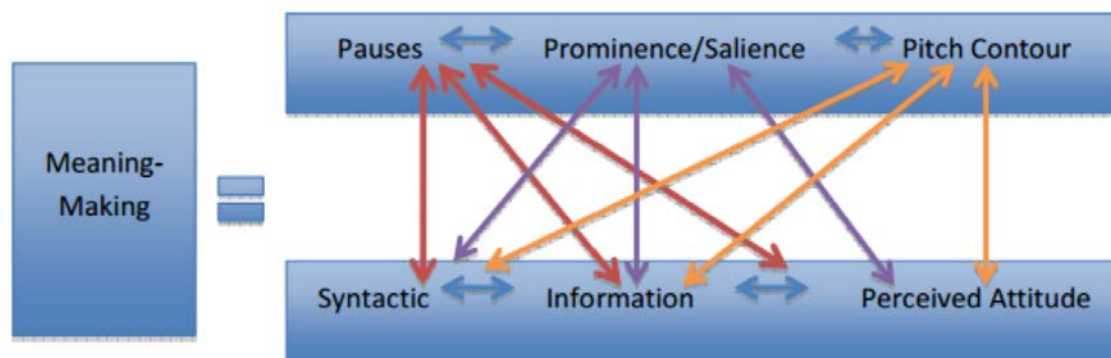


Figure 2. Integrated model of intonation

As shown in Table 4, utterance 1 represents a classic example in which the syntactic unit of a sentence overlaps the new/given information matching the peak of pitch contour on “few,” the most prominent syllable. In contrast, we found atypical thought groups in utterance 2 in which pauses create one word thought groups with prominence for special emphasis.

Utterance 2: //The **FIRST** was/ instead of the months flying by for**GOT**ten/the time was **MUCH/MORE/MEM**orable//

Clearly, thought group production impacts prominence, which if inaccurately placed or produced will automatically change the overall pitch contour not to mention misalign with the syntactic and information structure and consequently impact the intended communicative effectiveness.

With the same foundational parts (thought groups, prominence, salience, tone choice, pitch range, pitch contours) of intonation, Cutts’ perceived attitude changed from utterance 1 being reflective and sincere to utterance 2 showing his passionate and heartfelt attitude. The heartfelt, passionate, convincing attitude comes across by the dramatically short chunking, prominence on “for**GOT**ten” and contrast in the pitch, duration, and intensity at the end of the utterance. In order to achieve an advanced level of communication, students need skills to not only create syntactic units accurately, but also to use prominence accurately to produce thought groups that differentiate given from new information. Fluency development often poses a barrier with unintentional pauses not at syntactic units, which might cause breakdowns both at the language and intonation levels. Teachers need to understand the interplay and interactions between these systems to effectively provide instruction, scaffolded practice, and feedback on intonation.

## DISCUSSION

Typically, when intonation is addressed in the classroom, it tends to become a description or list of parts (Meyers, 2014; Sardegna & McGregor, 2013) and teaching materials (see for example, Celce-Murcia et al., 2010), although rich in information, tend to adopt a parts and pieces view

of intonation instruction. The findings here support Levis's claim that intonation training should start with "...the primary goal of communicative proficiency rather than of teaching the mechanics of intonation..." (1999, p. 59). TED Talks are audience-oriented to appeal and engage (Scarlo di Carlo, 2014), and intonation was found in the present study to strongly contribute to how the speaker conveyed his attitude toward both the content and the audience. For these reasons, we recommend starting intonation instruction with meaning-making to go beyond intelligibility to comprehensibility where the learner can first recognize the outcome of communicative acts, be motivated to delve into the layers creating the meaning-making and finally focus on the interrelated features within the systems. An intonation toolbox of parts is insufficient and an integrated approach to learning about intonation embraces all aspects of the language strata (Halliday & Greaves, 2008) from the lexicogrammatical to phonological and phonetic.

This research was based on one sample of monologic speech by one native North American English speaker in a TED Talk forum. Although TED Talks are a rich and easily accessible online resource, certainly the data here are limited in generalizability. In addition to the aforementioned limitation, non-verbal communication was not systematically analyzed due to the limited camera angles of the video recorded material, but is recognized by the researchers as a critical layer for future research to explore. In spite of these limitations, the consideration of the 3-layer analysis and integrated approach to embrace the complexity of intonation is strongly encouraged for future research, teacher training, improved textbook development and classroom instruction. The goal, after all, is to equip students with more than just parts of intonation – it is to prepare them for their own capacity for communicative success and meaning-making.

## **ACKNOWLEDGMENTS**

We would like to express our sincere appreciation to Dr. Ettien Koffi for his valuable comments on the roles that duration, F0/pitch and intensity play in sentence intonation analyses. We would also like to thank Mauricio Figueroa for his help with the PRAAT analysis. His recommendation to use the dynamic menu for undertaking the analyses was extremely helpful and timesaving. Finally, thanks to Dr. Elaine Tarone for providing feedback and suggestions for future work.

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## Appendix A

### Transcript with speech paragraphs (///), utterances (/) and thought groups (/) marked

#### Speech paragraph 1

a few years ago/ I felt like I was stuck/ in a rut// so I decided to follow in the footsteps of the great/American/ philosopher/ Morgan Spurlock/ and try something new/ for thirty days// the idea is actually pretty simple// think about something you've always wanted to add to your life/ and try it/ for the next thirty days// it turns out/ thirty days is just about the right amount of time/ to add a new habit/ or / subtract a habit/ like watching the news/ from your life///

#### Speech paragraph 2

there's a few things I learned while doing these thirty day challenges// the first was/ instead of the months flying by forgotten/ the time was much/ more/ memorable// this was part of a challenge I did to take a picture/ every day for a month/ and I remember exactly/ where I was/ and what I was doing that day// I also noticed/ that as I started to do more and harder thirty day challenges/ my self confidence grew// I went from desk dwelling computer nerd to/ the kind of guy who bikes to work/ for fun// even last year/ I ended up hiking up Mount Kilimanjaro/ the highest mountain in Africa// I would never/ have been / that adventurous / before I started my thirty day challenges///

#### Speech paragraph 3

I also figured out/ that/ if you really want something badly enough/ you can do anything/ for thirty days// have you ever wanted to write a novel// every November/ tens of thousands of people/ try to write their own fifty thousand word novel /from scratch/ in thirty days// it turns out/ all you have to do/ is write sixteen hundred and sixty-seven words a day/ for a month// so I did// by the way the secret/ is not to go to sleep/ until you've written your words for the day// you might be sleep deprived/ but/ you'll finish your novel// now/ is my book the next great American novel// no/ I wrote it in a month// it's awful// but/ for the rest of my life/ if I meet John Hodgman at a TED party/ I don't have to say/ I'm a computer scientist// no no/ if I want to I can say/ I'm a novelist///

#### Speech paragraph 4

so here's one last thing I'd like to mention// I learned that when I made small/ sustainable changes/ things I could keep doing/ they were more likely to stick// there's nothing wrong with big crazy challenges / in fact/ they're a ton of fun/ but they're less likely to stick// when I gave up sugar/ for thirty days/ day thirty-one looked like this///

#### Speech paragraph 5

so here's my question to you //what are you waiting for// I guarantee you the next thirty days/ are going to pass/ whether you like it or not// so why not think about something you have always / wanted / to try/ and give it a shot/ for the next thirty days//



## Appendix B

### Four-week Mirroring Project Syllabus

Week	Analysis	Intonation focus	In-class Activity	Homework
1	Context-setting & interpretative analysis	Thought groups & boundary tones	Discussion of topic Connection to what undergraduates expect Mark transcript for thought groups & pausing	Listen, view & mark focus words & body language
2	Perceptual analysis	Prominent and salient words Body language	Compare marking in pairs. View video to compare marking. Work with PRAAT recordings.	“Mirror” video
3	Acoustic analysis (PRAAT)	Tone choice	Work with PRAAT recordings. Record “cold” version	Critique “cold” version
4	Interpretation	ALL	Record “final” version	Complete self-critique form