WHADDYA CALL THAT AGAIN? MATERIALS FOR TEACHING CONNECTED SPEECH

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Part of the cost of learning a new language is a lifelong struggle with comprehension and intelligibility, even at the highest levels of proficiency (Derwing & Munro, 2009; Munro & Derwing, 2015; Fouz-Gonzalez, 2017). From the earliest stages of acquisition, learners are explicitly and implicitly socialized into a kind of half-truth about language: What happens in the classroom does not reflect the reality of daily language use (Brown, 2017, p. 6). The real world is much more unforgiving. High-stakes simultaneous and shifting demands require learners to draw upon an ever-changing range of linguistic and semiotic resources to accomplish their tasks (Blommaert & Rampton, 2011; Li Wei, 2016; Gumperz & Cook-Gumperz, 2013; Goodwin & Heritage, 1990; Goodwin, 2013; Mondada, 2014). Even with all these resources at their disposal, there is no guarantee that learners will succeed.

Classrooms, on the other hand, are generally more paced and orderly spaces that have traditionally prioritized the productive skills of speaking and writing, while leaving listening and reading to develop somewhat incidentally (Ahmadian & Matour, 2014, p. 227; Nunan, 1997). In these spaces, words are frequently introduced in isolation and presented in citation (dictionary) forms (Ur, 1984). Recognizing the disconnect between authentic and pedagogical contexts, researchers and instructors have spent the past 30 years attempting to bridge this gap (Sifakis & Sougari, 2005; Davies, Jindal-Snape, Collier, Digby, Hay, & Howe, 2013; Beckers & Van Merriënboer, 2016; Papavlasopoulou, Giannakos, & Jaccheri, 2017; Lai, Shum, & Tian, 2016; Moreno & Mayer, 2007; Moos & Azevedo; Webber & Miller, 2016; Hill, Song, & West, 2009). Technology has played an essential role in transforming and redefining how this happens (Wang & Hanafin, 2005; Abraham & Komattil, 2017; Dabbagh & Kitsantas, 2012; Kahn, Everington, Kelm, Reid, & Watkins, 2017).

Addressing all the ways in which researchers and instructors have employed technology, however, is beyond the scope of this paper. For the sake of space, I have chosen one particularly fertile, yet often overlooked, aspect of language learner acquisition: the intersection of technology and connected speech instruction.

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Briefly, connected speech is the natural way speakers really use the language to communicate in their daily contexts (Crystal, 2011, p. 2012). Despite the dominate narrative promoted by pedagogical materials, words generally do not occur, and are not spoken, in isolation; rather they exist as part of a complex ecosystem whose pronunciation changes based upon adjacent words and sounds (Brown & Hilferty, 1986a; Weinstein, 2001, Brown & Kondo-Brown, 2006; Crystal, 2011; Steffensen & Fill, 2014). Connected speech occurs in all registers and at all speech rates, and most importantly, is "an integral part of every language" (Rosa, 2002; Brown & Kondo-Brown, 2006; Ahmadian & Matour, 2014, p. 229).

I will expand my discussion of connected speech further below in the literature review; however, before I do, I must acknowledge the tightly bound relationship between speech and auditory perception (Reed & Michaud, 2011). In order to examine the phenomena of connected speech and the place technology has in its instruction, I must first examine the developments in speaking and listening instructor that have contributed to this area of research, instruction, and learning. The literature review, then, will present (a) an overview of current speaking instruction trends, (b) an overview of current listening instruction trends, (c) an explanation of connected speech and its features, (d) an overview of technology and computer-assisted language learning (CALL), and (e) an overview of technological interventions in connected speech instruction.

Through my findings, I hope to explore the following research questions:

1. How do instructors and learners feel about pronunciation, listening, and connected speech instruction?
2. How do instructors and learners feel about using technology to mediate the above instruction?
3. What do instructors and learners think of a number of activities developed in light of RQs 1 and 2?
4. How does the research literature reflect the topics of pronunciation, pronunciation with suprasegmentals, and suprasegmentals with technology?
5. How can a series of pedagogical materials support the technology-mediated instruction of connected speech?

LITERATURE REVIEW

Speaking Instruction

For decades, speaking instruction has been fraught with challenges. Although it is one of the most important skills, few researchers and instructors have paid enough attention to its role in language acquisition classrooms (Veselovska, 2015, p. 2; Suwartono & Rafli, 2015, p. 87; Baker, 2014). In a survey of 159 instructors, Foote, Holtby, and Derwing (2012) found that only 6% of class time was devoted to pronunciation instruction. Where pronunciation has been covered in curricula, often less helpful features are the focus of that coverage (Veselovska, 2015, p. 2). In many EFL classrooms, for instance, pronunciation has been downgraded to an elective and is rarely incorporated into instructional objectives; when it is taught, it is usually done so in ad hoc fashion (Yates, 2017). Instructors simply aren't confident in their abilities to teach pronunciation (Baker, 2011; Foote et al., 2012; Fraser, 2000; Macdonald, 2002). L2 instructors of English in particular have cited their insecurities addressing speaking and pronunciation in class, given their "nonnativeness" (Murphy, 2014; Couper, 2016; Jenkins, 2006).

Not knowing how to assess pronunciation is another major roadblock for its adoption in class and is also symptomatic of a larger need for improvement in teacher education programs (Macdonald, 2002). Part of the slow adoption of pronunciation training in these programs may have to do with the fact that until 10 years ago, there had been very little research conducted on the subject (Derwing & Munro, 2015). In general, Couper (2017) found that teacher education programs focused on phonetics and phonology rather than the actual instruction of pronunciation (p. 829). The majority of Couper (2017)'s surveyed instructors mentioned learning to teach pronunciation on the job or through professional development (PD) opportunities such as workshops and conferences. Recently, the field has seen an uptick in research-backed textbooks on pedagogical approaches (Grant & Brinton, 2014; Derwing & Munro, 2015), guidance (Celce-Murcia, Brinton, & Goodwin, 2010; Gilbert, 2012), and overviews of typical L1-related difficulties and individual differences (Swan & Smith, 2001).

Frustrations regarding pronunciation training are mirrored among language learners who are keenly aware of how the world sees views their abilities: "learners with good pronunciation may be judged competent, educated, or knowledgable" (Rajabi, Gowhary, & Azizifar, 2015, p. 242). As Brown (2017) put it: "Students whose education has been largely couched in slowly and

deliberately spoken English are often shocked to find, when they enter a context in which native speakers are talking to each other, that they have considerable difficulty understanding what is being said" (p. 6). Speech is inherently ephemeral, and the urgency of response places a high demand on learner's cognitive and affective faculties (Kennedy & Blanchet, 2014, p. 91; Ahmadian & Matour, 2014; Guion & Pederson, 2007; Tomlin & Villa, 1994). Because of this, learners easily become "overburdened, frustrated, and agonized when taking a listening exercise or communicating with native speakers"; often, this leads to an avoidance of the spontaneous interaction which is so pivotal to language acquisition (Ahmadian & Matour, 2014, p. 227; Field, 2008; Saito, 2011, Derwing, 2010, pp. 24-37). Even significant time abroad, immersed in the target language, is no guarantee of mastery of pronunciation; in fact, very few learners manage to achieve this (Bongaerts, Van Summeren, Planken, & Schils, 1997; Flege, 2009; Moyer, 1999).

Since pronunciation is relatively immune to all but the most intensive form-focused treatments (DeKeyser, 1998, p. 43), many of the activities developed for this purpose have followed a kind of explicit, skills-and-drills approach (Saito, 2013; Saito & Lyster, 2012; Couper, 2017). The international phonetic alphabet (IPA) plays a central role in raising awareness of finer phonetic detail in many of these activities (Allegra, 2018). Further activities include listen-and-repeats; practice exercises on websites; corrective feedback (Derwing & Munro, 2014; Saito & Lyster, 2012); peer correction (Derwing & Munro, 2015); awareness raising (Kennedy & Blanchet, 2014); perceptual training (Fraser, 2001, 2009; Best & Tyler, 2007; Flege, 1995; Couper, 2006, 2009; Spada & Lightbown, 2008; Trofimovich & Gatbonton, 2006); conceptualization of target features; recording, revising, and receiving feedback (Derwing & Munro, 2014, 2015; Foote et al., 2016); diagnostic tests; and needs analyses (Derwing & Munro, 2015), and input enhancement (Chapelle, 2003; Wong, 2005; Ioup, 1995; Han et al., 2008; Fouz-Gonzalez, 2017). For a more extensive list of activities, see Appendix A. Despite all the difficulties mentioned above, the biggest takeaway is that pronunciation instruction persists and is effective at all levels (Zielinski & Yates, 2014).

Listening Instruction

Listening has long been considered the most difficult of the four main language skills to acquire and to teach (Siegel, 2014; Vandergrift, 2004; Field, 2008; Graham, 2017). Techniques for instruction have generally centered upon responses to comprehension questions like those on

standardized listening tests (Flowerdew & Miller, 2005; Field, 2008; Goh, 2010; Graham, Santos, & Vanderplank, 2011). Because of its classification as a passive skill, previous consensus has been that learners' proficiency in it will develop automatically alongside the active, productive skills of speaking and writing (Call, 1985; Mendelsohn, 1984; Oxford, 1993; Graham, 2017). Research findings, however, have shown this not to be the case (Graham, 2017; Jiang, Kalyuga, & Sweller, 2017; Zarrabi, 2017).

Given the nature of L2 acquisition to require copious amounts of authentic and comprehensible input, and the central role that listening plays in the delivery of that input, it only makes sense that there is renewed interest in how to teach it (Vanderplank, 2010; Rost, 1994; Siegel, 2014; Goh, 2010; Lynch, 1998; Rosa, 2002; Cauldwell, 2002; Field, 2003; Brown, 2006; Matsuzawa, 2006; Carreira, 2008). As mentioned above, the typical procedure for instruction involves blanket anecdotal and intuitive approaches, where "learners [are] given minimal guidance about how to listen, and feedback [that] focuses on what the learners understood, not on how learners made sense of the L2" (Kennedy & Blanchet, 2014, p. 92; Field, 2008, 2012; Vandergrift & Goh, 2012; Graham et al., 2011; Nemtchinova, 2013; Siegel, 2014). Recognition of the inadequacy of these approaches has led to a variety of interventions designed to help learners integrate information from a range of "phonetic, phonological, prosodic, lexical, syntactic, semantic and pragmatic" sources (Graham, Santos, & Francis-Brophy, 2014; Ahmadian & Matour, 2014, p. 228)

Techniques have included decoding and bottom-up activities (Field, 2008), predictions (Lynch & Mendelsohn, 2002), metacognitive listening cycles (Vandergrift & Goh, 2012), transfer of top-down listening strategies (Siegel, 2013), and teacher modeling (Goh, 2008). While strategies instruction has taken up the bulk of newer approaches to listening instruction, researchers like Renandya (2012), Ridgway (2000), and Mizbani & Chalak (2017) have pointed to the unreasonable demand strategies instruction places on learners: "Teaching listening strategies such as making inferences is a waste of time. There is no cognitive space for employing such strategies in real-time listening. Either the inference is made, or it isn't. There can be no going back to make inferences as we do in reading—the next part of the text is already being processed" (Ridgway, 2000, p. 184).

With so much debate about how listening should be taught, it's no wonder, then, that learners feel overwhelmed and frustrated that there are "no rules to memorize that will automatically lead

to listening success" (Nemtchinova, 2013; Henrichsen, 1984; Brown & Hilferty, 1986a, 1986b; Brown, 2006; Siegel, 2013, p. 22). Learners must "acquire a new phonetic system, learn to parse the L2 stream, and discover connections between words they know in writing and those same words in speech" (Siegel, 2014, p. 22). Much of the time, they cannot "tell if and when their listening is improving" (Siegel, 2014, p. 23).

In light of the above criticisms and in order to mitigate learner difficulties, researchers have pursued a variety of activities, including dictations and dictoglosses (Wilson, 2003; Wajnryb, 1990; Field, 1999), extensive listening (Ridgway, 2000), lip reading (Ridgway, 2000), body language (Ridgway, 2000), conversational interaction, discovery listening (Wilson, 2003), audio courses, pronunciation courses, audio recordings, abridged/unabridged audiobooks, graded audiobooks, audio magazines, audio and video lectures, mobile applications, web-based resources, songs, audio-assisted reading (Brown et al., 2008; Webb & Chang, 2012; Chang, 2009, 2011; Chang & Millett, 2013, 2015; Veselovska, 2015; Sawaengmongkon, 2013), television programs and other media with subtitles and/or captions (Peters et al., 2016), and partial and synchronized captioning (Mirzaei et al., 2017).

Connected Speech

Connected speech—the way speakers really use the language in daily contexts—falls within a larger category of features known as suprasegmentals. Suprasegmentals are prosodic or non-segmental features of spoken language such as pitch, rhythm, intonation, and stress (Richards & Schmidt, 2013; Ladefoged & Johnson, 2014; Fromkin, Rodman, & Hyams, 2007). These features are pivotal to meaning-making and comprehension in speaking and listening contexts, because "they accentuate the most important part of the message and indicate where the listener should pay particular attention" (Zarifi & Sayyadi, 2015, p. 1167; Sawaengmongkon, 2013; Ladefoged & Johnson, 2014; Gilakjani, 2011; O'Neal, 2010, pp. 65-87). A change in suprasegmentals can mean a change in utterance meaning (Ladefoged & Johnson, 2014; Gilakjani, 2012).

Intimately tied to this understanding are the topics of intelligibility and comprehensibility (Derwing & Munro, 2009; Munro & Derwing, 2015; Fouz-Gonzalez, 2017). A major concern with the instruction of connected speech is that it will go down the pathway of accent reduction, modification, and neutralization protocols that have historically problematized the negotiations

of learner identity (Thomson, 2014; Derwing, 2003; Derwing & Munro, 2014; Eades, 2009; Lippi-Green, 2012; Munro, 2003; Sikorski, 2005; Garcia, 2017). Rather than churn out wave after wave of so-called native speakers, instructors instead focus on awareness of connected speech features in the hopes of improving learners' intelligibility and comprehensibility (Derwing, Munro, Carbonaro, 2000; Gynan, 1985; Field, 2005; Hahn, 2004; Harmer, 2007; Jenkins, 2002; Hazan, Tuomainen, & Pettinato, 2016; Brown, 2006).

Given the difficulty of instructing speaking and listening in general contexts, it is no surprise that when instructors have been faced with the added challenge of connected speech instruction, they have chosen to ignore it. Veselovska (2015) cited "lack of instruction on connected speech elements to be a shortcoming of the contemporary approach to teaching English as a second language" (p. 11). A number of researchers have shown that explicit instruction of connected speech can be effective (Ahmadian & Matour, 2014; Brown & Hilferty, 1986b; Matsuzawa, 2006; Carreira, 2008; Levis, 2007). However, instructors who have implemented connected speech work in their classrooms have often been criticized for uninteresting lessons, no model activities, the teacher-centeredness of the lessons, and the focus on drills (Suwartono & Rafli, 2015).

In anticipation of the future emphasis on instruction of suprasegmentals in general and connected speech in particular, Brown and Kondo-Brown (2006) collected nine features of connected speech that would go on to influence contemporary curriculum and materials design as well as teacher education:

1. Word Stress: the degree of force used in producing a syllable.
2. Sentence Stress and Timing: the stress or pattern of stress groups in a sentence or utterance (sentence stress) and the pattern of stress or syllable timing in the stress groups in a sentence (utterance) (sentence timing).
3. Reduction: the process that occurs in connected speech in which phonemes of the language are changed, minimized, or eliminated in order to facilitate pronunciation.
4. Citation and Weak Forms: citation forms are pronounced one way when they are prominent or stressed and another way (weak forms) when they are not prominent or stressed.
5. Elision: elimination or dropping of phonemes that would be present in the citation form of a word or phrase

6. Intrusion: the opposite of elision; involves inserting phonemes within or between words.
7. Assimilation: the process whereby one phoneme is changed into another because of the influence of a nearby phoneme.
8. Transition (Juncture): boundary markers between phonemes, syllables, and words.
9. Contraction: showing the reduced characteristics of spoken language in written language (Brown & Kondo-Brown, 2006, pp. 2-4).

These nine features, coupled with recent corpus work on high-frequency reduced forms, have provided instructors with enough of a theoretical underpinning to shift their pedagogical approaches (Ahmadian & Matour, 2014; Ernestus, Hanique, & Verboom, 2015; Liang, 2015; Gahl, Yao, & Johnson, 2012; Aylett & Turk, 2006; Bell, Jurafsky, Fosler-Lussier, Girand, Gregory, & Gildea, 2003; Gahl, 2008). A range of adapted or unique materials have grown out of the research findings above: discovery listening (Wilson, 2003); podcasts (Stanley, 2006); dialogue, reflective, and listening journals (Ho, 2003; Norris, 1994); dictations (Norris, 1993); cloze exercises (Cahill, 2006; Norris, 1994); explicit instruction (Norris, 1994); awareness exercises (Norris, 1994); conversational interaction (Norris, 1994); song and poetry exercises (Ashtiani & Zafarghandi, 2015). In general, these activities and exercises reflect the common pedagogy for speaking and listening mentioned earlier in this paper.

Enter Technology: Computer-assisted Language Learning (CALL)

Advancements in technology have drastically transformed the language learning landscape in the past 30 years. Gone are the days of industrialized classrooms and private academies as the primary sites of learner achievement. While a complete overview of the field is beyond the scope of this paper, we can address several areas of strong interest that impact speaking and listening. Among researchers, there appears to be a general consensus that previous CALL literature suffers "poor description of the research design; poor choice of variables to be investigated; lack of relevant data about participants; studies based on untrained users of the technology; a nearly exclusive focus on Western European languages, especially English; and an overall lack of systematicity in investigating key factors that may enhance the effectiveness of FL learning" (Golonka, Bowles, Frank, Richardson, & Freynik, 2014, p. 71).

Rather than be discouraged by these findings, contemporary research has oriented to these concerns and responded with a wide range of literature on topics like reviews and trends (Lai &

Li, 2011; Golonka et al., 2014; Stockwell, 2007; Price & Kirkwood, 2014; Bush, 2008; Trace, Brown, & Rodriguez, 2017; Hockly, 2015; Tour, 2015; Scholz & Schulze, 2017; Smith & Shulze, 2013; Kulik & Fletcher, 2016; Godwin-Jones, 2017; Chinnery, 2006; Evans, Pearce, Vitak, & Treem, 2016; Taj, Sulan, Sipra, & Ahmad, 2016; Popescu, Khribi, Huang, Jemni, Chen, & Sampson, 2017; Sourmelis & Zaphiris, 2017; Liu & Yang, 2016; Van Praag & Sanchez, 2015; Duman, Orhon, & Gedik, 2015; Levis, 2007; Levy, 2009; Healey, Hegelheimer, Hubbard, & Ioannou-Georgiou, 2008; Salaberry, 2001; Burston, 2015), mobile applications teachers can design (Lindaman & Nolan, 2016), online digital environments (Mroz, 2014; Kronenberg, 2016; Messina & Bagga-Gupta, 2016), computer-mediated communication (CMC) (Lin, 2015), digital literacy (Castellano, 2015; Dooly, 2015), augmented reality (Zheng, Liu, Lambert, Lu, Tomei, & Holden, 2018; Godwin-Jones, 2016), support for less commonly taught languages (Thompson & Schneider, 2016; Sauro, 2016; Murphy-Judy & Jonshoy, 2017), competence and learning models (Bull & Wesson, 2016), criteria for selecting technology (McMurry, Rich, Hartshorn, Anderson, & Williams, 2006), technology needs assessments (O'reilly, 2016), semiotic views of technology in the classroom (Dooly, 2018), and digital access in rural areas (Correa & Pavez, 2016).

Like their traditional counterparts, digital speaking and listening instruction have suffered the same disconnect between research and practice (Golonka, 2014). Ravitz, Becker, and Wong (2000) noticed that compared with instructors of other subjects, foreign-language teachers have been found least inclined to use technology (Burston, 2014; Li & Walsh, 2011). Cultural backgrounds and attitudes have also contributed to instructor reluctance to introduce technology into the classroom (Ertmer & Ottenbreit-Leftwich, 2010). Those instructors who have kept pace with technological developments tend to adopt a "future-proof" approach of thinking about technology in general, rather than focusing on any particular tool; for these instructors, technological choices are the natural outcome of solid pedagogical design (Colpaert, 2006; Arnold, 2013).

Learners, however, have profited the most from the introduction of technology into their educational ecosystems (Cole & Vanderplank, 2016; Kuppens, 2010; Sockett, 2014; Sundqvist, 2011; Sundqvist & Sylven, 2014). Technology has opened up a host of new ways to self-reflect, self-assess, raise awareness of learning systems, and develop key language skills more meaningfully than in formal contexts (Pickering, 2005; Posner, 1996; Roediger, 2012; Martinson & Chu, 2008; Levy, 2009). The identities that learners develop in digital spaces are positively

associated with acquisition and affect, and are complementary to traditional classroom roles (Lai, Zhu, & Gong, 2015; Cole & Vanderplank, 2016; Larsson, 2012; Lepännen, 2007; Sylvén & Sundqvist, 2012; Thorne, Sauro, & Smith, 2015; Lai et al., 2015; Blyth, LaCroix, & Dalluhn, 2011; Richards, 2015). Regardless of proficiency levels, learners have primarily employed technology to study listening and vocabulary (Çelik, Arkin, & Sabriler, 2012; Ekşi & Aydin, 2013; Trinder, 2016).

CALL and Connected Speech

Three major interventions have grown out of the intersection of technology and connected speech instruction: (a) computer-assisted pronunciation training (CAPT), (b) high variability phonetic training (HVPT), and (c) automatic speech recognition (ASR). In CAPT, learners complete a series of drills within a controlled context; models for pronunciation tend to be limited (typically only one speaker) (Thomson, 2013). HVPT, on the other hand, exposes learners to "multiple voices producing target sounds, rather than a single voice as if often the case in a classroom environment, or even many CAPT applications" (Thomson, 2013, p. 749). ASR systems are prized for their abilities to provide user feedback and potential language gains (Hansen, 2006; Neri, Cucchiarini, Strik, & Boves, 2002; Mohsin, 2012).

Some researchers have even experimented with spectrographic software like PRAAT and WASP to produce visual representations of connected speech forms, which could then be compared to learner output (Varden, 2006; Coniam, 2003). Visual displays have been shown to be effective for teaching suprasegmentals and lead to improved pronunciation that also generalizes to new contexts (Anderson-Hsieh, 1994; Eskenazi, 1999; Neri et al., 2002; Hardison, 2004, 2005). Thomson (2013), however, warns that spectrograms are uninterpretable to non-experts and do not convey any information that can be readily used to improve pronunciation, despite Varden's (2006) claims to the contrary. For this reason, Neri et al. (2002) suggests replacing spectrogram approaches with ASR.

Though, ASR is not without its criticisms: Systems have demonstrable challenges recognizing learners' speech as intelligible and accepting learner accents that are dissimilar to the "native speaker" models used to train them (Thomson, 2013; Derwing et al., 2000). ASR learners frequently receive erroneous feedback, and this has led to a great deal of skepticism regarding the validity of these systems (Neri, Cucchiarini, & Strik, 2008a; Hincks, 2003). Gains

reported by learners have also not necessarily been that different from traditional classroom instruction, suggesting that ASR does not add to, but simply replaces, the teacher (Thomson, 2013; Neri et al., 2008a). There's also little "convincing evidence that ASR-based pronunciation is generalizable to new words, nor whether it impacts the learners' perceptual system" (Thomson, 2013, p. 748).

HVPT systems, on the other hand, allow learners to achieve greater and more generalizable gains in speech production by presenting a diverse array of listening input (Logan et al., 1991; Lively, Logan, & Pisoni, 1993; Bradlow, 2008; Bradlow, Pisoni, Akahane-Yamada, & Tohkura, 1997; McClelland, Fiez, McCandliss, 2002; Lambacher, Martens, Kakehi, Marasinghe, & Molholt, 2005; Nishi & Kewley-Port, 2007, 2008). While CAPT systems have had some criticisms (Neri et al., 2008a; Neri, Mich, Gerosa, & Giuliani, 2008b), a number of other researchers have found them to be quite effective, especially for training suprasegmental features (Golonka et al., 2014; Alipanahi, 2014; Hincks & Edlund, 2009; Elimat & AbuSeileek, 2014; Ouni, 2013).

Some software developers have produced tools that blend ASR, CAPT, and HVPT (e.g. *Talk to Me-English [TTME]*, *Pronunciation Power*, *Connected Speech*, *Streaming Speech*); however, results have been somewhat mixed in some of these, with lower proficiency students improving pronunciation, while higher proficiency students experienced worsening effects (Hincks, 2015). A key takeaway from these efforts is that the field is still in transition, and there is a great need for future research and experimentation to expand the options available to researchers, instructors, and students.

In light of this gap, I will propose multiple pedagogical solutions to support technological intervention of connected speech instruction. The foundation for these materials lies in the theoretical background addressed above as well as a mixed-methods approach combining instructor and student survey questionnaires with a research article deep dive, each intended to reveal the attitudes of researcher, instructor, and learner communities toward the importance of connected speech instruction and technological interventions in contemporary practice.

The sections to follow will address (a) the needs analysis consisting of instructor and student survey questionnaires and an analysis of recent research literature related to pronunciation, suprasegmentals, and technology mediation of suprasegmental instruction; (b) the results from

these investigations; (c) implementation of materials based upon these results; and (d) a conclusion summarizing the limitations and potential future directions for this research.

METHOD

Needs Analysis

Instructor survey questionnaire participants. Instructor survey participants (N = 34, Male = 11, Female = 23) were randomly sampled from a range of Internet forums and communities related to language research, instruction, and learning. The average age of participants was 46.44 (SD = 12.88), with the youngest being 26 years old and the oldest 66 years old. Participants had taught English for an average of 14.88 years (SD = 12.16), with the lowest 1 year and highest 45 years. Nationalities were self-reported as USA, Australia, Brazil, Hispanic, India, Turkey, Serbia, Earth, and Venezuela, and L1s included English, Brazilian Portuguese, Spanish, Tamil, Turkish, Serbian, Hindi, Persian. For participants language learning narratives, please see Appendix B.

Student survey questionnaire participants. Student survey participants (N = 7, Male = 1, Female = 6) were randomly sampled from a range of Internet forums and communities related to language research, instruction, and learning. The average age of participants was 24.2 (SD = 6.6), with the youngest 19 years old and the oldest 36 years old. All participants had attended university and had studied English for an average of 15.17 years (SD = 3.25), with the lowest 10 years and the highest 19 years. Nationalities were self-reported as Poland, Sweden, South Asia, Finland, Germany, and Hong Kong, and L1s included Polish, Swedish, Hindi and English, Finnish, German, and Cantonese. For participants language learning narratives, please see Appendix C.

Data Collection and Procedures

Instructor survey questionnaire. The instructor survey questionnaire (k = 56) included a range of opinion and self-reporting questions (short/long answer, multiple choice, yes/no, Likert) related to instructor's biodata, opinions on English pronunciation and connected speech, English features of connected speech, and suggested English connected speech activities (see Appendix D for complete instructor survey). The survey was compiled in Google Forms, then piloted by a tenured professor of Second Language Studies at the University of Hawai‘i at Mānoa who

specializes in language testing, curriculum development, program evaluation, quantitative research methods, mixed-methods research, and connected speech. The professor completed both instructor and student surveys and made the following recommendations, which were implemented before the survey launch:

1. Spelling modifications (Hawai‘i diacritical markers, abbreviations)
2. Clarification of language
3. Re-ordering and splitting of sections
4. Replaced N/A options with option to skip question altogether
5. Strengthened poles of Likert scale items (e.g., “Not strong” --> “Not at all”, “No need” —> “Definitely no need”)
6. Reduced complexity of language throughout survey
7. Embedded connected speech features into questions (with samples)
8. Added a thank you message at conclusion of survey

After the modifications were completed, the survey was made available to participants via an advertisement message and weblink posted to a range of online communities, forums, and mailing lists that specialize in language research, instruction, and learning (see Appendix E for a list of sites):

> Aloha,
>
> I am currently a master’s student at the University of Hawai‘i at Mānoa, and I am conducting a survey questionnaire for teachers and students to gather their opinions on the instruction of English connected speech using technology. If you have the time, I would greatly appreciate your input. Please see below for the appropriate survey questionnaire link.
>
> *Teacher / Instructor Survey Questionnaire (web link)*
>
> *Student Survey Questionnaire (web link)*

Responses were collected over a two-week period and stored in Google Forms, then transferred to Microsoft Excel as comma-separated values (CSVs). This data appears in the results and appendices below. During the process of survey distribution, I encountered some difficulties with forum and group moderators unsure of the relevance of the survey to their communities; however, after several rounds of communication, I was able to demonstrate the validity of the surveys in their communities, and they allowed the survey to be posted. Every

posting site required an account to access its content, so I created an anonymous account to facilitate posting.

Student survey questionnaire. The student survey (k = 42) followed the same procedures outlined above and included a range of opinion and self-reporting questions (short/long answer, multiple choice, yes/no, Likert) related to students' biodata, opinions on English pronunciation and connected speech, English features of connected speech, and suggested English connected speech activities (see Appendix F for the complete student survey).

Article deep dive. In addition to the instructor and student survey questionnaires, I extended the data triangulation to include researcher attitudes as reflected in the number of recent journal articles related to pronunciation, suprasegmentals, and technology mediation of suprasegmental instruction (see Appendix G for the complete list). Given that many features of connected speech are also part of the suprasegmental classification, I made "suprasegmental" the optimal search term for the literature I reviewed.

My search included all articles ranging from 2015 to March, 2018 in a number of key linguistics journals (k = 23). Journals were chosen based upon (a) curated lists by several highly regarded second language studies programs, (b) strong impact factor rankings, and (c) specific relevance to the subject area (e.g., phonetics, phonology, pronunciation, and technology journals).

Given the sheer volume of these journals (k = 2,719), I employed several approaches to tabulation: (a) hand counts, (b) article total listings provided by journal indices, and (c) a digital tallying procedure that involved copying the table of contents from each journal issue into an Excel spreadsheet, ensuring that titles and authors appeared on single separate lines, and then taking the total line count and dividing by two to get the article count. This last solution was most efficient for journals whose articles numbered greater than 600 and whose formatting lent itself well to copy-paste procedures.

RESULTS

As outlined above, I set out to examine the attitudes and pedagogical and research support for technology-mediated instruction of connected speech. To that end, I employed a mixed-methods approach with triangulation of instructor and student survey data with an article deep dive that

reflects the current perceptions of the research field toward pronunciation, suprasegmentals, and technology-mediated suprasegmental instruction. The results from each of these procedures are as follows.

Instructor Survey Questionnaire

Overall, instructors reported moderate comfort with combined values of teaching pronunciation, connected speech, and using technology to accomplish both ($M = 3.83$, $SD = 0.35$). Individually, instructors rated their comfort teaching English pronunciation ($M = 4.12$; $SD = 1.02$) and importance of teaching connected speech ($M = 4.32$; $SD = 0.88$) the highest. The lowest score involved how much technology instructors use to teach pronunciation ($M = 3.23$; $SD = 1.16$). For the full responses, please see Appendix H.

As to whether instructor training materials, resources, and colleagues mention or involve connected speech, the average response of all three was 46.25%. Individually, textbooks and materials mentioned connected speech about 53% of the time, while research literature consumed by instructors only mentioned it 41% of the time (see Appendix I for full breakdowns). Classroom listening and speaking exercises generally involved a fair amount of connected speech (82% and 76%).

Most of the instructors reported average performance across their students' pronunciation ($M = 3$; $SD = 0.78$), speaking ($M = 3.21$; $SD = 0.73$), and listening ($M = 3.29$; $SD = 0.87$) skills (see Appendix J for complete breakdown), while rating their own speaking ($M = 4.82$; $SD = 0.46$) and listening ($M = 4.85$; $SD = 0.36$) skills high. Some, but not all, were taught English pronunciation and connected speech in the classroom (35% and 29%). Many employed a range of teacher training, on-the-job training and professional development, resources and materials, and natural contexts to acquire their training (see Appendix K for complete list).

In general, the instructors reported strong understanding of most features of connected speech ($M = 4.37$; $SD = 0.44$) (see Appendix L for complete list). Lowest ranked were intrusion ($M = 3.74$; $SD = 1.36$) and juncture ($M = 3.76$; $SD = 1.39$). Highest ranked were word stress ($M = 4.76$; $SD = 0.65$) and contraction ($M = 4.97$; $SD = 0.17$). Actual instruction of connected speech features occurred more limitedly ($M = 3.7$; $SD = 0.60$). The most commonly taught features are word stress ($M = 4.44$; $SD = 0.82$) and contraction ($M = 4.59$; $SD = 0.56$). The least

commonly taught features are intrusion (*M* = 2.74; *SD* = 1.46) and juncture (*M* = 3.06; *SD* = 1.43) (see Appendix M for complete list).

Of the suggested activities for CALL and connected speech instruction (*k* = 11), the instructors reported moderate interest (*M* = 3.70; *SD* = 0.38) (see Appendix N for complete list. Highest ranked activities included video supercuts (*M* = 4.24; *SD* = 1.00), YouTube and Spritz Applet (*M* = 4.06; *SD* = 1.06), as well as Listening and Dictation from Digital Regional Dialects (*M* = 4.06; *SD* = 1.22). Lowest ranked activities included Partner Comparison Word Doc (*M* = 3.06; *SD* = 1.20) and Digital Grocery List (*M* = 3.34; *SD* = 1.33).

In terms of additional suggestions for teaching connected speech, instructors provided a range of qualitative responses (see Appendix O for full list) with activities that included (a) listening to authentic samples of English with and without connected speech, (b) timed speaking (e.g., Nation's 3-2-1 exercise or Pecha Kucha presentations), (c) avoiding IPA instruction and/or seeking out alternative instruction of sound transcription, (d) focused and quick instruction, (e) using limericks and writing reflections on recorded limerick listening, (f) mirroring practice with poetry, (g) transcribing audio assignments and discussing the transcriptions, (h) a low-cost reliable app that models connected speech and captures student speech samples, (i) listening exercises, and (j) drilling.

Student Survey Questionnaire

On average, students were multilingual, with the lowest number of languages studied being two and the most being five (*M* = 3.29; *SD* = 1.11). Students assessed their speaking, pronunciation, and listening skills highly (*M* = 4.38; *SD* = 0.08), as well as their classmates' speaking and listening skills (*M* = 4.28; *SD* = (0.20) (see Appendix P for full list). Students rated their instructor's pronunciation skills similarly (*M* = 4.29; *S* = 0.49). According to their responses, students also received classroom instruction in pronunciation (86%) and connected speech (86%) (see Appendix Q for full list). As far as exposure to connected speech outside of the classroom, one participant mentioned learning connected speech while abroad, but the participant did not mention if their time abroad was for pleasure, work, or studying.

In general, the classroom materials students were exposed to reflected connected speech in both listening and speaking exercises (100% and 86%) (see Appendix R for full list). As far as using technology to learn pronunciation and connected speech, students had moderate responses

(*M* = 3.29, *SD* = 1.11 and *M* = 3.29, *SD* = 1.25) (see Appendix S for full list). The students ranked connected speech as very important (*M* = 4.25; *SD* = 1.25) and showed a strong familiarity with connected speech features (*M* = 4.10; *SD* = 0.53) (see Appendix T for full list). The most familiar features were reduction (*M* = 4.57; *SD* = 0.79) and contraction (*M* = 4.86; *SD* = 0.38), and the least familiar were citation vs. weak forms (*M* = 3.67; *SD* = 1.63) and intrusion (*M* = 3.29; *SD* = 1.89).

Overall, students had a moderate interest in the suggested connected speech activities (*SD* = 3.40; *SD* = 0.47). Highest ranked activities were E-books and Dictionaries w/Connected Speech IPA Gloss (*M* = 4.00; *SD* = 1.15) and Digital Choose Your Own Adventure (CYOA) Story (*M* = 3.86; *SD* = 1.21). Lowest ranked activities were Partner Comparison Word Doc (*M* = 2.71; *SD* = 1.25) and Digital Reflective Journals on Social Media (*M* = 2.43; *SD* = 1.51) (see Appendix U for complete list). In terms of their own qualitative suggestions for using technology to teach connected speech, the students had none (i.e., "/" was the only student comment).

Article Deep Dive

Appendix G represents the findings for the article deep dive. Of the 23 journals, 364 issues, and 2,719 articles surveyed, 566 (21%) dealt with pronunciation, 91 (3%) dealt with pronunciation and suprasegmentals, and 11 (0.04%) dealt with suprasegmentals and technology.

DISCUSSION

Pedagogical Materials

In light of the survey questionnaire responses and the overwhelming absence of technology-mediated connected speech literature, I have proposed the following activities. Prior to the questionnaire responses, I planned 11 potential activities; however, after taking into account the instructor and student rankings, I have reduced that number to seven activities (eliminating the shifting consonant prediction, bar line transcription, grocery list, and reflective journal activities). Because of each activity's flexibility, I present them more as general tools adaptable to some, if not all, of the connected speech features addressed earlier in this paper. Limitations related to this approach and other aspects of the study will be discussed in the conclusion.

Activity 1: Digital choose your own adventure (CYOA) story. A segment of interactive fiction genre, CYOA stories gained a huge following in the 80s and 90s after R.A. Montgomery introduced them to the children's literature market ("CYOA", 2014). Since then, digital CYOA stories have appeared all over the Internet in a variety of static and animated forms. While producing these stories was once a time-consuming process, these days, there are a number of digital tools that exist to streamline story making activities (e.g., Inkle Writer, Twine, Quest, Squiffy, Inform). Stories can be made ahead of time or downloaded from hosting sites and modified to suit classroom requirements. Instructors and students can also convert their stories into mobile apps through software (e.g., Adobe PhoneGap, StoryKit, I-Tell a Story, Bunsella Bedtimes Story, Scribble Press).

Appendix V demonstrate how a student can progress from one part of a story to another using connected speech features. The samples were created with plain English, a loose transcription, and an IPA transcription. Online text-to-IPA converters like PhoTransEdit and Easy Pronunciation Phonetic Transcription Translator have some built-in features for minor connected speech conversion in the final transcription.

Activity 2: IPA- and broad transcription-glossed digital graphic novels. With the advent of e-readers and tablets, access to books has never been more simple and convenient. A wide range of open-source, freely available material now exists for download from local libraries, digital repositories, online newspapers, and select websites (Project Gutenberg, Digital Comic Museum, Google search for "web comics", Ren'Py). Some sites require free registration to view their content, but most are open to guest visitors.

Appendix W include samples of a digital comic that has had a mouse hover treatment applied to it through Adobe Acrobat. When the mouse, pointer, or finger passes over the speech bubble in the comic panel, a text bubble pops up and displays the connected speech version of the comic dialogue. Unfortunately, Adobe Acrobat is not free in its full version; however, many libraries and universities have public terminals that will allow you access to the software. Otherwise, free imaging software like GIMP or Preview (on Mac OS) can allow you to overwrite and create your own bubbles.

Tutorials exist freely throughout the Internet to create mouse hover treatments for websites, but some programming knowledge is necessary (or use of pre-made scripts). E-books created this way can then be stored on free websites created through platforms like Wix or Wordpress. To

build these mouse hovers in Adobe Acrobat, creators will need to follow transparent button and tooltip creation tutorials, which are available through Adobe Acrobat's help files and forums, as well as outside tutorials searchable with Google.

Activity 3: IPA- and broad transcription-glossed e-books / connected speech custom dictionary for kindle readers. These days, e-readers and tablet dictionaries can be loaded with a wide range of languages to support multilingual literacy development. One such reader, the Amazon Kindle, has individual dictionary files that, with the help of online tutorials, can be loaded onto the device to make a bilingual dictionary. Dictionaries can be found online and through Amazon's own website. They can also be created by users and shared through online forums and discussion groups dedicated to e-readers and other reading tools.

Based on an existing English dictionary pre-loaded on the Amazon Kindle, the activity in Appendix X illustrates how an additional connected speech gloss could appear in a typical lookup. This can be accomplished in several ways. One option is to create an entire dictionary file altogether; another is to insert highlights into the key areas of the text that would allow for glossing of connected speech features (so students can focus on particular areas mentioned by the instructor). Highlighted areas can contain notes that students may use to augment their reading and speaking experiences. These can be done as experimental read-aloud, classroom reading, or just personal reading on learners' own terms.

Massive collections of bilingual English-L2 and other multilingual dictionaries can be found at dict.cc. Rather than creating your own dictionary, with the aid of some programming knowledge (Python, generally), creators can modify an existing dictionary to include potential connected speech features within preferred transcription formats.

Activity 4: a word doc comparison activity, where learners guess at the connected speech features in a text. While not truly authentic, there are many pedagogical resources for scripts and subtitles that are authentic to their media contexts (e.g., IMSDb Script Database, news broadcast transcripts, TED Talks, SubD, Subscene, SubtitleSeeker, Open Subtitles). These scripts and subtitles are readily available, and with the combination of the script/subtitle and the film/media, instructors can provide powerful tools for students to preview, predict, and explore connected speech in contemporary media.

Appendix Y demonstrates how students can take the learning activity into and out of the classroom. Providing an instructor's key to the student sample response allows for flexible usage

of connected speech in different scenarios. Students, too, can be trained to use the procedure on their own so that they can download the scripts and subtitles to films and other media, watch them, and then compare the texts with their own transcriptions. A word of warning: scripts, more than subtitles, will go through some later-stage revisions before they are implemented, and so students may want to also reference the final subtitles for any film or television program they review. In this way, they can also compare the differences of transition from script to screen and get a sense of media editing practices in the industry. These changes can also generate conversation among students as to why they were made and to what purpose.

In Microsoft Word under the "Tools" menu, there is a submenu item called "Track Changes", and within that selection, there is a "Compare Documents" option that will allow you to select a source and a comparison document to compare. Word will then generate a third document with all the differences highlighted. This process can be reversed so that instructor-learner and learner-instructor comparisons can be made.

Activity 5: Isolating connected speech features within a video supercut using a tool. Publicly available video editing and subtitling software have revolutionized the way we can segment and manipulate audio-visual information. In this activity, I chose the video supercut editing tool Videogrep and the TED subtitling tool Ted2Srt to create video supercuts of connected speech production in a TED Talks video. A supercut is simply a way of stitching together a series of different segments of a video that contain particular characteristics to highlight (e.g., words, colors, sound effects). TED Talks are only one option in the diverse ecosystem of Internet media resources (Youtube, Story Corps, Google Video). From 911 calls in authentic contexts to massive speech archives (Speech Accent Archive, Aschmann's American English Dialects, Randall's Cyber Lab, ELLO, Lingual Net) a great deal of natural data exists for learner input. One alternative to TED Talks is the site Subzin that allows users to search for dialogue within film scripts; this information can also be used to isolate connected speech features using Videogrep.

Appendix Z demonstrates the isolation of an assimilated phrase "have got to" (i.e., "gotta") in a TED Talks video featuring a speaker discussing how to resolve racially stressful situations (Stevenson, 2018). The subtitles were created using Ted2Srt, then imported into Videogrep, after which the phrase "gotta" was isolated based upon the type-token counter built into Videogrep. Instances of "gotta" were plentiful, so they were selected as the feature of choice to isolate.

While the resulting video can be "padded" (i.e., given a buffer of time before and after the occurrence of the feature), I chose to go with the default settings for this.

Activity 6: Youtube playback of video with slower speeds. A powerful and underutilized function of Youtube videos is the option to modify the playback speed of the stream. With the ability to adjust playback rates from 0.25x to 1.5x, instructors and students can micro-analyze connected speech as it happens in dialogue, and then adjust it back to normal speeds for assessment purposes. This activity can be done in phases.

The first phase involves instructors and students watching the video at normal speed. The second phase involves slowing down the playback to about half speed (0.5x) and marking the transcript of the video for potential changes they notice. The third phase would be to decipher these changes in terms of IPA or looser transcription spellings, and then to discuss these changes with the instructors or classmates. As they discuss, instructors and learners can make notes in a collaborative environment to be shared later (e.g., Google Docs). Appendix AA reflects the three phases of this activity.

The video sample is from Story Corps, a National Public Radio (NPR)-funded project to record, preserve, and share the stories of American from all backgrounds and beliefs (StoryCorps). In it, a discussion takes place between Dezmond Floyd, a 10-year-old fifth-grader, and his mother Tanai Bernard on the topic of active shooter drills going on in Dezmond's school (Karwowski, 2018).

Activity 7: Listening responses with a wide range of samples from authentic Regional English dialects and speaker types. As mentioned earlier in this paper, intelligibility and comprehensibility are central to communication. Given the sheer number of North American dialects, it's surprising how little pedagogical materials reflect this diversity. With some basic searching in Google, instructors and learners can uncover a near-endless collection of examples of authentic speaker utterances (e.g., Aschmann's North American Dialects, the Speech Accent Archive, American Rhetoric Archive, Randall's Cyber Listening Lab, English Language Listening Library Online, LingualNet, International Dialects of English Archive [IDEA], My English Voice).

In this digital audio discourse scramble activity, instructors and learners begin with an audio passage and an accompanying transcript (and optional IPA transcript) from any collection of their choosing. I selected a sample from the Speech Accent Archive, because the Archive uses only

one standardized text across a wide range of speakers, and the Archive also has powerful search tools for isolating regional dialects. Narrow transcriptions are also provided by the Archive, which allows for more fine-grained analyses (though most instructors and learners will probably translate these to broader or looser transcriptions).

Once these samples have been assembled, the creators can scramble the words and phrases through any number of digital game engines that do not require programming knowledge (e.g., Scratch, Music Blocks, GameMaker: Studio, Adventure Game Studio, Unity, RPG Maker, GameSalad). Words can be replaced with their IPA equivalents, or blanked out and replaced with only the audio from the speaker (see Appendix BB). In this way, learners must work alone or collaboratively to reassemble the discourse in the order they believe it to follow. Instructors can replay the full audio clip as desired to assist learners having significant difficulties.

When the learners have assembled their version of the sample, they can record themselves speaking or the original passage using any number of free recording tools (e.g., Audacity, Blender), internal microphones, or external recording devices (e.g., digital/podcast recorders, cell phones, tablets, iDevices). With minor Python scripting knowledge, some of these processes could be automated, or instructors and learners could develop their own graphic interfaces and mobile apps to accomplish this.

After learners have finished creating their samples, they can submit these digitally to the instructor through e-mail or online content management systems (CMSes). As an alternative, instructors can ask learners to submit their verbal responses through online digital recording tools like Vocaroo, which record speech and allow audio samples to be submitted via temporary web links. Links remains active depending on Vocaroo's available server storage. Other sites have much firmer limitations (e.g., one week, one month).

An extension of this activity would be to take the original audio sample and the learner-generated sample, and then compare the two using free spectrographic software like PRAAT or WASP. Appendix BB also shows a comparison of these waveforms. Comparisons can be printed out and shared with learners in groups (e.g., Varden, 2006) or analyzed real-time with microphones and audio files at digital stations. While these two pieces of software can be manipulated to perform some complex analyses of speech signals, the knowledge required to complete this particular extension is minimal. Tutorials and scripts and other resources also exist to streamline the process (e.g., Google search "PRAAT scripts").

CONCLUSION

Before summarizing the findings in this study, I must address a number of its limitations. First, due to the small sample size, short collection period (two weeks), and etiquette about reposting on forums, community groups, and mailing lists, I was unable to achieve the response numbers I had hoped for from the instructor and survey student questionnaires ($N = 34$ and $N = 7$, respectively). Because of this, it is possible that some eliminated activities may have been more popular than originally ranked, and some of the attitudinal responses could be notably different. Second, the article deep dive suffers from potential human error, as I was the only researcher reviewing the records. However, even with the margin of error included in the counts, the conclusions would still be roughly what they are—a decidedly marked absence of research on technology-mediated suprasegmental topics.

Third, the time, resources, and training limitations involved in creating materials could be prohibitive to researchers, instructors and learners in more restricted contexts. However, with current fair use policies in most educational institutions, instructors and learners have a greater amount of access to resources that can reduce the time and investments necessary to produce materials. Professional tutors and private businesses, however, despite performing many of the same duties, do not have the same freedoms for materials usage that educational institutions enjoy. Moving forward, it may be useful for researchers, instructors, and learners to pool their resources, or consider opening up copyright and use policies on constructed materials so that all populations can better serve their learners.

A final limitation is that researchers, instructors, and learners may remain skeptical about technology and avoid the integration of these findings into their practice. To those individuals, the traditional methods of research, instruction, and learning will always be available. But to those willing to embrace the affordances that technology can provide, these individuals will discover new and innovative ways to empower their learners.

As I have shown in this mixed-methods analysis of attitudes toward technology-mediation of connected speech instruction, researchers, instructors, and learners all see a need for increased attention to be paid to this area of learning. By triangulating two qualitative survey questionnaire instruments and a quantitative analysis of research literature in the field of language learning, I

was able to capture the attitudes of three key stakeholders in the language learning process and demonstrate how the research field has not satisfactorily addressed instructors' and learners' desires for more resources and support in the technology-mediated instruction of connected speech. I was also able to show how across the language research field, pronunciation instruction came up 21% of the time in the literature, whereas instructors cited it as a much rarer occurrence, suggesting that perhaps they don't review some of this literature, or that they have difficulty accessing and applying it. When taking into account Larsen-Freeman's (2003) proposal for grammaring to occupy a fifth skill in the four skills domains, this 21% division does not seem like an unreasonable amount of coverage in the research field (p. 143). However, the 0.04% representing technology-mediation and suprasegmentals is another story.

Overall, the survey questionnaires illuminated a range of attitudes from instructors and learners individually, but when compared and contrasted with each other, these instruments reveal how frequently instructor and learner interests diverge. For instance, in their questionnaire, instructors keyed into activities that provided more collaborative listening input (e.g., Youtube videos and dialect audio samples), whereas learners prioritized more self-study activities (e.g., digital glosses and e-books and CYOA stories) and even ranked the collaborative activities the lowest (e.g., partner comparisons and social media reflective journals). Granted, all of these activities have the potential to serve collaborative or self-study purposes; however, the learner focus on reading activities over listening is noteworthy. Also, while instructors reported familiarity with all the connected speech features, they frequently did not instruct them, despite the fact that learners saw these features as very important and desired to have them taught in their learning spaces. Instructors were also more reliable in terms of providing qualitative feedback on suggestions for future activities. Notably, the majority of their suggestions involved (a) avoiding complex steps and processes and (b) privileging traditional speaking and listening exercises over technology interventions.

As far as theoretical implications, this study furthers the attitude that mixed-methods research can serve as "a powerful third paradigm choice that often will provide the most informative, complete, balanced, and useful research results" in studies where solely qualitative or quantitative approaches are limited (Johnson, Onwuegbuzie, & Turner, 2007, p. 129). Furthermore, the findings here reinforce the interconnectedness of speaking and listening, while suggesting a reorientation in the research field toward the instruction of connected speech

features. I also hope that I have revealed the current limitations of research on technology and pronunciation instruction, in the hopes of encouraging more work in that area. Finally, I would like to strongly emphasize more exploration into the spaces where learning and instruction occur. Given how permeable the barriers are becoming between classrooms and real-world contexts, it would be beneficial to researchers, learners, and instructors to better understand how to incorporate language learning in the wild into their own spaces.

In terms of practical implications, I would appeal to curriculum and materials designers to further develop resources for speaking and listening instruction, and in particular, the instruction of connected speech. I would also urge teacher training programs to address the gaps in listening, pronunciation, and connected speech instruction described in this study's data. An additional suggestion would be to equip instructors with the necessary grant writing skills to engage technology grant funding down the road. Lastly, I would like to encourage more collaboration between software developers, educational technology specialists, language researchers, instructors, and learners. If the future is connectivity, the starting point will be our spaces of education.

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Appendix A

TABLE 2
Summary of the Different Types of Pronunciation Activities Used by the Five Teachers

#	Code	Brief description
Controlled activity		
1	Listening text presentation	Students listen to a text. No additional work is required.
2	Explanations and examples	Teacher explains and gives examples of a feature of pronunciation and how to use it.
3	Production practice	Students read a set of words or sentences, focusing on specific features of pronunciation that have been previously identified.
4	Kinesthetic/tactile production practice	Accompanied by a specific physical movement (e.g., clapping), students read target words or sentences, focusing on specific features of pronunciation that have been previously identified.
5	Checking activity	Teacher checks student performance and gives feedback on the students' work from a previous pronunciation activity.
6	Question-answer display activity—knowledge verification	To verify that students have understood previously taught material, teacher asks students knowledge-based questions to which she already knows the answer.
7	Question-answer display activity—knowledge exploration	To find out whether students already know or understand content not already taught in class, teacher asks students knowledge-based questions to which she already knows the answer.
8	Repetition drill activity	Students repeat a target form.
9	Visual identification activity	With the aid of a visual prompt or text-based material, students select a particular target form, feature, or rule. Students respond verbally.
10	Audio identification activity	(Listening discrimination activity) Students make a choice based on what they hear. Students respond verbally.
11	Repetition drill—audio identification activity	Teacher first has students repeat a target form and then asks them to make a choice based on what they hear. Students respond verbally.
12	Visual recognition activity	As with visual identification, teacher has students identify a particular target form; however, students do not respond verbally.
13	Audio recognition activity	(Listening discrimination activity) As with audio identification, students make a choice based on what they hear; however, students do not respond verbally.
14	Review activity	Teacher reviews content learned in a previous lesson.
15	Testing activity	Either students do a formal test or quiz or teacher discusses how she will assess students in an upcoming test or quiz.
Guided activity		
16	Question-answer referential activity	Teacher asks students knowledge-based questions to which she does not know the answer beforehand.
17	Production—student feedback practice	In pairs one student produces a target form while a second student gives feedback on his or her pronunciation if necessary.
18	Production—audio identification activity	One student produces a target form while a second student (or the whole class) makes a choice based on what he or she hears. The second student (or other students) responds verbally.

(Continued)

TEACHERS' KNOWLEDGE OF PRONUNCIATION TECHNIQUES 11

Figure 1. A summary of different types of pronunciation activities. From Baker, A. (2014). Exploring teachers' knowledge of second language pronunciation techniques: Teacher cognitions, observed classroom practices, and student perceptions. *TESOL Quarterly*, *48*(1), 136-163.

TABLE 2
(Continued)

#	Code	Brief description
19	Production—audio recognition activity	One student produces a target form while a second student (or the whole class) makes a choice based on what he or she hears. The second student (or whole class) does not respond verbally.
20	Mutual exchange activity	In pairs, students exchange information to accomplish a task. Requires both listening discrimination and appropriate production by both students to accomplish successfully.
21	Preparation	In pairs or groups, students prepare for a major project such as a presentation or dramatic work.
Free activity		
22	Game	Students engage in a language activity that involves an objective, a set of rules, and a degree of competition.
23	Drama	Students plan, practice, and/or perform a play, a skit, or a scene from a movie or TV show.
24	Presentation	Students give an oral exposition or report on a topic prepared by the students.
25	Discussion	Students discuss or debate a specific topic in groups.

TABLE 3
All Types of Activities Used Based on Combined Research Methods

	Tanya	Laura	Abby	Ginger	Vala
Controlled activities					
Listening text presentation	X	X	X		
Explanation and examples	X	X	X	X	X
Production practice	X	X	X	X	X
Kinesthetic/tactile practice		X	X	X	
Checking	X	X	X	X	X
Question-answer display—knowledge verification	X	X	X	X	
Question-answer display—knowledge exploration	X	X	X		
Repetition drill	X	X	X	X	X
Visual identification	X	X	X	X	X
Audio identification			X	X	X
Repetition drill—audio identification	X				
Visual recognition	X	X			
Audio recognition	X	X	X		X
Review	X	X	X		
Testing	X	X	X	X	X
Guided activities					
Question-answer referential	X				
Production—student feedback practice	X	X			X
Production—audio identification	X	X			
Production—audio recognition		X	X		
Mutual exchange			X		
Preparation	X	X	X	X	X
Free activities					
Game	X	X	X		
Drama		X			
Presentation	X		X	X	X
Discussion			X	X	X
TOTAL	19	19	19	12	12

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Figure 2. A summary of different types of pronunciation activities. From Baker, A. (2014). Exploring teachers' knowledge of second language pronunciation techniques: Teacher cognitions, observed classroom practices, and student perceptions. *TESOL Quarterly*, *48*(1), 136-163.

Appendix B

Table 1

Instructor biodata (age, gender, nationality, first language, language learning experience, length of time teaching English) (N = 34)

N	Age	Gender	Nationality	L1	L2+ Learning Experiences	Years Teaching
N1	26	F	USA	English	I have learned English "natively" since birth, and I have studied Spanish academically and immersively since I was 10.	4
N2	30	M	USA	English	I studied Spanish as a teen achieved communicative proficiency. As an adult, i studied Korean and Arabic; I speak both at a basic level.	6
N3	50	M	USA	English	Native English speaker with a bachelor's degree in Spanish, which I began studying in high school; also studied German for three terms at a local community college	3
N4	53	F	Australia	English	Native English speaker with 3 degrees in social science and a TEFL qualification.	2
N5	54	F	Australia	English	Learned French as a child (French immersion, grades 1-7, advanced level though rusty), learned a bit of Hebrew as a child (know the letters and 100 words or so), learned Spanish as an adult (advanced level), now learning Russian (beginner)	5
N6	48	F	USA	English	Have studied small amounts of several languages, majored in French in college.	21
N7	66	M	USA	English	I spoken German and French since childhood in addition to English	44
N8	60	F	USA	English	I have studied English since I was a child. I have studied Spanish as an adult and have a low intermediate proficiency.	15
N9	31	M	Brazil	Brazilian Portuguese	Self-taught + licenciate degree + master's degree in translation studies.	10
N10	65	F	USA	Spanish	I have spoken Spanish and English since childhood.	11
N11	50	F	USA	English	varied languages/beginner levels	20

N12	35	F	USA	English	I studied Spanish from high school to college	13
N13	62	F	USA	English	I studied French beginning in middle school; did one semester in French; and worked 2 years in Francophone Africa; have also studied German, Arabic, Hebrew.	40
N14	33	M	USA	English	I have studied French in middle school, Latin in high school, Spanish in graduate school, a summer course in Amer Sign Lang, one semester of Arabic. I took Mongolian classes while working for Peace Corps, and some Turkish while teaching in Turkey for 1 year	9
N15	57	F	USA	English	I studied Spanish in high school. I have dabbled in learning Turkish.	3
N16	58	F	USA	English	Currently studying beginner Chinese and low intermediate Spanish. Studied French in High School and college and Italian in college.	14
N17	51	F	Hispanic	Spanish	Learned Spanish at home and English at 13 yrs old	13
N18	44	M	USA	English	2 years Spanish in high school; several years Italian, self-study; 2 years Japanese in college; courtesy level French and German, self-study	1
N19	66	F	USA	English	I am a lifelong language learner, starting with Spanish, when I lived in Mexico (age 8), Ruusian from grandparents and in high school & BA, Flemish as exchange student in high school, German, Latin, Hungarian, and others in college and graduate school, and Mandarin, Thai, and others on my own. I speak about 6 languages at B1 or B2 (European Council/CEFR) levels and have studied a total of 15 languages.	45
N20	45	F	USA	English	English is my first and primarily language. I speak basic Spanish and school Japanese.	20
N21	31	M	USA	English	Studied German since8th Grade, Bachelors in German, Studied Korean for 1 year	9
N22	59	F	India	Tamil	I have grown up acquiring Tamil as my Mother Tongue and studied Telugu,Hindi and English in school. I learned French as a Foreign Language and have a Master's degree in English language.	12
N23	N/A	F	Turkey	Turkish	received intensive English education at age 11 and used it since then. know basic German and Spanish	6
N24	36	F	USA	English	2 years German in high school, studied Korean off-and-on for many years, bringing me to an intermediate level	17

N25	29	F	Serbia	Serbian	native speaker of Serbian, started acquiring Spanish at the age of 7, started acquiring English at the age of 9, went on to study English at primary and secondary school and studying it at university; also learnt French for 5 years, Portuguese for 2 years, Chinese for 2 years, Turkish for one year; Dutch for 8 years, Latin for 2 years.	5
N26	31	F	India	Hindi	I have studied English (British) since I was a child.	5
N27	N/A	M	USA	English	Native English; Spanish in high school and university (both US), 20 years living in Spanish-speaking country	18
N28	27	F	USA	English	I studied Spanish in high school and I was an American Sign Language major in undergrad	5
N29	48	F	USA	English	Connected to around a dozen languages as a child. Learned 2 fluently (English, German) and 3 moderately well (Russian, French, Spanish). The others I can recognize but not speak (eg. Chukeese, Maori, Samoan, Mayan Quiche, Hopi, Navajo, Mandarin)	11
N30	50	M	Iran	Persian	N/A	20
N31	N/A	F	USA	English	I've been studying French since high school, I studied German and Japanese in college, and I recently started studying Tagalog.	9
N32	52	F	USA	English	I studied Spanish as a teenager and adult.	20
N33	N/A	M	Earth	English	N/A	30
N34	N/A	M	Venezuela	Spanish	I have studied English since I was a teenager	40

Appendix C

Table 2

Student biodata (age, gender, nationality, first language, language learning experience, length of time learning English) (N = 7)

N	Age	Gender	Nationality	L1	L2+ Learning Experiences	Years Learning	Attend(ed) University?
N1	19	M	Poland	Polish	I have been learning English since ever, Russian and Spanish for three years, and German and Basque as a hobby.	10	Y
N2	19	F	Sweden	Swedish	I have studied english for 13 years, spanish for 6 years and chinese for 3 years.	13	Y
N3	18	F	South Asia	Hindi & English	I learned both Hindi and English from my parents, but have only studied English formally.	15	Y
N4	28	F	Finland	Finnish	I have studied English since I was 9, some Swedish at school (ages 13-18) and tried to learn Spanish as an adult.	19	Y
N5	23	F	Poland	Polish	i've been learning english since i was 6. i've also studied french, german and old germanic languages.	17	Y
N6	28	F	Germany	German	I started studying English when I was 11, spent 18 months abroad in an English-speaking country, hold a BA degree in English (and French) and am currently studying in an MA program of English linguistics.	17	Y
N7	36	F	Hong Kong	Cantonese	Learned English since I was 3 and mandarin since I was 6. Also learned French and German at college	N/A	Y

Appendix D

Table 3
Instructor survey participant agreement

I understand the purpose of this research. My participation in this survey is voluntary and may include the potential risks of feelings of discomfort when making comparisons and observations about oneself and others. If I wish to stop the survey for any reason, I may do so without having to give an explanation. If any questions cause me discomfort, I am free to skip them. Minor direct benefits to me include the opportunity to get additional ideas for activities inside and outside the classroom based upon provided activity suggestions. The researcher has reviewed the relevant risks and potential direct/indirect benefits with me, to the extent there are any. I am aware the information will be used in an MA Scholarly Paper that will be publicly accessible online and at the INSTITUTION NAME. I have the right to review, comment on and withdraw information prior to XXX X, 2018. All the information I provide will be confidential. The researcher will keep my survey notes and results in a secure location on his personal computer. Only the researcher and faculty adviser will have access to this information. Upon completion of this project, all surveys and notes will be destroyed. Although the information gathered in this study is confidential with respect to my personal identity, I understand that complete confidentiality cannot be guaranteed, since the researcher may be required to surrender notes and/or recordings if served with a court order. If I have questions about this study, I can contact the researcher at XXX@XXXX.edu.

Table 4
Instructor survey questions

Category		Response Type
Biodata		
1.	Age	Short Answer
2.	Gender	Multiple Choice
3.	Nationality	Short Answer
4.	First Language	Short Answer
5.	Please provide a brief description of your language learning experiences.	Long Answer
6.	How long have you taught English?	Short Answer
English Pronunciation and Connected Speech		
7.	How comfortable are you teaching English pronunciation?	1 2 3 4 5
8.	How comfortable are you teaching connected speech?	1 2 3 4 5
9.	Do you think teaching connected speech is important?	1 2 3 4 5
10.	How much technology do you use when teaching pronunciation?	1 2 3 4 5
11.	Do you think using technology to teach pronunciation is important?	1 2 3 4 5
12.	Do you think using technology to teach connected speech is important?	1 2 3 4 5
13.	Do the textbooks you use mention connected speech?	Yes / No
14.	Does the research literature you read mention connected speech?	Yes / No
15.	Do the training materials you read mention connected speech?	Yes / No

16. Do your colleagues mention connected speech? Yes / No

17. Do the LISTENING exercises you use in class involve samples of English speakers using connected speech? Yes / No

18. Do the SPEAKING exercises you use in class involve students producing English connected speech? Yes / No

19. How would you rate your students' PRONUNCIATION skills? 1 2 3 4 5

20. How would you rate your students' SPEAKING skills? 1 2 3 4 5

21. How would you rate your students' LISTENING skills? 1 2 3 4 5

22. Do you see a need for additional English connected speech teaching materials? 1 2 3 4 5

23. How would you rate your English SPEAKING skills? 1 2 3 4 5

24. How would you rate your English LISTENING skills? 1 2 3 4 5

25. Were you taught English pronunciation in the classroom? Yes / No

26. Were you taught English connected speech in the classroom? Yes / No

27. If you learned about connected speech outside the classroom, where did you learn about it? Short Answer

Features of English Connected Speech

28. How familiar are you with English WORD STRESS? [Examples: "Hello (he-LOH)" / "Goodbye (good-BAYH)" / "Welcome (WEL-kuhm)"] 1 2 3 4 5

29. How familiar are you with English SENTENCE STRESS and TIMING? [Examples: "ONE and TWO and THREE and FOUR" = "ONE and a TWO and a THREE and a FOUR"] 1 2 3 4 5

30. How familiar are you with English REDUCTION? [Examples: Going to (gonna) / Want to (wanna) / Have to (hafta)] 1 2 3 4 5

31. How familiar are you with English CITATION vs. WEAK FORMS? [Examples: "Can I have some of that?" vs. "Can I have summa / some uv that?"]	1	2	3	4	5
32. How familiar are you with English ELISION? [Examples: Camera vs. /kæmra/, Probably vs. /ˈprɒbli/, About vs. /baut/]	1	2	3	4	5
33. How familiar are you with English INTRUSION? [Examples: Triangle vs. tri-/j/angle, Lower vs. low-/w/er, Something vs. some/p/-thing]	1	2	3	4	5
34. How familiar are you with English ASSIMILATION? [Examples: Don't you (dontchu) / Did you (didju) / Won't you (wonchu)]	1	2	3	4	5
35. How familiar are you with English JUNCTURE? [Examples: Top person (to-person) / Left arm (lef-tarm) / Nitrate vs. night-rate]	1	2	3	4	5
36. How familiar are you with English CONTRACTION? [Examples: Will not (won't) / Cannot (can't) / Have not (haven't)]	1	2	3	4	5
37. When teaching pronunciation, how often do you teach English WORD STRESS? [Examples: Hello (he-LOH) / Goodbye (good-BAYH) / Welcome (WEL-kuhm)]	1	2	3	4	5
38. When teaching pronunciation, how often do you teach English SENTENCE STRESS and TIMING? [Examples: "ONE and TWO and THREE and FOUR" = "ONE and a TWO and a THREE and a FOUR"]	1	2	3	4	5
39. When teaching pronunciation, how often do you teach English REDUCTION? [Examples: Going to (gonna) / Want to (wanna) / Have to (hafta)]	1	2	3	4	5
40. When teaching pronunciation, how often do you teach English CITATION and WEAK FORMS? [Examples: "Can I have some of that?" vs. "Can I have summa / some uv that?"]	1	2	3	4	5
41. When teaching pronunciation, how often do you teach English ELISION? [Examples: Camera vs. /kæmra/, Probably vs. /ˈprɒbli/, About vs. /baut/]	1	2	3	4	5

42. When teaching pronunciation, how often do you teach English INTRUSION? [Example: Triangle vs. tri-/j/angle, Lower vs. low-/w/er, Something vs. some/p/-thing]	1	2	3	4	5
43. When teaching pronunciation, how often do you teach English ASSIMILATION? [Examples: Don't you (dontchu) / Did you (didju) / Won't you (wonchu)]	1	2	3	4	5
44. When teaching pronunciation, how often do you teach English JUNCTURE? [Examples: Top person (to-person) / Left arm (lef-tarm) / Nitrate vs. night-rate] When teaching pronunciation, how often do you teach English CONTRACTION? [Examples: Will not (won't) / Cannot (can't) / Have not (haven't)]	1	2	3	4	5

English Connected Speech Activities

45. A digital choose your own adventure (CYOA)-style story, where you will navigate based on (1) English, (2) loose English transcriptions (e.g., "We hafta run! Now!), and (3) IPA-transcribed connected speech (e.g., "ˈ/wʌlər jʊ ˈgɑnə du/" for "What're you gonna do?). CYOA story explanation available at (https://en.wikipedia.org/wiki/Choose_Your_Own_Adventure).	1	2	3	4	5
46. Reading digital graphic novels and comics that have English speech bubbles that turn into IPA connected speech transcriptions when you hover your mouse over them.	1	2	3	4	5
47. E-books and digital dictionaries that have IPA transcriptions for English connected speech features.	1	2	3	4	5
48. An activity where you guess the connected speech features within a dialogue, script, or text, and then use Word's document comparison function to see how closely your transcription matches a friend's, classmate's, or instructor's.	1	2	3	4	5
49. Watching a film or video that shows many different uses of the same connected speech feature (e.g. all the times "I can't do that" appears in a television program).	1	2	3	4	5

50. Using Youtube videos, an IPA transcript / subtitles, and the Spritz app (http://spritzinc.com/) to watch and listen for connected speech features. You can speed up or slow down the transcription and the video playback of the Youtube video.	1 2 3 4 5
51. Listening and dictation (your write down what they're saying) exercises using videos from a wide range of English speakers from all over the world.	1 2 3 4 5
52. Seeing the script of a dialogue or conversation and predicting how the words in it will change based upon English connected speech features (e.g., "an-apple" = "a napple"). Then watching the video and doing comparisons to see if your guesses were correct.	1 2 3 4 5
53. Comparing your connected speech guesses with another person's (teacher, classmate, friend) using Word's document comparison feature. Bar line transcriptions like the one below can allow you to make quick comparisons. (E.g. "She's in Italy".)	1 2 3 4 5
54. A grocery list activity, where you read through digital images of found grocery lists and determine what features in each list could be connected speech. You also take the whole list and try to imagine who the person is and how they might live based upon what they put on the list. You can then write your own grocery list and analyze it, while also using connected speech features to recite the items. (Sample grocery lists: http://www.grocerylists.org/lists-1-100/)	1 2 3 4 5
55. Keeping a digital connected speech reflective journal, where you write down your observations about connected speech and also include videos and audio files of your choosing. You can use Twitter, Instagram, Tumblr, Facebook, or other social media sites and keep the account private or open to specific individuals who may comment on your posts. Other users could share their feedback and videos and audio files as well.	1 2 3 4 5
56. What suggestions do you have for learning English connected speech using technology?	Long Answer

Table 5
Instructor survey participant thank you message

Mahalo lui noa (thank you very much) for taking the time to complete the survey. We truly value the information you have provided. Your responses will contribute to the future creation and refinement of pronunciation resources for language learners, instructors, and curriculum and materials designers.

Appendix E

Table 6
Survey sites for instructor and student survey questionnaires

Site Name		Site Type
1.	TESOL Mailing List	Mailing List
2.	Linguist List	Internet Forum
3.	Dave's ESL Café	Internet Forum
4.	r/TEFL	Reddit Community
5.	r/SampleSize	Reddit Community
6.	r/Linguistics	Reddit Community
7.	r/ELATeachers	Reddit Community
8.	r/EdTech	Reddit Community
9.	r/HigherEducation	Reddit Community
10.	r/Teachers	Reddit Community

11.	r/TEFLTeachers	Reddit Community
12.	r/LanguageLearning	Reddit Community
13.	TEFL.net Forums	Reddit Community
14.	Waygook.org Forums	Reddit Community
15.	ESL Base Forums	Internet Forum
16.	ESL/EFL/TEFL Jobs Worldwide Facebook Group	Facebook Community
17.	PIVOT: Exploring Career TESOL Pathways Facebook Group	Facebook Community
18.	Portland ESL Network Facebook Group	Facebook Community

Appendix F

Table 7
Student survey participant agreement

I understand the purpose of this research. My participation in this survey is voluntary and may include the potential risks of feelings of discomfort when making comparisons and observations about oneself and others. If I wish to stop the survey for any reason, I may do so without having to give an explanation. If any questions cause me discomfort, I am free to skip them. Minor direct benefits to me include the opportunity to get additional ideas for activities inside and outside the classroom based upon provided activity suggestions. The researcher has reviewed the relevant risks and potential direct/indirect benefits with me, to the extent there are any. I am aware the information will be used in an MA Scholarly Paper that will be publicly accessible online and at the INSTITUTION NAME. I have the right to review, comment on and withdraw information prior to XXX X, 2018. All the information I provide will be confidential. The researcher will keep my survey notes and results in a secure location on his personal computer. Only the researcher and faculty adviser will have access to this information. Upon completion of this project, all surveys and notes will be destroyed. Although the information gathered in this study is confidential with respect to my personal identity, I understand that complete confidentiality cannot be guaranteed, since the researcher may be required to surrender notes and/or recordings if served with a court order. If I have questions about this study, I can contact the researcher at XXX@XXXX.edu.

Table 8
Student survey questions

Category	Response Type
Biodata	
1. Age	Short Answer
2. Gender	Multiple Choice
3. Nationality	Short Answer
4. First Language	Short Answer
5. Please provide a brief description of your language learning experiences.	Long Answer
6. How long have you studied English?	Short Answer
7. Did/Do you attend a university?	Yes / No
English Pronunciation and Connected Speech	
8. How would you rate your English SPEAKING skills?	1 2 3 4 5
9. How would you rate your English PRONUNCIATION skills?	1 2 3 4 5
10. How would you rate your English LISTENING skills?	1 2 3 4 5
11. Were you taught English pronunciation in the classroom?	Yes / No
12. Were you taught English connected speech in the classroom?	Yes / No
13. If you learned about English connected speech outside the classroom, where did you?	Short Answer

14.	Do the LISTENING exercises you use in class involve samples of English speakers using connected speech?	Yes / No				
15.	Do the SPEAKING exercises you use in class involve speaking English using connected speech?	Yes / No				
16.	How would you rate your classmates' English SPEAKING skills?	1	2	3	4	5
17.	How would you rate your classmates' English LISTENING skills?	1	2	3	4	5
18.	How would you rate your instructor's English PRONUNCIATION skills?	1	2	3	4	5
19.	How do you feel about using technology to learn English pronunciation?	1	2	3	4	5
20.	How do you feel about using technology to learn English connected speech?	1	2	3	4	5
21.	Do you think it is important to learn English connected speech (i.e., how speakers of English actually talk)?	1	2	3	4	5

Features of English Connected Speech

22.	How familiar are you with English WORD STRESS? [Examples: "Hello (he-LOH)" / "Goodbye (good-BAYH)" / "Welcome (WEL-kuhm)"]	1	2	3	4	5
23.	How familiar are you with English SENTENCE STRESS and TIMING? [Examples: "ONE and TWO and THREE and FOUR" = "ONE and a TWO and a THREE and a FOUR"]	1	2	3	4	5
24.	How familiar are you with English REDUCTION? [Examples: Going to (gonna) / Want to (wanna) / Have to (hafta)]	1	2	3	4	5
25.	How familiar are you with English CITATION vs. WEAK FORMS? [Examples: "Can I have some of that?" vs. "Can I have summa / some uv that?"]	1	2	3	4	5

26. How familiar are you with English ELISION? [Examples: Camera vs. /kæmra/, Probably vs. /ˈprɒbli/, About vs. /baut/]	1	2	3	4	5
27. How familiar are you with English INTRUSION? [Examples: Triangle vs. tri-/j/angle, Lower vs. low-/w/er, Something vs. some/p/-thing]	1	2	3	4	5
28. How familiar are you with English ASSIMILATION? [Examples: Don't you (dontchu) / Did you (didju) / Won't you (wonchu)]	1	2	3	4	5
29. How familiar are you with English JUNCTURE? [Examples: Top person (to-person) / Left arm (lef-tarm) / Nitrate vs. night-rate]	1	2	3	4	5
30. How familiar are you with English CONTRACTION? [Examples: Will not (won't) / Cannot (can't) / Have not (haven't)]	1	2	3	4	5

English Connected Speech Activities

31. A digital choose your own adventure (CYOA)-style story, where you will navigate based on (1) English, (2) loose English transcriptions (e.g., "We hafta run! Now!), and (3) IPA-transcribed connected speech (e.g., "ˈ/wʌlər jʊ ˈgɑnə du/" for "What're you gonna do?). CYOA story explanation available at (https://en.wikipedia.org/wiki/Choose_Your_Own_Adventure).	1	2	3	4	5
32. Reading digital graphic novels and comics that have English speech bubbles that turn into IPA connected speech transcriptions when you hover your mouse over them.	1	2	3	4	5
33. E-books and digital dictionaries that have IPA transcriptions for English connected speech features.	1	2	3	4	5
34. An activity where you guess the connected speech features within a dialogue, script, or text, and then use Word's document comparison function to see how closely your transcription matches a friend's, classmate's, or instructor's.	1	2	3	4	5
35. Watching a film or video that shows many different uses of the same connected speech feature (e.g. all the times "I can't do that" appears in a television program).	1	2	3	4	5

36. Using Youtube videos, an IPA transcript / subtitles, and the Spritz app (http://spritzinc.com/) to watch and listen for connected speech features. You can speed up or slow down the transcription and the video playback of the Youtube video.	1 2 3 4 5
37. Listening and dictation (your write down what they're saying) exercises using videos from a wide range of English speakers from all over the world.	1 2 3 4 5
38. Seeing the script of a dialogue or conversation, and predicting how the words in it will change based upon English connected speech features (e.g., "an-apple" = "a napple"). Then watching the video and doing comparisons to see if your guesses were correct.	1 2 3 4 5
39. Comparing your connected speech guesses with another person's (teacher, classmate, friend) using Word's document comparison feature. Bar line transcriptions like the one below can allow you to make quick comparisons. (E.g. "She's in Italy".)	1 2 3 4 5
40. A grocery list activity, where you read through digital images of found grocery lists and determine what features in each list could be connected speech. You also take the whole list and try to imagine who the person is and how they might live based upon what they put on the list. You can then write your own grocery list and analyze it, while also using connected speech features to recite the items. (Sample grocery lists: http://www.grocerylists.org/lists-1-100/)	1 2 3 4 5
41. Keeping a digital connected speech reflective journal, where you write down your observations about connected speech and also include videos and audio files of your choosing. You can use Twitter, Instagram, Tumblr, Facebook, or other social media sites and keep the account private or open to specific individuals who may comment on your posts. Other users could share their feedback and videos and audio files as well.	1 2 3 4 5
42. What suggestions do you have for learning English connected speech using technology?	Long Answer

Table 9
Student survey participant thank you message

Mahalo lui noa (thank you very much) for taking the time to complete the survey. We truly value the information you have provided. Your responses will contribute to the future creation and refinement of pronunciation resources for language learners, instructors, and curriculum and materials designers.

Appendix G

Table 10
Article deep dive related to pronunciation, pronunciation with suprasegmentals and suprasegmentals with technology

Journal Name	# of Issues Since 2015	Total Articles	Pron. Articles	Pron. w/ Supra.	Supra. w/ Technology
1. TESOL Quarterly	13	82	12	1	0
2. TESOL Journal	13	113	7	1	0
3. CALL	24	145	16	8	2
4. CALICO	10	60	5	1	0
5. Language Learning and Language Technology (LLLT)	17	66	4	3	0
6. CALL-EJ Online	7	26	1	1	1
7. ReCALL	10	61	1	1	1
8. International Association for Language Learning Technology (IALLT)	5	18	0	0	0
9. System	27	302	15	5	0
10. International Review of Applied Linguistics in Language Teaching	13	55	7	0	0
11. International Journal of Applied Linguistics	10	81	5	0	0
12. Journal of Second Language Pronunciation	6	33	33	7	1
13. Language Teaching	14	120	6	3	0

14. Language Teaching Research	20	122	7	3	0
15. Modern Language Journal	16	133	11	2	0
16. Second Language Research	15	68	15	5	0
17. Studies in Second Language Acquisition	12	71	10	6	1
18. Education and Information Technologies	18	370	1	1	1
19. Journal of Phonetics	21	155	155	27	1
20. Journal of the International Phonetic Association	9	28	2	2	0
21. Journal of Speech Language and Hearing Research	26	610	221	9	2
22. Advances in Language and Literary Studies	19	505	32	5	1
23. Asian Social Science	39	1609	0	0	0
Total	**364**	**2719**	**566 (21%)**	**91 (3%)**	**11 (0.4%)**

Appendix H

Table 11
Instructor comfort teaching pronunciation, connected speech, and using technology to accomplish both (N = 34)

		M	SD
1.	How comfortable are you teaching English pronunciation?	4.12	1.02
2.	How comfortable are you teaching connected speech?	3.88	1.12
3.	Do you think teaching connected speech is important?	4.32	0.88
4.	How much technology do you use when teaching pronunciation?	3.24	1.16
5.	Do you think using technology to teach pronunciation is important?	3.61	1.28
6.	Do you think using technology to teach connected speech is important?	3.70	1.19
7.	Do you see a need for additional English connected speech teaching materials?	3.91	0.97

Table 12
Instructor comfort teaching pronunciation, connected speech, and using technology to accomplish both (N = 34)

N	How comfortable are you teaching English pronunciation?	How comfortable are you teaching connected speech?	Do you think teaching connected speech is important?	How much technology do you use when teaching pronunciation?	Do you think using technology to teach pronunciation is important?	Do you think using technology to teach connected speech is important?	Do you see a need for additional English connected speech teaching materials?
N1	1	3	4	2	4	5	4
N2	5	5	4	3	3	4	3
N3	4	3	4	4	3	3	3
N4	5	5	5	1	1	3	1
N5	3	4	5	4	5	5	3
N6	5	5	4	3	3	3	4
N7	5	5	5	1	1	1	5
N8	5	4	5	5	5	5	4
N9	5	5	5	5	5	5	5
N10	4	1	3	4	4	3	3
N11	4	3	4	3	4	3	4
N12	2	2	5	2	3	3	4

N13	5	5	4	3	2	2	3
N14	4	3	5	2	3	N/A	4
N15	3	4	5	4	3	3	5
N16	5	5	5	4	5	5	5
N17	4	2	4	2	4	4	4
N18	4	3	5	4	4	4	5
N19	5	5	5	4	3	3	4
N20	4	4	5	4	5	5	4
N21	4	4	3	3	2	3	3
N22	5	5	4	3	5	5	3
N23	3	3	4	3	5	5	4
N24	3	2	2	5	1	1	2
N25	5	4	4	1	4	4	5
N26	4	4	5	3	4	4	5
N27	5	5	5	3	4	4	4
N28	3	3	4	2	3	3	3
N29	5	5	5	5	3	3	4

N30	5	3	2	3	5	5	5
N31	4	4	5	3	5	5	5
N32	5	4	3	3	2	2	4
N33	5	5	5	4	5	4	5
N34	3	5	5	5	5	5	4

Appendix I

Table 12
Whether instructor training materials and resources mention or involve connected speech (N = 34)

	Y	N	N/A
19. Do the textbooks you use mention connected speech?	53%	32%	15%
20. Does the research literature you read mention connected speech?	41%	47%	12%
21. Do the training materials you read mention connected speech?	53%	38%	9%
22. Do your colleagues mention connected speech?	38%	56%	6%
23. Do the LISTENING exercises you use in class involve samples of English speakers using connected speech?	82%	15%	3%

24. Do the SPEAKING exercises you use in class involve students producing English connected speech?	76%	21%	3%

1. N/A indicates contexts where instructors (1) did not use textbooks, (2) did not have access to textbooks, (3) or created all their own materials.
2. N/A indicates instructors did not read the research in the field or who didn't respond.
3. N/A indicates non-response or non-understanding by instructor participant.
4. N/A indicates instructor non-response
5. N/A indicates instructor not knowing
6. N/A indicates instructor not knowing

Table 13
Whether instructor training materials and resources mention or involve connected speech (N = 34)

N	Do the textbooks you use mention connected speech?	Does the research literature you read mention connected speech?	Do the training materials you read mention connected speech?	Do your colleagues mention connected speech?	Do the LISTENING exercises you use in class involve samples of English speakers using connected speech?	Do the SPEAKING exercises you use in class involve students producing English connected speech?
N1	No	No	No	No	Yes	Yes
N2	Yes	No	Yes	Yes	Yes	Yes
N3	I don't usually use a textbook	Yes	Yes	No	Yes	occasionally
N4	No	No	No	No	Yes	Yes

N5	Yes	N/A	N/A	N/A	Yes	Yes
N6	Yes	Yes	N/A	N/A	Yes	Yes
N7	No	Yes	Yes	No	No	Yes
N8	Yes	Yes	Yes	No	Yes	Yes
N9	Yes	Yes	Yes	Yes	Yes	Yes
N10	No	No	No	No	No	No
N11	No	No	No	No	No	Yes
N12	Yes	Yes	Yes	Yes	Yes	Yes
N13	Yes	I haven't done much research in this area	Yes	Yes	Yes	Yes
N14	Yes	No	Yes	Yes	Yes	Yes
N15	Yes	Yes	Yes	No	Yes	Yes
N16	Yes	No	No	No	Yes	Yes
N17	No	No	No	No	No	No
N18	I currently work and volunteer part-time and create/adapt all my own materials	Yes	Yes	No	Yes	Yes

N19	I don't regularly use a textbook for speaking.	Yes	Yes	Some	Yes	Yes
N20	A bit, but it's hodgepodge, probably about the same way I teach it...it's not the focus of the oral communication class	Sometimes. It depends on the focus of the research.	Yes, depending on the materials.	Rarely	Yes	Yes
N21	Yes	Yes	Yes	Yes	Yes	Yes
N22	No	Yes	Yes	No	Yes	Yes
N23	Yes	No	Yes	Yes	Yes	No
N24	Yes	I don't read much research literature.	Yes	No	Yes	No
N25	No	No	I don't know	No	I don't know	I don't know
N26	Only a few contracted forms like I'm, I've etc.	No	No	Yes	Yes	Yes
N27	No	Yes	No	Yes	Yes	No
N28	I don't currently have a textbook	No	No	No	Yes	not explicitly? I'm not sure what exactly you

						mean by this... am I grading them on it? is it the sole focus of the assignment? do I expect them to use it in general?
N29	I am currently working with Burlington English. There is no textbook.	Not that I can recall.	No	Yes	Yes	Yes
N30	No	No	No	No	No	No
N31	Some do.	Haven't read up much on this topic recently, but of what I have seen, yes.	I'm not sure what this means. Training materials for teachers? Yes.	In class? I think so? They at least do when the curriculum requires it.	Yes	It depends on the class (topic, learning outcomes)
N32	Yes	Yes	Yes	No	Yes	Yes
N33	Yes	I find it to be 'woefully lacking.'	No	No	Yes	Yes
N34	No	No	No	No	Yes	Yes

Appendix J

Table 14
How instructors feel about their students' speaking and listening skills (N = 34)

		M	*SD*
1.	How would you rate your students' PRONUNCIATION skills?	3	0.78
2.	How would you rate your students' SPEAKING skills?	3.21	0.73
3.	How would you rate your students' LISTENING skills?	3.29	0.87

Table 15

How instructors feel about their students' speaking and listening skills (N = 34)

N	How would you rate your students' PRONUNCIATION skills?	How would you rate your students' SPEAKING skills?	How would you rate your students' LISTENING skills?
N1	3	4	5
N2	4	4	3
N3	3	4	4
N4	3	3	3
N5	3	4	3
N6	3	3	3
N7	4	4	2
N8	3	3	3
N9	3	3	3
N10	4	3	5
N11	4	4	4
N12	2	3	3

N13	4	4	4
N14	3	3	3
N15	2	2	3
N16	3	4	4
N17	3	4	2
N18	1	2	2
N19	2	3	3
N20	3	4	5
N21	4	3	3
N22	3	3	3
N23	2	2	2
N24	2	2	3
N25	4	3	3
N26	3	3	4
N27	3	3	3
N28	3	4	4
N29	4	4	5

N30	2	2	2
N31	4	3	3
N32	3	3	4
N33	2	2	3
N34	3	4	3

Appendix K

Table 16
How instructors feel about their own speaking and listening skills (N = 34)

	M	*SD*
25. How would you rate your English SPEAKING skills?	4.82	0.46
26. How would you rate your English LISTENING skills?	4.85	0.36

	Y	N	N/A
27. Were you taught English pronunciation in the classroom?	35%	62%	3%
28. Were you taught English connected speech in the classroom?	29%	68%	3%

	TT	OTJ/PD	R/M	N	N/A
29. If you learned about connected speech outside the classroom, where did you learn about it?	12%	6%	18%	12%	53%

7. N/A indicates non-response.
8. N/A indicates non-response
9. TT = teacher training, OTJ/PD = on the job / professional development, R/M = research and materials (books, etc.), N = natural contexts (instructors with English as L1), N/A = non-response, non-understanding, or entirely new topic for instructor (N = 1)

Table 17
How instructors feel about their own speaking and listening skills (N = 34)

N	How would you rate your English SPEAKING skills?	How would you rate your English LISTENING skills?	Were you taught English pronunciation in the classroom?	Were you taught English connected speech in the classroom?	If you learned about connected speech outside the classroom, where did you learn about it?
N1	5	5	No	No	N/A
N2	5	5	No	No	N/A
N3	4	4	Yes	Yes	I learned about it in phonetics and phonology courses, not TESOL
N4	5	5	No	No	N/A
N5	5	5	No	No	I'm a native English speaker, so this set of questions is a little bizarre.
N6	5	5	N/A	N/A	N/A
N7	5	5	Yes	Yes	N/A
N8	5	5	Yes	Yes	I have also read up on connected speech

					outside of the classroom.
N9	5	5	Yes	Yes	Books, articles, videos...
N10	3	5	No	No	N/A
N11	5	5	No	No	N/A
N12	5	5	No	No	N/A
N13	5	5	No	No	I'm a native speaker of English
N14	5	5	No	No	N/A
N15	5	4	No	No	N/A
N16	5	5	No	No	N/A
N17	4	4	No	No	conferences, PD training, other
N18	5	5	No	No	[as a monolingual native English speaker, I find this page confusing]
N19	5	5	Yes	Yes	See long answer above.
N20	5	5	Yes	Yes	I have a masters in applied linguistics

					and a pronunciation course was required, which covered connected speech among other topics
N21	5	5	No	No	N/A
N22	5	5	Yes	Yes	N/A
N23	5	5	No	No	in a book called Whaddaya say
N24	5	5	No	No	N/A
N25	5	5	Yes	Yes	I never heard about it before this survey
N26	5	4	Yes	Yes	Linguistics lessons, edu tech poducts
N27	5	5	No	No	Native English speaker; Spanish instruction offered NO support in this aspect
N28	5	5	No	No	N/A
N29	5	5	Yes	Yes	course materials at one school where I taught

N30	4	5	Yes	Yes	N/A
N31	5	5	No	No	As a speaker by learning English as an L1. As a teacher by reading and seminars/webinars.
N32	5	5	No	No	as a teacher, not a student
N33	5	5	No	No	I came across American Accent Training by Ann Cook
N34	4	4	Yes	Yes	While reading an article about TEFL

Appendix L

Table 18
How familiar instructors are with English connected speech features (N = 34)

		M	*SD*
1.	Word Stress	4.76	0.65
2.	Sentence Stress	4.47	0.99
3.	Reduction	4.76	0.55
4.	Citation vs. Weak Forms	4.11	1.17
5.	Elision	4.30	0.92
6.	Intrusion	3.74	1.36
7.	Assimilation	4.50	0.86
8.	Juncture	3.76	1.39
9.	Contraction	4.97	0.17

Table 19
How familiar instructors are with English connected speech features (N = 34)

N	How familiar are you with English WORD STRESS?	How familiar are you with English SENTENCE STRESS and TIMING?	How familiar are you with English REDUCTION?	How familiar are you with English CITATION vs. WEAK FORMS?	How familiar are you with English ELISION?	How familiar are you with English INTRUSION?	How familiar are you with English ASSIMILATION?	How familiar are you with English JUNCTURE?	How familiar are you with English CONTRACTION?
N1	5	3	5	2	4	3	4	1	5
N2	5	5	5	5	5	5	5	5	5
N3	5	5	5	3	5	5	5	5	5
N4	5	1	3	2	3	1	3	1	5
N5	5	5	5	5	5	5	5	5	5
N6	5	5	5	5	NA	5	5	5	5
N7	5	5	5	5	5	5	5	5	5
N8	5	5	5	5	4	1	5	1	5
N9	5	5	5	5	5	5	5	5	5

N10	5	4	5	4	3	3	5	3	5
N11	5	5	5	4	4	4	4	4	4
N12	5	4	4	4	4	2	4	3	5
N13	5	5	5	5	5	5	5	5	5
N14	5	5	5	4	4	4	5	3	5
N15	3	3	4	2	2	2	4	4	5
N16	5	5	5	5	5	5	5	4	5
N17	3	2	4	2	4	2	2	2	5
N18	5	5	5	1	3	3	5	1	5
N19	5	5	5	5	5	5	5	5	5
N20	5	5	5	5	5	5	5	5	5
N21	5	4	5	5	5	4	3	3	5
N22	5	5	5	5	5	5	5	5	5
N23	5	4	5	5	4	4	5	3	5
N24	3	3	3	3	2	1	2	3	5
N25	5	5	5	4	5	4	4	4	5
N26	5	5	5	4	4	3	5	5	5

N27	5	5	5	5	5	5	5	5	5
N28	5	5	5	5	5	3	4	2	5
N29	5	5	5	4	5	3	5	5	5
N30	5	5	5	5	5	5	5	5	5
N31	5	5	5	5	5	5	5	3	5
N32	5	5	5	3	3	2	4	4	5
N33	5	5	5	5	5	4	5	5	5
N34	3	4	4	4	4	4	5	4	5

Appendix M

Table 20
How often instructors of English teach specific connected speech features (N = 34)

	M	*SD*
1. Word Stress	4.44	0.82
2. Sentence Stress	3.97	1.24
3. Reduction	3.94	1.10
4. Citation vs. Weak Forms	3.56	1.26
5. Elision	3.50	1.19
6. Intrusion	2.74	1.46
7. Assimilation	3.71	1.21
8. Juncture	3.06	1.43
9. Contraction	4.59	0.56

Table 19
How familiar instructors are with English connected speech features (N = 34)

N	How familiar are you with English WORD STRESS?	How familiar are you with English SENTENCE STRESS and TIMING?	How familiar are you with English REDUCTION?	How familiar are you with English CITATION vs. WEAK FORMS?	How familiar are you with English ELISION?	How familiar are you with English INTRUSION?	How familiar are you with English ASSIMILATION?	How familiar are you with English JUNCTURE?	How familiar are you with English CONTRACTION?
N1	5	3	5	2	4	3	4	1	5
N2	5	5	5	5	5	5	5	5	5
N3	5	5	5	3	5	5	5	5	5
N4	5	1	3	2	3	1	3	1	5
N5	5	5	5	5	5	5	5	5	5
N6	5	5	5	5	NA	5	5	5	5
N7	5	5	5	5	5	5	5	5	5
N8	5	5	5	5	4	1	5	1	5
N9	5	5	5	5	5	5	5	5	5

N10	5	4	5	4	3	3	5	3	5
N11	5	5	5	4	4	4	4	4	4
N12	5	4	4	4	4	2	4	3	5
N13	5	5	5	5	5	5	5	5	5
N14	5	5	5	4	4	4	5	3	5
N15	3	3	4	2	2	2	4	4	5
N16	5	5	5	5	5	5	5	4	5
N17	3	2	4	2	4	2	2	2	5
N18	5	5	5	1	3	3	5	1	5
N19	5	5	5	5	5	5	5	5	5
N20	5	5	5	5	5	5	5	5	5
N21	5	4	5	5	5	4	3	3	5
N22	5	5	5	5	5	5	5	5	5
N23	5	4	5	5	4	4	5	3	5
N24	3	3	3	3	2	1	2	3	5
N25	5	5	5	4	5	4	4	4	5
N26	5	5	5	4	4	3	5	5	5

N27	5	5	5	5	5	5	5	5	5
N28	5	5	5	5	5	3	4	2	5
N29	5	5	5	4	5	3	5	5	5
N30	5	5	5	5	5	5	5	5	5
N31	5	5	5	5	5	5	5	3	5
N32	5	5	5	3	3	2	4	4	5
N33	5	5	5	5	5	4	5	5	5
N34	3	4	4	4	4	4	5	4	5

Appendix N

Table 20
How instructors feel about suggested connected speech CALL activities (N = 34)

	M	SD
1. Digital Choose Your Own Adventure (CYOA) Story	3.45	1.28
2. Digital Comics / Graphic Novels w/IPA Connected Speech Gloss	3.45	1.35
3. E-books and Dictionaries w/Connected Speech IPA Gloss	3.70	1.26
4. Word Doc Comparison	4.00	0.97
5. Video Supercut of Connected Speech in Use	4.24	1.00
6. YouTube and Spritz Applet	4.06	1.06
7. Listening & Dictation from Digital Regional Dialects	4.06	1.22
8. Script / Subtitle Word Doc	3.88	1.19
9. Partner Comparison Word Doc	3.06	1.20
10. Digital Grocery List	3.34	1.33
11. Digital Reflective Journals on Social Media	3.39	1.25

Table 21

How instructors feel about suggested connected speech CALL activities (N = 34)

N	CYOA Story	Digital Comics / Graphic Novels w/ Connected Speech IPA Gloss	E-books and Dictionaries w/Connected Speech IPA Gloss	Word Doc Comparison	Video Supercut	YouTube & Spritz Applet	Listening & Dictation from Various Digitized Regional Speakers	Script / Subtitle Activity	Partner Comparison & Word Doc	Grocery List	Digital Reflective Journals on Social Media
N1	1	1	1	3	5	4	4	1	1	1	5
N2	3	3	3	4	4	1	1	2	4	3	5
N3	2	2	2	1	4	4	5	3	1	1	5
N4	1	4	4	4	4	4	3	4	1	4	2
N5	3	1	1	4	5	2	4	5	1	3	3
N6	1	3	5	3	5	4	3	3	3	N/A	2
N7	2	5	4	4	1	3	1	1	1	1	1
N8	3	3	5	4	5	4	3	4	3	4	3
N9	4	4	5	5	5	5	5	5	4	4	4
N10	3	5	5	4	4	3	3	3	3	3	3
N11	4	1	2	3	5	4	4	4	3	4	5

N12	5	2	3	3	3	4	4	4	4	3	2
N13	2	2	2	4	5	5	5	4	3	5	4
N14	2	4	5	4	4	3	4	3	4	2	3
N15	3	3	4	4	5	5	5	5	4	4	4
N16	4	4	4	5	5	5	3	5	3	2	4
N17	3	3	4	3	3	4	5	3	4	2	2
N18	5	5	3	5	5	5	5	5	5	5	4
N19	3	3	3	4	5	5	5	5	3	4	2
N20	4	2	3	5	4	4	4	5	3	3	5
N21	5	5	5	4	4	5	5	4	4	4	5
N22	4	4	4	4	4	3	4	5	4	4	3
N23	5	5	5	5	5	5	5	5	4	5	4
N24	2	2	2	2	2	2	1	2	2	1	1
N25	4	4	4	4	3	4	5	4	4	3	2
N26	5	5	4	4	5	5	5	5	4	5	5
N27	5	5	5	5	4	5	5	3	3	2	2
N28	4	3	4	5	3	3	4	5	3	4	3
N29	5	2	2	3	4	4	5	5	1	5	4

N30	4	5	5	5	5	5	5	4	5	5	5
N31	4	4	4	5	5	5	5	5	2	2	3
N32	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N33	5	5	5	5	5	5	4	3	3	4	3
N34	4	5	5	5	5	5	5	4	4	5	4

Appendix O

Table 22
How instructors feel about suggested connected speech CALL activities (N = 34)

N	Suggestions
N1	Listening to examples of speech that may or may not have connected speech (it is ambiguous), and then guessing what the speaker intended based on context.
N2	N/A
N3	Timed speaking, such as Nations' 3-2-1 exercise or Pecha Kucha presentations -- anything that forces students to speak faster and more relaxed
N4	N/A
N5	I have only ever had 1 student with very strong IPA and don't have time to teach it. So I wouldn't be able to use tools that rely on IPA.
N6	I'm not sure the way you're representing juncture is helpful for students. (We don't say "a napple"; we say "anapple".) . Also, your example IPA transcriptions are somewhat problematic (e.g. for "gonna"). Which points out the issues of having students actually do significant amounts of transcription. It's very useful for them to understand it, but having them really do it in large amounts is not as useful, I've found. I really like some of your ideas for using technology, but many of them seem to overemphasize student-generated transcription. Just my two cents. Thanks!
N7	pronunciation must be focussed and quick. More than a couple of minutes on pronunciation at a time is wasted effort on both sides.
N8	Use limericks and have students analyze them using some of your techniques, and then students are recorded reciting the limerick. Then they analyze their recording and write a reflection on what they did well and what they need to improve on. The instructor does the same and both meet to discuss findings. This helps

students not only learn targets but also gain trust in their own self-evaluation and build confidence in their pronunciation and speaking.

N9 N/A

N10 N/A

N11 N/A

N12 N/A

N13 I use mirroring practice with nonnative speakers of English reading poems they love from the Favorite Poem Project http://www.favoritepoem.org/index.html

N14 The most useful to me would be transcribing an audio assignment, answering some comprehension questions, and seeing how my transcription differs from classmates and the teacher. During this we could discuss connected speech. Subsequently, we could record speaking short parts of the dialogue analyzed and see how close we can match the original pronunciation and stress patterns. Then reflect what made this task easy or difficult.

N15 N/A

N16 A low-cost, reliable app that models connected speech and captures student speech samples for instructor review.

N17 Teachers of ELLs need to be trained on how to teach connected speech first then be informed of technology resources available to teach reading with connected speech. I am not familiar with many technology resources in the market.

N18 While I have not delved this deeply into connected speech specifically, I frequently use the videos on ELLLO.ORG for listening activities. Videos are short and include transcripts. I feel it's crucial for students to begin to notice the difference between written and spoken English, and the transcripts help to that end. ELLLO is great because so many varieties are represented.

N19 N/A

N20 I use audio clips very often. Students listen to the audio and mark linking, reductions, thought groups, etc., depending on the target structure. Songs are also very useful, although I think they're more useful if they are edited with a video editor to allow for pausing and feedback. It just takes a lot of time to create these type of activities!

N21 N/A

N22 Using samples of everyday conversation (eg.In a Pharmacy, a book-store)as spoken by different speakers of English would be a useful exercise.

N23 videos from films

N24 I've used ISpraak as well as www.englishcentral.com. They give you a "score", and I find that my score is less than perfect as a native speaker. I rarely teach pronunciation because I feel it's a bit dull. I taught it during my speech classes, but generally, I only correct grammar when there are problems with communication. I don't do many exercises of any kind if I can help it.

N25 teach me what connected speech is!

N26 Listening exercises can help decode connected speech. Poetry and songs can also be of huge help because they follow a rhythm and hence connected speech is more apparent there (from the perspective of encoding and decoding.)

N27 My focus is primarily on student comprehension - auditory flexibility - when confronted with most of these features. Though the Common European Framework specifically avoids pronunciation issues (and the US Common Core Curriculum lacks the worldview and rigor to consider them), I would equate the PRODUCTION of many of these features with B2,2 and up, where the comfort and ease of expression allows a student to produce at a rate where such features might be anticipated.

N28 N/A

N29 N/A

N30 N/A

N31 N/A

N32 N/A

N33 N/A

N34 I know it sounds boring, but repetitive drilling (using IPA and audio).

Appendix P

Table 23
How students feel about their speaking and listening skills, their classmates', and their instructors' (N = 7)

	M	*SD*
1. How would you rate your English SPEAKING skills?	4.42	0.53
2. How would you rate your English PRONUNCIATION skills?	4.29	0.95
3. How would you rate your English LISTENING skills?	4.43	1.13
4. How would you rate your classmates' English SPEAKING skills?	4.14	0.90
5. How would you rate your classmates' English LISTENING skills?	4.42	0.79
6. How would you rate your instructor's English PRONUNCIATION skills?	4.29	0.49

Table 24

How students feel about their speaking and listening skills, their classmates', and their instructors' (N = 7)

N	How would you rate your English SPEAKING skills?	How would you rate your English PRONUNCIATION skills?	How would you rate your English LISTENING skills?	How would you rate your classmates' English SPEAKING skills?	How would you rate your classmates' English LISTENING skills?	How would you rate your instructor's English pronunciation teaching skills?
N1	4	3	2	4	4	4
N2	5	5	5	5	5	4
N3	4	5	5	5	5	5
N4	4	3	4	3	3	4
N5	5	5	5	5	5	5
N6	5	5	5	4	4	4
N7	4	4	5	3	5	4

Appendix Q

Table 25
Whether students were taught connected speech or pronunciation in class (N = 7)

	Y	N	N/A
30. Were you taught English pronunciation in the classroom?	86%	14%	0%
31. Were you taught English connected speech in the classroom?	86%	0%	14%

10. N/A indicates non-understanding by student participant.

Table 26
Whether students were taught connected speech or pronunciation in class (N = 7)

N	Were you taught English pronunciation in the classroom?	Were you taught English connected speech in the classroom?
N1	Yes	Yes
N2	No	I don't know what that is
N3	Yes	Yes
N4	Yes	Yes
N5	Yes	Yes
N6	Yes	Yes
N7	Yes	Yes

Appendix R

Table 27
Whether student classroom materials reflect connected speech usage (N = 7)

	Y	N	N/A
32. Do the LISTENING exercises you use in class involve samples of English speakers using connected speech?	100%	0%	0%
33. Do the SPEAKING exercises you use in class involve samples of English speakers using connected speech?	86%	14%	0%

11. N/A indicates non-understanding by student participant.

Table 28
Whether student classroom materials reflect connected speech usage (N = 7)

N	Do the LISTENING exercises you use in class involve samples of English speakers using connected speech?	Do the SPEAKING exercises you use in class involve samples of English speakers using connected speech?
N1	Yes	Yes
N2	Yes	Yes
N3	Yes	Yes
N4	Yes	Yes
N5	Yes	at university level, yes. but i got a degree in english, so an average english learner would not be taught this.
N6	Yes	No
N7	Yes	Yes

Appendix S

Table 29
How students feel about using technology to learn pronunciation and connected speech (N = 7)

	M	SD
1. How do you feel about using technology to learn English pronunciation?	3.29	1.11
2. How do you feel about using technology to learn English connected speech?	3.29	1.25

Table 30
How students feel about using technology to learn pronunciation and connected speech (N = 7)

N	How do you feel about using technology to learn English pronunciation?	How do you feel about using technology to learn English connected speech?
N1	4	2
N2	2	3
N3	2	2
N4	4	5
N5	3	3
N6	5	5
N7	3	3

Appendix T

Table 31
How familiar students are with English connected speech features (N = 7)

	M	SD
1. Word Stress	4.40	0.79
2. Sentence Stress	4.14	1.07
3. Reduction	4.57	0.79
4. Citation vs. Weak Forms	3.67	1.63
5. Elision	4.14	0.90
6. Intrusion	3.29	1.89
7. Assimilation	4.42	0.79
8. Juncture	3.43	1.27
9. Contraction	4.86	0.38

Table 32
How familiar students are with English connected speech features (N = 7)

N	How familiar are you with English WORD STRESS?	How familiar are you with English SENTENCE STRESS and TIMING?	How familiar are you with English REDUCTION?	How familiar are you with English CITATION vs. WEAK FORMS?	How familiar are you with English ELISION?	How familiar are you with English INTRUSION?	How familiar are you with English ASSIMILATION?	How familiar are you with English JUNCTURE?	How familiar are you with English CONTRACTION?
N1	4	3	3	1	3	1	4	3	5
N2	3	3	5	5	3	1	3	2	5
N3	5	5	5	5	5	5	5	3	5
N4	4	3	4	3	4	2	4	2	4
N5	5	5	5	N/A	5	5	5	5	5
N6	5	5	5	5	5	5	5	5	5
N7	5	5	5	3	4	4	5	4	5

Appendix U

Table 33
How students feel about suggested connected speech CALL activities (N = 7)

	M	SD
1. Digital Choose Your Own Adventure (CYOA) Story	3.86	1.21
2. Digital Comics / Graphic Novels w/IPA Connected Speech Gloss	3.57	1.27
3. E-books and Dictionaries w/Connected Speech IPA Gloss	4.00	1.15
4. Word Doc Comparison	3.43	1.62
5. Video Supercut of Connected Speech in Use	3.71	1.60
6. YouTube and Spritz Applet	3.57	1.62
7. Listening & Dictation from Digital Regional Dialects	3.57	1.27
8. Script / Subtitle Word Doc	3.43	0.98
9. Partner Comparison Word Doc	2.71	1.25
10. Digital Grocery List	3.14	1.57
11. Digital Reflective Journals on Social Media	2.43	1.51

Table 32
How familiar students are with English connected speech features (N = 7)

N	How familiar are you with English WORD STRESS?	How familiar are you with English SENTENCE STRESS and TIMING?	How familiar are you with English REDUCTION?	How familiar are you with English CITATION vs. WEAK FORMS?	How familiar are you with English ELISION?	How familiar are you with English INTRUSION?	How familiar are you with English ASSIMILATION?	How familiar are you with English JUNCTURE?	How familiar are you with English CONTRACTION?
N1	4	3	3	1	3	1	4	3	5
N2	3	3	5	5	3	1	3	2	5
N3	5	5	5	5	5	5	5	3	5
N4	4	3	4	3	4	2	4	2	4
N5	5	5	5	N/A	5	5	5	5	5
N6	5	5	5	5	5	5	5	5	5
N7	5	5	5	3	4	4	5	4	5

Appendix V

Figure 3. CYOA adventure story progress seen from three modifications: (a) standard orthography, (b) broad IPA transcription, and (c) loose transcription.

Appendix W

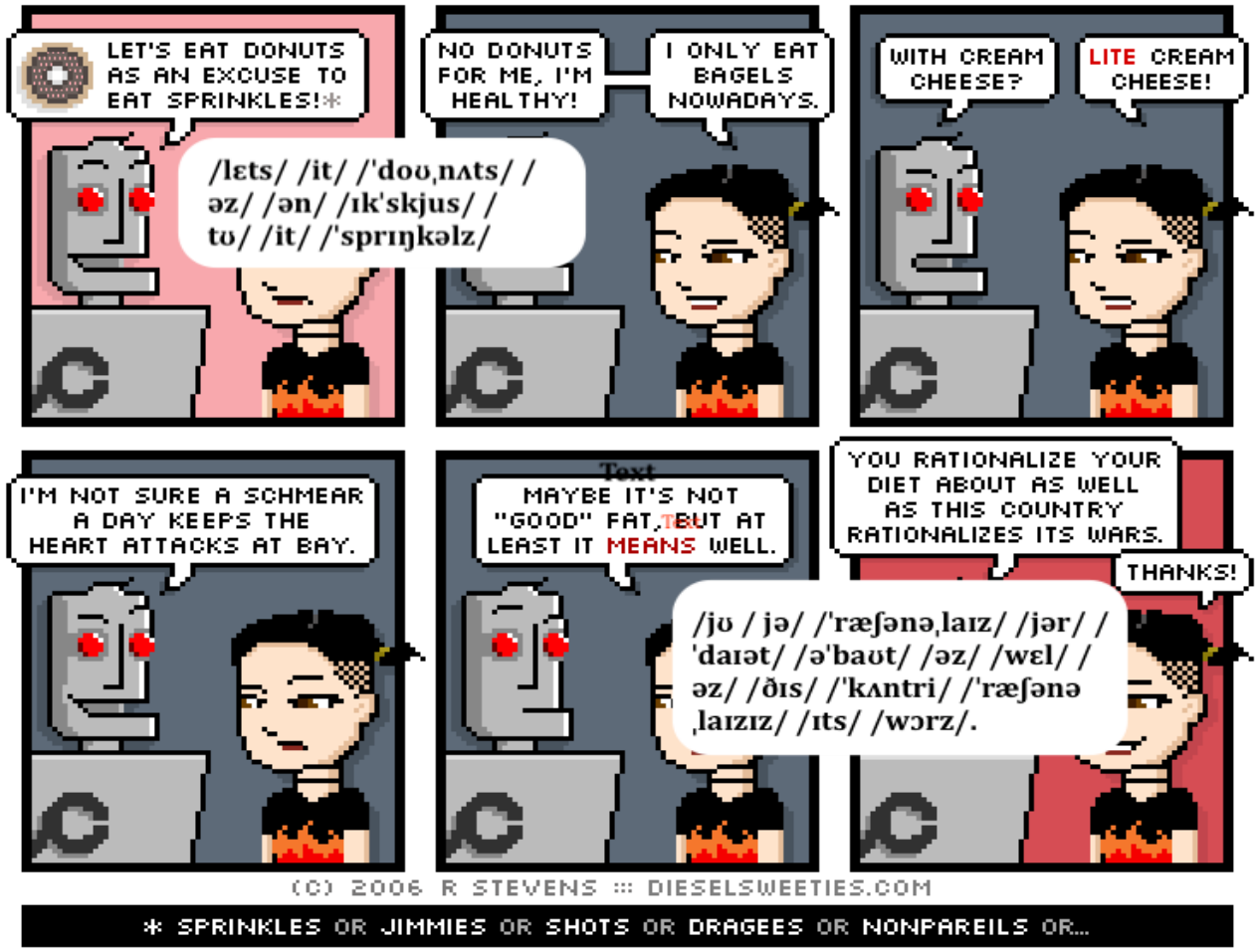

Figure 4. Graphic novel glossed with IPA-transcribed connected speech using mouse hover technique.

Appendix X

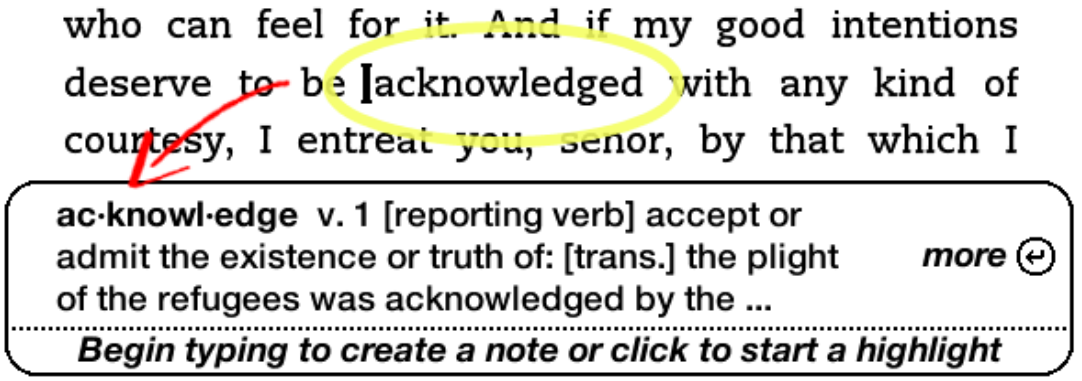

Figure 5. Example of text selected to be highlighted.

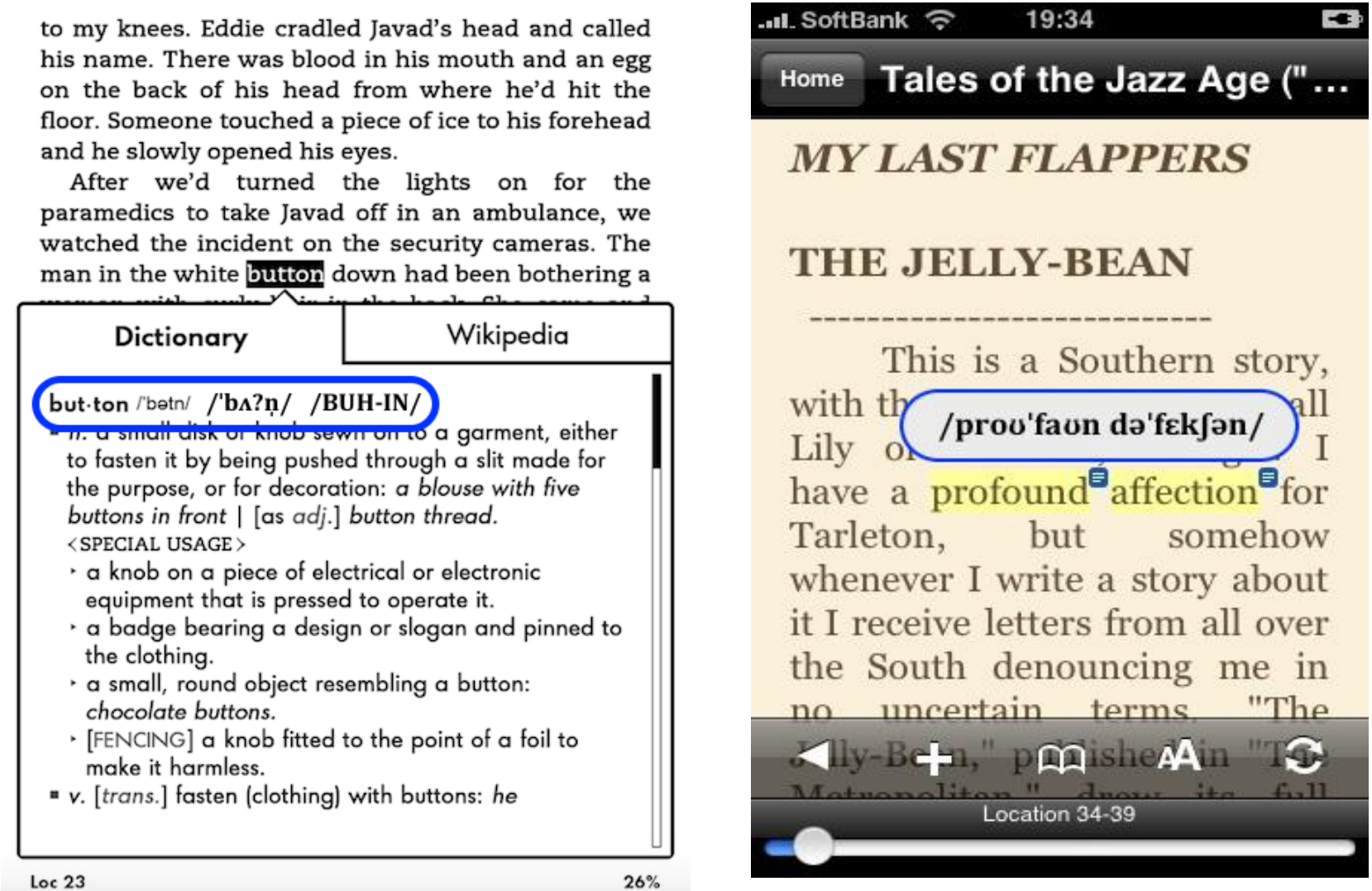

Figure 6. IPA-glossed connected speech entry in e-book and highlighted connected speech gloss in mobile e-book.

Appendix Y

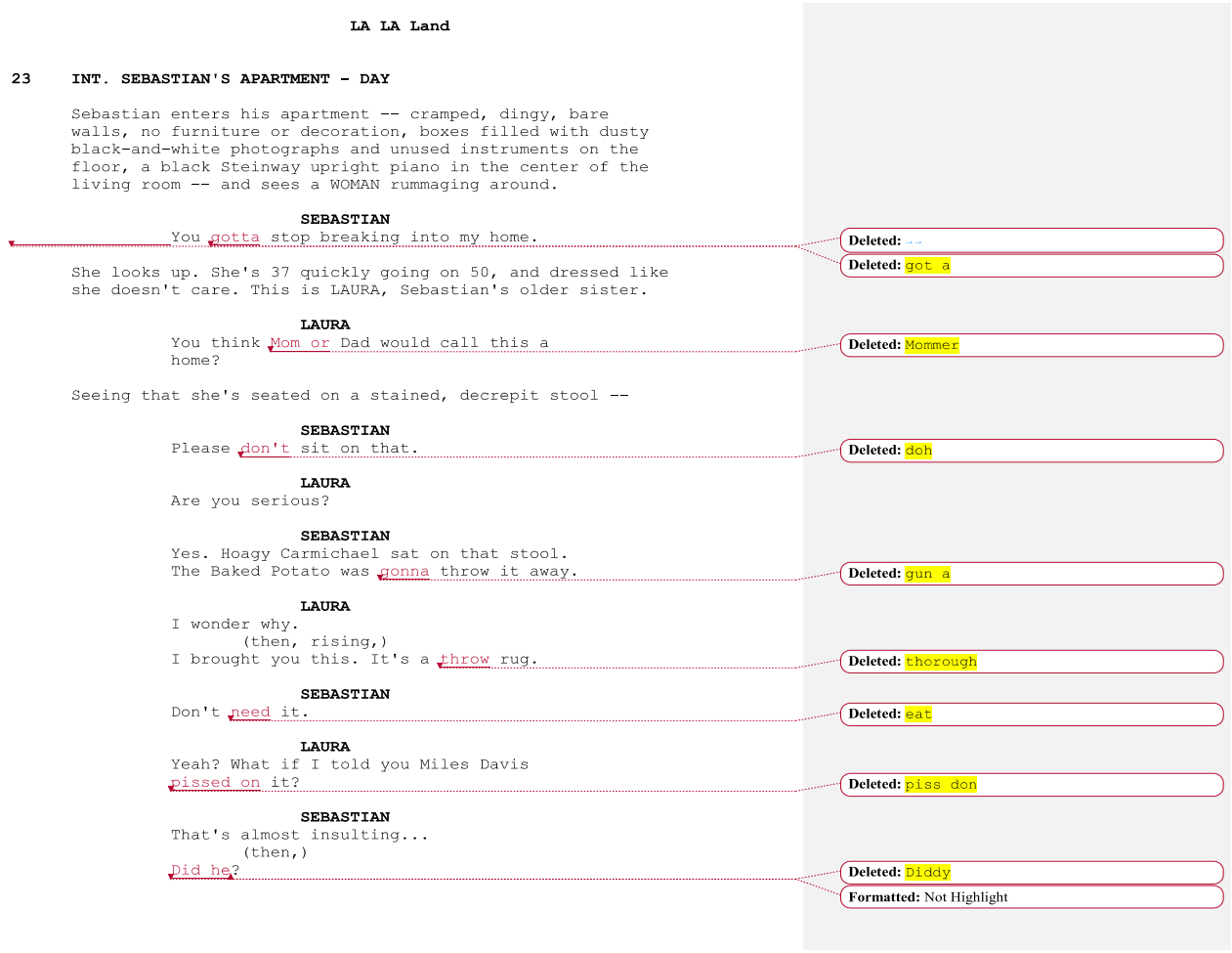

Figure 7. Word document comparison output showing learner hypotheses vs. actual script dialogue.

Appendix Z

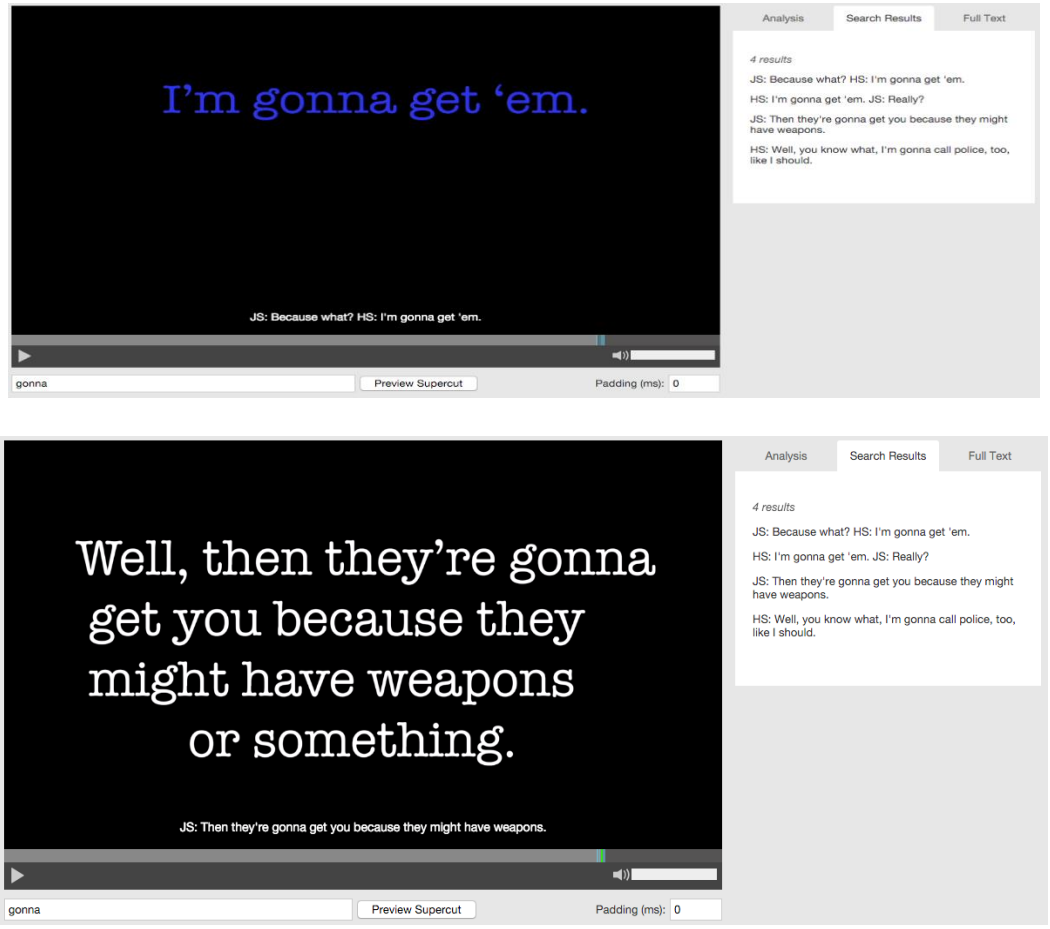

Figure 8. Videogrep supercut footage of connected speech points.

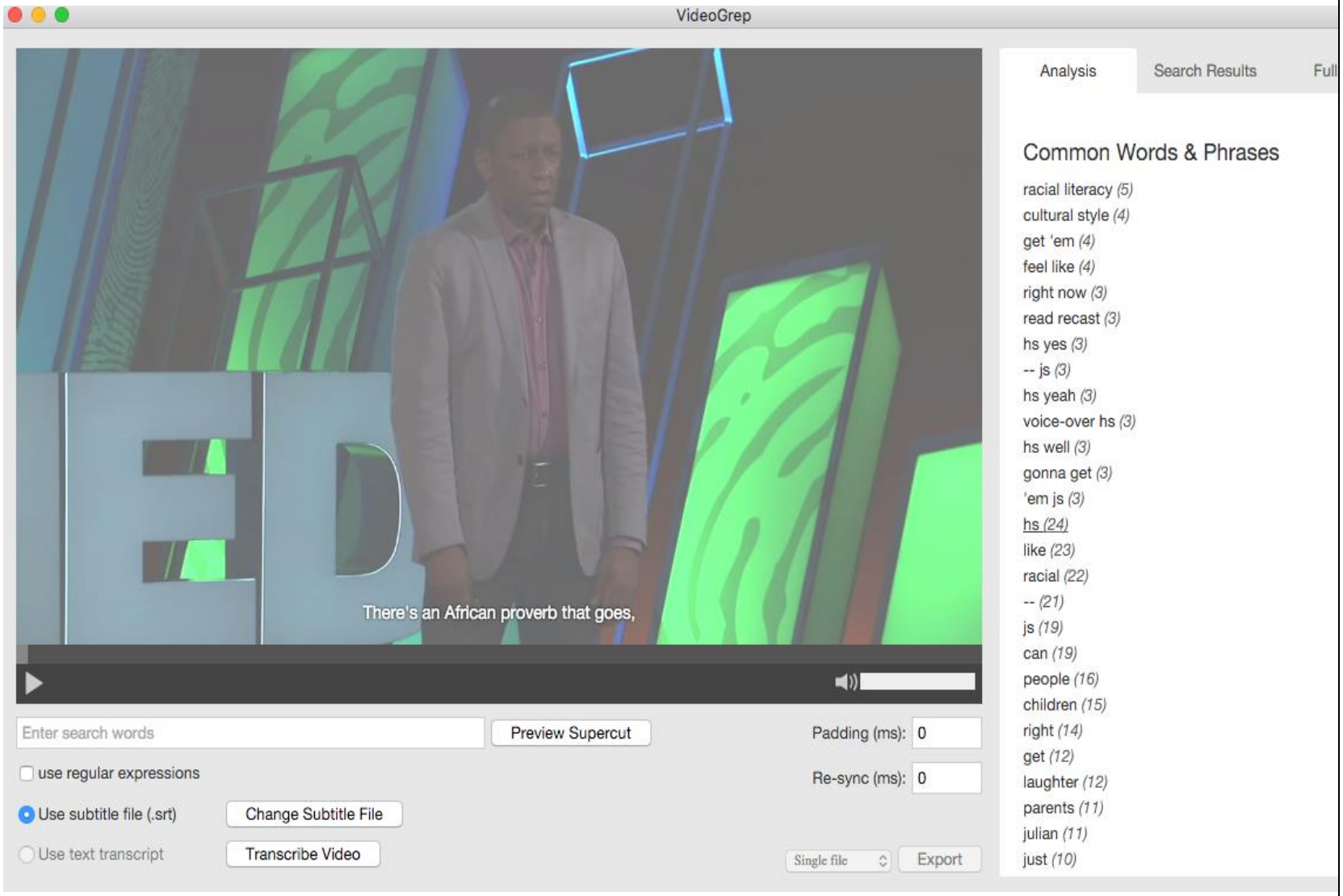

Figure 9. Videogrep interface with type-token corpus (right-hand side).

Appendix AA

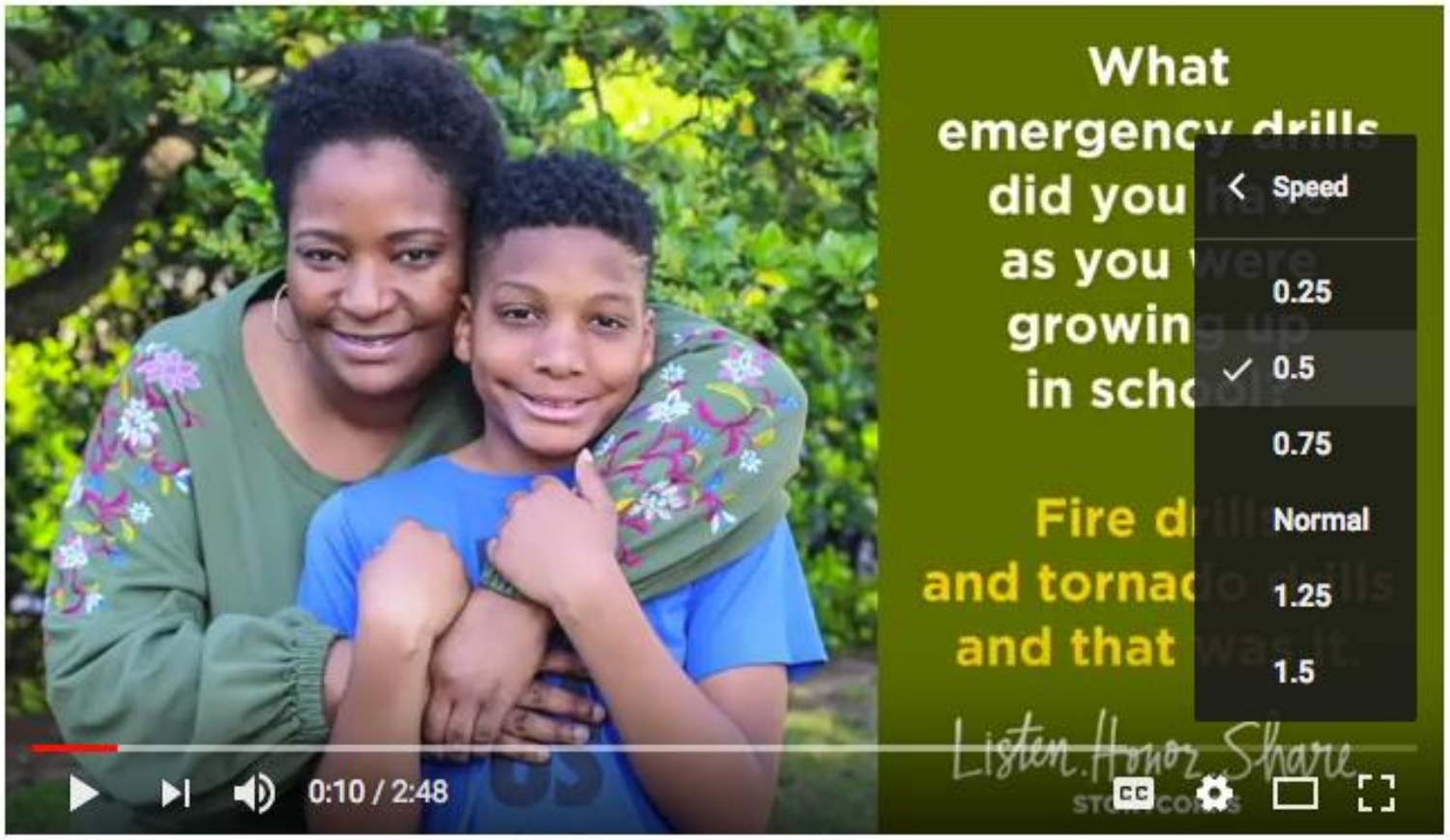

Figure 10. StoryCorps screenshot with playback speed adjustment (right-hand side).

Dezmond Floyd (DF) and Tanai Benard (TB)

DF: What emergency drills did you have as you were growing up in school?

TB: Fire drills and tornado drills and that was it.

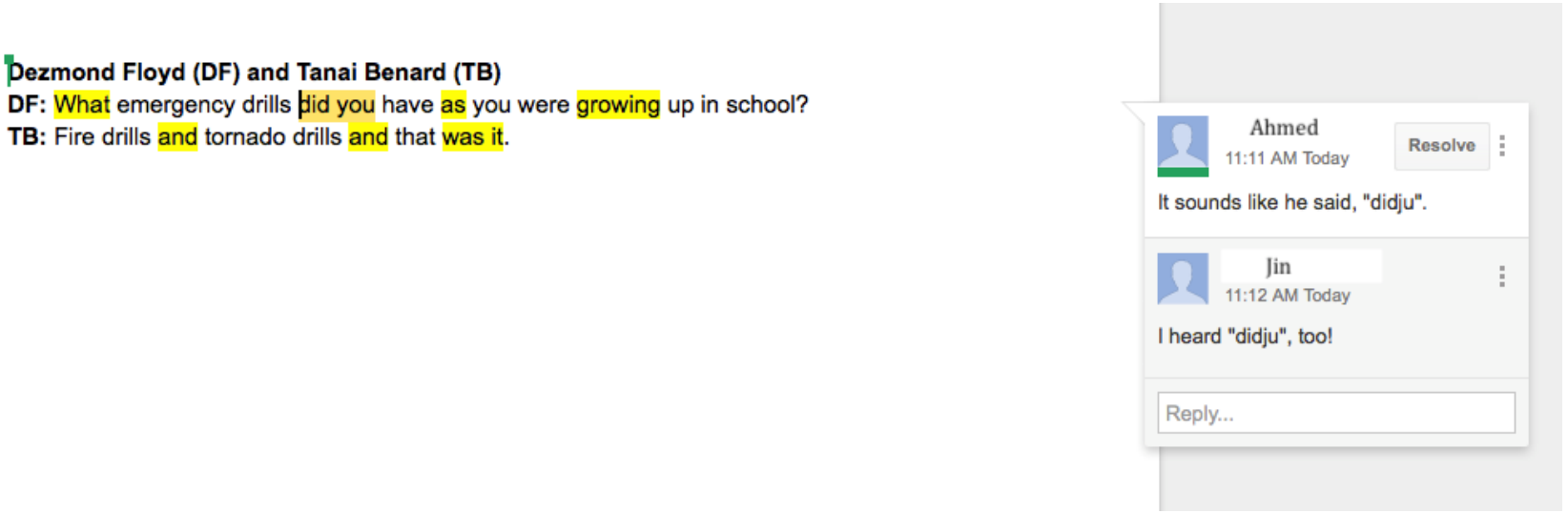

Figure 11. Highlighted connected speech text from video transcript above, and collaborative Google Docs space with learner comments.

Appendix BB

Figure 12. Speech Accent Archive landing page.

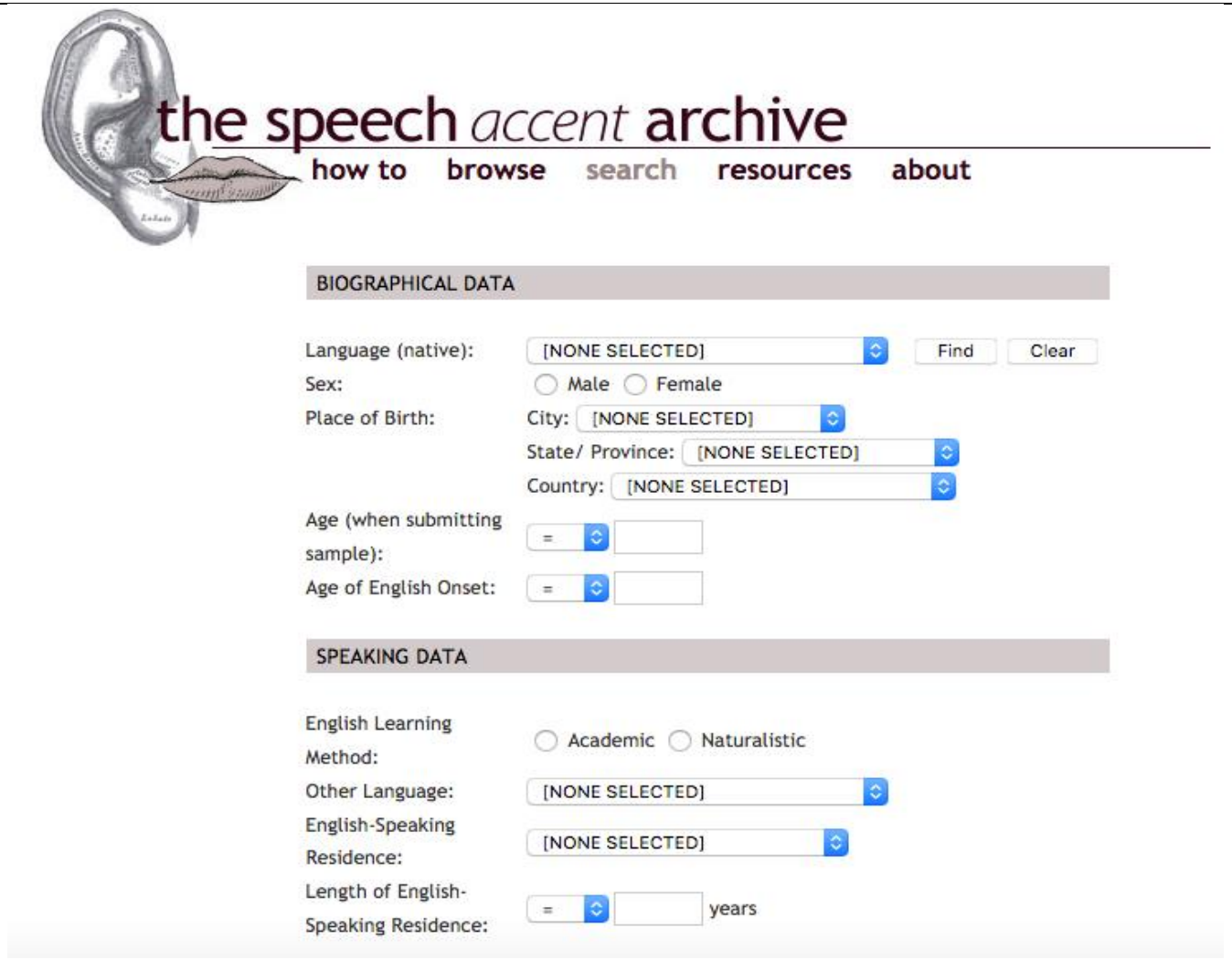

Figure 13. Speech Accent Archive search page.

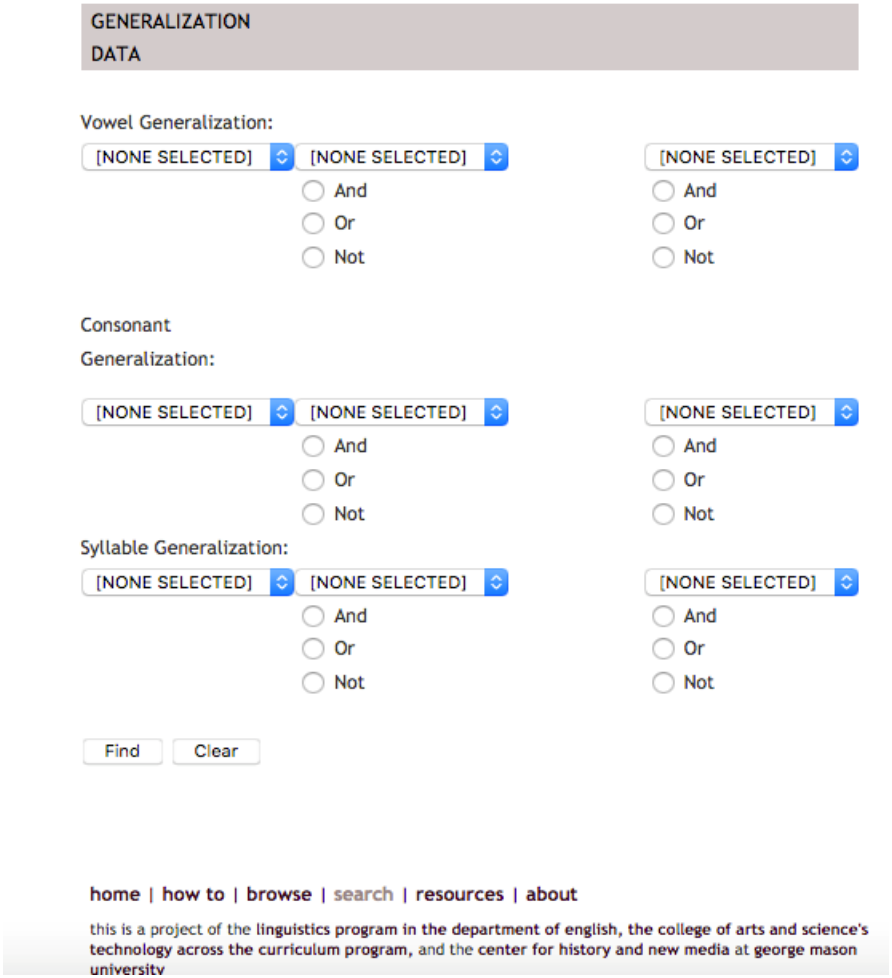

Figure 14. Additional search options on the Speech Accent Archive search page.

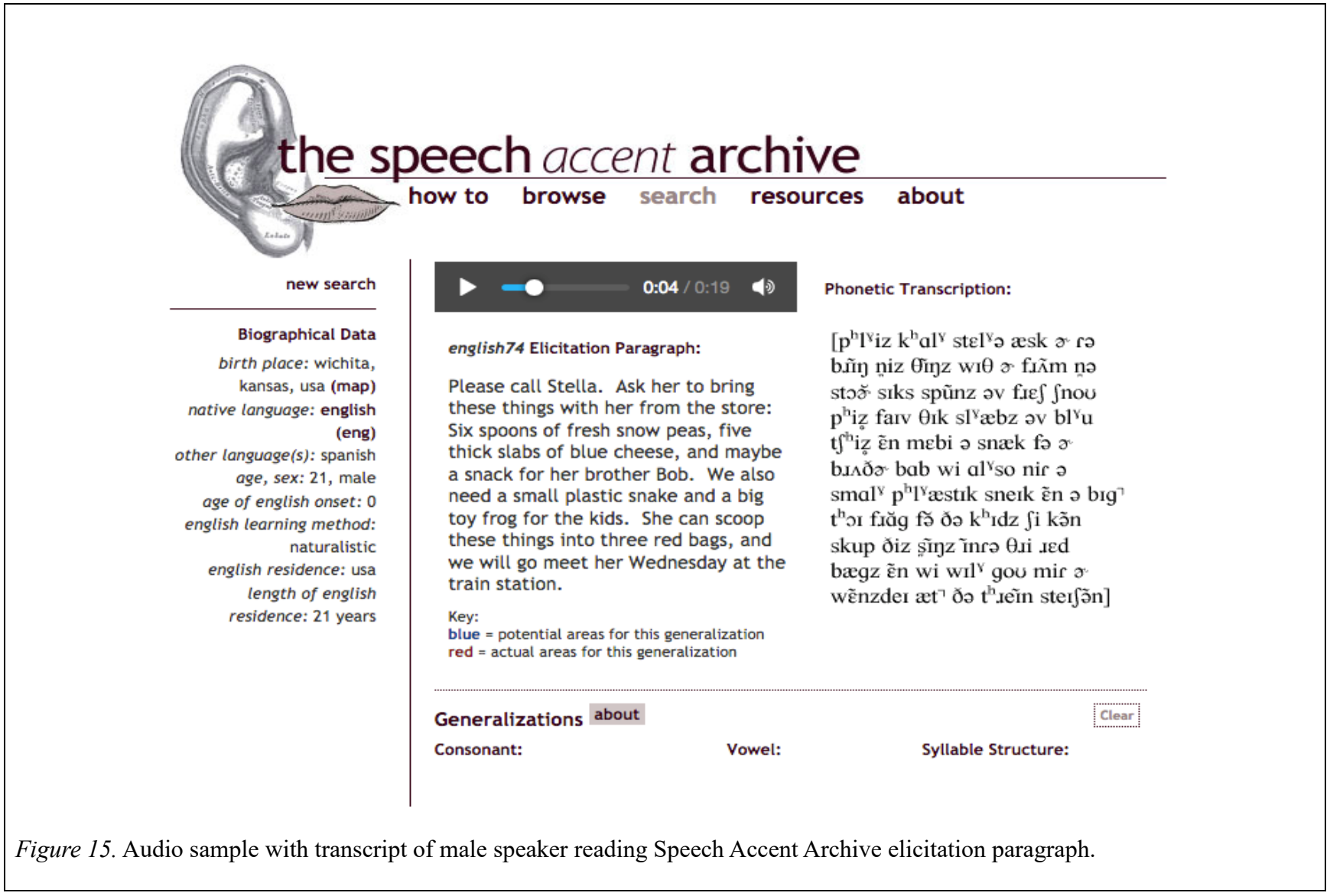

Figure 15. Audio sample with transcript of male speaker reading Speech Accent Archive elicitation paragraph.

***english74* Elicitation Paragraph:**

Please call Stella. Ask her to bring these things with her from the store: Six spoons of fresh snow peas, five thick slabs of blue cheese, and maybe a snack for her brother Bob. We also need a small plastic snake and a big toy frog for the kids. She can scoop these things into three red bags, and we will go meet her Wednesday at the train station.

Key:
blue = potential areas for this generalization
red = actual areas for this generalization

Phonetic Transcription:

[pʰlˠiz kʰɑlˠ stɛlˠə æsk ɚ ɾə
bɹ̃ɲ n̥iz θ̃ɪŋz wɪθ ɚ fɹʌ̃m n̥ə
stɔɚ̆ sɪks spũnz əv fɹɛʃ ʃnoʊ
pʰiz̥ faɪv θɪk slˠæbz əv blˠu
tʃʰiz̥ ɛ̃n mɛbi ə snæk fə ɚ
bɹʌðɚ bɑb wi ɑlˠso nɪɾ ə
smɑlˠ pʰlˠæstɪk sneɪk ɛ̃n ə bɪg˞
tʰɔɪ fɹɑ̆g fə̃ ðə kʰɪdz ʃi kə̃n
skup ðiz s̥ĩŋz ĩnɾə θɹi ɹɛd
bægz ɛ̃n wi wɪlˠ goʊ mɪɾ ɚ
wɛ̃nzdeɪ æt˞ ðə tʰɹeĩn steɪʃə̃n]

Figure 16. Close-up view of elicitation paragraph with narrow phonetic transcription of speaker's utterance.

Figure 17. Vocaroo recording page. Once the sample is recorded, a web link option will appear.

Figure 18. MIT Scratch environment for designing games and animations.

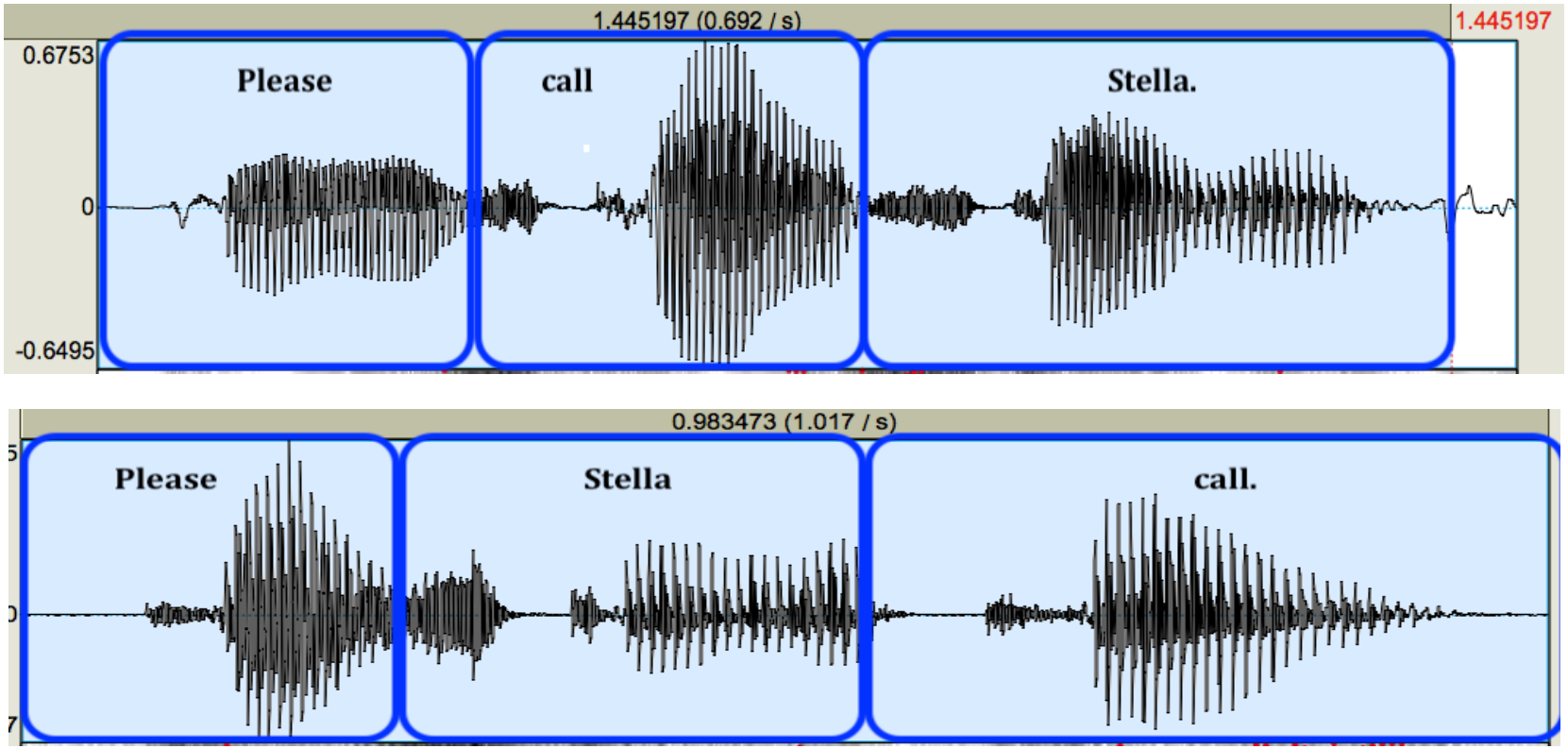

Figure 19. Comparison of two different spectrogram outputs ("Please call Stella" vs. "Please Stella call").