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PRONUNCIATION AND TECHNOLOGY

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INTRODUCTION

Pronunciation training that makes use of technology has come a long way from its early days in language laboratories equipped with record players. The current explosion in new technologies means that language learners are now capable of working on their pronunciation at any time, regardless of where they are. Web-based programs and mobile apps that claim to improve learners' pronunciation are readily accessible, and most are relatively inexpensive. Nonetheless, many of the commercially available products are often neither pedagogically sound nor informed by research (Foote & Smith, 2013). There is clearly a need for collaboration among pronunciation researchers, software developers, and classroom language teachers to determine which aspects of pronunciation should be prioritized for which types of learners, which types of pronunciation activities are most beneficial for developing pronunciation skills, and how these technologies can best be used to enhance classroom teaching. Most importantly, the goal of any new pronunciation technology should be the development of more intelligible speech. That is, pronunciation training should enable second language (L2) learners to be more easily understood (Levis, 2005).

The use of pronunciation technologies within an L2 teaching and learning context is captured within the field of Computer-Assisted Pronunciation Teaching (CAPT). Recent reviews of the CAPT literature (Chun, 2013; Levis, 2007; O'Brien, 2011) often demonstrate promising results, especially with software that provides learners with specific feedback on their errors. Researchers tend to rely on software that was developed for the recording and analysis of learners' speech. On the other hand, language learners and teachers are often on the lookout for user-friendly software that has been developed specifically for the purposes of student training (i.e., courseware). Until recently, the gulf between the use of technology for research and teaching has seemed far too wide. Although software used in research laboratories like *Praat* (Boersma & Weenink, 2017) and *Audacity* (Audacity Team, 2017) have been developed with the goals of researchers in mind, with training and a set of clear learner tasks, this same technology can be used for teaching purposes (e.g., Hardison, 2004; Levis & Pickering, 2004). Similarly, courseware created for the purposes of training learners' perception (e.g., *English Accent Coach,* Thomson, 2017) or production (e.g., *DISCO*, Strik, Colpaert, van Doremalen, & Cucchiarini, 2012) can be used to gather data on pronunciation development. Moving forward, collaborations among stakeholders will result in more research-informed pronunciation technologies that have the capability to truly improve learners' pronunciation in ways that are tailored to individual learners' needs.

Encouraging collaboration among stakeholders was a primary goal of the 2016 Pronunciation in Second Language Learning and Teaching (PSLLT) Conference. The theme of the Conference, held at the University of Calgary on August 12-13, 2016, was

"The Role of Technology in L2 Pronunciation Research and Teaching." It featured 41 individual papers and 13 posters, a plenary by John Levis on the use of technology in the intelligibility-based classroom, 11 research-based tips and strategies for teaching pronunciation, and a roundtable on the development and use of cutting-edge technology in L2 pronunciation teaching and research. Sponsored by *Language Learning*, the roundtable featured the work of Debra Hardison, Catia Cucchiarini, Hansjörg Mixdorff, and Ron Thomson. The organizers were fortunate to receive substantial funding from other sponsors including the Social Sciences and Humanities Research Council of Canada (SSHRC), the University of Calgary Faculty of Arts, the University of Alberta Faculties of Education and Extension, and the Alberta Teachers of English as a Second Language (ATESL).

We are pleased to share the Proceedings with you. A representative sample of conference papers and teaching tips and strategies are included here. Many of the contributions feature specific technologies including sophisticated hardware (i.e., ultrasound), acoustic analysis software like *Praat*, and software designed for purposes other than teaching pronunciation (e.g., *Qualtrics*, *Anytune*). The themes of the papers extend beyond the use of technology and include the assessment of L2 pronunciation, the effects of pronunciation training, the ability of learners to perceive and / or produce segmental differences in their L2, prosodic features of the L2, and learner and teacher beliefs and practices. We have also included nine website/software/corpus/book reviews. Although these reviews were not presented at the conference, they align well with the conference theme and will be of special interest to pronunciation researchers and teachers. Below we present a brief summary of each of the contributions.

PAPERS

In their paper "The Role of Phonological Distributional Information on the Acquisition of L2 Allophones", Taylor Anne Barriuso and Shannon Barrios focus on adults' ability to distinguish between [b] and [β] after exposure to these segments in an artificial language. The authors were primarily interested in determining whether participants exposed to the sounds in overlapping contexts (i.e., the segments were presented in all of the same contexts) would differ in their sensitivity to these sounds from participants who heard the sounds in complementary contexts (i.e., the contexts did not overlap). Although they expected that listeners would be able to make use of distributional information and that participants in the overlapping context would be better able to distinguish between [b] and [β] on an ABX task, they found no such pattern, and they concluded that the participants were unable to infer the phonological status of the two segments.

Shannon Becker examines the ability of English-French L2 learners from three separate levels of French instruction to perceive and produce the French nasal vowels /ɑ̃/ and /ɔ̃/ in her contribution "Perception and Production of Unfamiliar L2 Segments: Using Technology for Teaching and Research." The results demonstrate that learners did not differ according to class level and that there were no changes from pre- to posttest. Participants showed a great deal of variation in their production of these segments. The

final section of the paper encourages instructors to make use of research tools like *Praat* and *Qualtrics* survey software to create perception and production exercises for students.

The contribution "Ultrasound Technology and its Role in Cantonese Pronunciation Teaching and Learning" by Heather Bliss, Lauretta Cheng, Murray Schellenberg, Zoe Lam, Raymond Pai, and Bryan Gick focuses on the use of ultrasound overlay videos as a pronunciation teaching tool in beginner level university Cantonese language classes. The researchers taught the pronunciation of two sets of sounds (unreleased final stops and low central vowels) to learners under two conditions. One group of participants used the overlay videos and the other used audio-only materials. The results point to better performance in perception and production among learners who made use of the videos. Based on the findings, the authors propose that such videos could be used as pronunciation teaching tools in a range of languages.

Wayne B. Dickerson's piece, "The Baby in the Rhythmic Bathwater," proposes an alternative to teaching English stress-timed rhythm, which he calls the two-peak profile. Although he notes that there are certain aspects of pedagogical materials that rely on a model of stress-timed rhythm that are worth using in the classroom, he posits that the two-peak profile is both better aligned with the rhythm that is employed in spontaneous speech. His contribution demonstrates how teachers can integrate the two-peak profile approach even when their classroom resources are based on a model of stress-timed rhythm.

David O. Johnson and Okim Kang, in "Measures of Intelligibility in Different Varieties of English: Human vs. Machine," introduce an automated tool to measure the intelligibility of English speech. The performance of the tool was compared to human measure of intelligibility of six varieties of English speech (American, British, Indian, South African, Chinese, and Spanish). The computer tool was used to identify up to 11 features that likely affect intelligibility scores.

In his paper "An Acoustic Phonetic Account of the Confusion between [ɹ] and [l] in Seven Varieties of L2 English: Focus on Intelligibility and Accentedness," Ettien Koffi provides analyses of [ɹ] and [l] productions of English L2 learners from a range of first languages (L1s) and compares them to those produced by native speakers of American English. The results of acoustic analyses of F3 values and vibration rates of the consonants demonstrate that some participants produced /l/s and /ɹ/s that are indistinguishable from one another. Koffi concludes with pedagogical implications that focus on encouraging intelligible production of the consonants.

Di Liu's "A Mandarin Speaker's Intonational Emphasis in English and Mandarin Lectures" examines one Mandarin-English L2 learner's prosodic marking of new and old information in an identical lecture given in both of his languages. Specifically, Liu looks at the speaker's use of maximum pitch to highlight new constituents. The results indicate that the speaker uses pitch to contrast new and old information to a greater extent in Mandarin than in English. Liu proposes that learners should be encouraged transfer prosodic features from their L1 to their L2, even when the two languages are typologically dissimilar.

Enrica Piccardo and Brian North report on their project aimed at developing new descriptors targeting pronunciation for the Common European Framework of Reference in their paper "Developing Phonology Descriptors for the Common European Framework of Reference (CEFR)." The authors describe the multi-staged consultation process and the qualitative and quantitative analysis of data that they carried out to come up with the new descriptors of phonological proficiency and new scales (sound articulation and prosody). Whereas the previous scale of phonological control was based on notions of accentedness, the authors point to the central role played by intelligibility in the new descriptors.

Asmaa Shehata's "Teaching Arabic Pronunciation to Non-Natives: Cognition and Practice" examines the extent to which two Arabic teachers' beliefs about pronunciation teaching are borne out in their classroom practice. Shehata probed alignment between teachers' and students' beliefs via questionnaires and interviews and actual practice via classroom observations. In general, the teachers reported difficulty with teaching pronunciation, and they relied primarily on controlled activities that focus on segmentals when they did teach pronunciation. The results of the study point to a need for language-specific pronunciation training for language teachers.

In their paper "Lexical Encoding and Perception of Palatalized Consonants in L2 Russian," Ala Simonchyk and Isabelle Darcy report on their study investigating English-Russian L2 learners' perception of Russian of the plain/palatalized contrast in the /l/ vs. /lʲ/ pair. Their goal was to determine whether there is a relationship between participants' abilities to perceive the contrast in an ABX task and their ability to encode and retrieve words with the contrast in an auditory word-picture matching task. Although they found no relationship between the scores on the perceptual and encoding/retrieval tasks among intermediate learners, Simonchyk and Darcy demonstrated a strong relationship between the performance on the two tasks for advanced learners of Russian. This leads the authors to conclude that there is a strong connection between learners' perception and lexical encoding of the contrast.

Jessica Sturm investigates the effectiveness of training on English-French L2 learners to produce the /u/-/y/ contrast in "Phonetics Instruction and the /u/-/y/ Distinction in French as a Foreign Language: A Preliminary Study." Participants came from two groups: one group received explicit instruction on the contrast in the context of a French phonetics and pronunciation course, and the other group did not. Although Sturm did not find significant acoustic differences in the production of the vowels between the trained and untrained groups of learners after training, she suggests that earlier and/or more systematic training might have a more profound impact on learners' ability to distinguish between the vowels.

Amy Thompson and Amanda Huensch explore the relationship between learners' status as bilinguals/multilinguals and their attitudes toward improving their pronunciation in their contribution "Pronunciation Attitudes: The Role of Multilingual Status and Perceived Positive Language Interaction (PPLI)." They operationalized multilingualism in two ways: traditionally (i.e., learners' self-reports of number of languages spoken) and as PPLI (i.e., multilingual learners are those who perceive positive interactions between their languages). The results of the study demonstrate that multilingual and PPLI

participants demonstrated a stronger desire to improve their pronunciation than bilingual participants did. Thompson and Huensch argue that language learners' multilingualism should be viewed as an asset in the language classroom and that instructors should inform learners about the benefits of crosslinguistic interactions.

Donald White, Richard Gananathan, and Peggy Mok report on the results of a training study in their contribution "Teaching Dark /l/ with Ultrasound Technology." The participants in their study, eight Cantonese-English L2 learners, read sentences containing [ɬ] before and after training. One group received feedback from the ultrasound scanner on their productions, and the other did not. The authors found that most of the participants who received feedback improved, but they did not find evidence for improvement among the participants in the no-feedback condition. They therefore conclude that even very short ultrasound training may be an effective way to teach [ɬ] to Cantonese-English L2 learners.

In their paper "Exploring the Relationship between Fluency Measures and Speaking Performance of Prospective International Teaching Assistants," Ziwei Zhou and Zhi Li investigate the extent to which four categories of fluency measures (i.e., speed, juncture pauses as breakdown, non-juncture pauses as breakdown, and fillers) predict the oral proficiency scores assigned to the speech samples of International Teaching Assistants (ITAs). The results of a multiple regression analysis point to average syllable duration and juncture pauses as the best predictors of overall proficiency scores. The findings add to the growing body of literature investigating the ability of automated systems to evaluate L2 learners' speaking proficiency and may inform L2 speaking proficiency assessment, both in terms of rating schemes and assessor training.

TEACHING TIPS

For the third year, we include Teaching Tips in the proceedings. Teaching Tips are done at the conference in a Round-Robin format. For 8-10 minutes, presenters teach their tip to a table of participants. At the end, participants go to another table, and presenters have a new set of participants to present to again. In a 90-minute period, participants have the opportunity to try about 8 teaching tips. The weakness of this system is that presenters don't get to see other presenters, but the energy level of the session is amazing.

In his teaching tip "Oye mi Canto, mi Son: Using Tongue Twisters and Songs," Douglas Bowman presents a series of activities that he has used to teach Spanish <o> to beginner level middle school and high school learners of Spanish. He focuses specifically on the use and repetition of tongue twisters and songs in order to encourage the solidification of sound-symbol correspondences.

Marsha Chan's teaching tip, "*Anytune* Slows Down Sound Tracks for Language Practice," provides clear instructions for how language learners and instructors may use the slow-downer app *Anytune* to slow down sound files without changing the pitch of the original sound file. She highlights the ability of the software to speed up the sound file

incrementally so that learners can control the tempo and can listen to a speech sample at a particular tempo as often as they wish.

Brenda Imber, Carson Maynard, and Maria Parker make the case for using visualization cues in *Praat* to improve L2 learners' comprehensibility in their teaching tip, "Using *Praat* to Increase Intelligibility through Visual Feedback." The starting point for their contribution is their experience teaching graduate student ESL oral skills courses. They note that learners' ability to evaluate their pronunciation and see their improvement enables them to develop autonomy through in-class work and homework assignments. In the tip, the authors lay out their progression for training students how to use *Praat*, and they provide evidence of one student's suprasegmental improvement after seven weeks of instruction.

In her teaching tip, "Teaching Pronunciation through Homework Assignments: The Method of iCPRs", Ines Martin demonstrates how teachers can make use of innovative Cued Pronunciation Readings (iCPRs) to teach pronunciation. The iCPRs, which can be created by instructors using *PowerPoint*'s built-in features, follow the same progression: perceptual training (accentedness detection followed by sound discrimination) and production training. Martin demonstrates that iCPRs assigned as homework in both face-to-face and online education settings effectively target pronunciation.

Elizabeth Zetterholm's contribution "Teaching the Pronunciation of Swedish Exotic Vowels" outlines steps that teachers can take when teaching new L2 vowels. Her teaching tip focuses primarily on teaching Swedish rounded vowels, which are relatively rare in the languages of the world and which have been shown to cause difficulties for L2 learners. She notes that instructors should focus primarily on the articulatory differences among the vowels. In order to do so, she proposes that language learners can use mirrors to enable observations of their jaw openings and pencils above their upper lips to encourage lip protrusion.

REVIEWS

Similar to last year, we add a set of reviews of websites, books, and software. These were not part of the conference, but were developed by John Levis's graduate students in a course on Technology and Oral Language at Iowa State University during Fall semester 2016. We share them in the proceedings both because of their interest to readers of the proceedings and because of their relevance to the conference theme.

Mo Chen reviews *Saundz*, an app designed for English-as-a-foreign-language (EFL) students which offers computer assisted pronunciation training. The goal of the software is to help students learn American English sounds, give them easy access to pronunciation tutoring, and help reduce their accents. The review evaluates the main features of Saundz according to a much-used CALL evaluation framework. While the app is useful on a word-by-word basis, it could be improved with the addition of visuals, a more individualized approach to feedback, and a more meaningful context.

Idée Edalatishams reviews the *LeaP corpus*, a collection of speech from L2 learners of German and English. The context of the corpus creation was investigating the acquisition of prosody at phonetic and phonological levels. The review reveals that while some prosodic features are included in annotations, more should be added for pitch, and that the annotations also are unreliable at times. Additionally, the corpus is less user friendly than is desirable, but this may be a function of the age of the corpus design.

Nazlinur Gokturk looks at how *Mondly* uses gamification to present vocabulary and conversational skills in 33 languages. The app presents 23 different situations a user is likely to run into, and presents 6 relevant lessons on vocabulary and conversational skills pertaining to that situation. While these lessons are good for a novice learner, the conversation lessons are limited enough to not be as beneficial for a higher level learner. An improvement that could be made would be to include an explicit feedback system.

Voicetube allows students to practice pronunciation through videos, and it is reviewed by Haeyun Jin. *Voicetube* is a Taiwan-based web application and is accessible through a main website, iOS and Android mobile applications. An extra feature *Voicetube* provides is a shadowing tool in the speaking section of the videos. This gives students the ability to practice shadowing through listening, speaking, and vocabulary. While the content is authentic and the site provides highly individualized practice, there is room for improvement. Some of these include adding an automatic speech recognition feature to provide feedback, more levels of the shadowing feature, and other technical limitations.

Yasin Karatay reviews the multiple functions provided by *YouGlish,* a searchable video database, which provides short video segments for any word or phrase contained within the database. When users sign up for an account, the site provides a lesson of the day, a word of the day, and users are able to save videos to a set location. While there are many benefits to this easily searchable database of speech, there are also a few drawbacks to the site. *YouGlish* is output based, and there is no way to record speech to receive feedback on pronunciation. Also, a phonetic transcription of the words is not provided.

Jeremy Lockwood reviews *NORM: The Vowel Normalization and Plotting Suite*, a website developed for socio-phoneticians, phoneticians, and sociolinguists to facilitate manipulation, normalization, and plotting of vowel formants. The site assumes its users have sufficient background knowledge in acoustic analysis and acquiring formant data. The site is difficult to navigate, and researchers without the proper background knowledge cannot easily use it. For those with the ability, however, NORM provides excellent ways to visualize acoustic vowel data.

The *American English Pronunciation Tutor* smartphone application, which offers ten units covering segmentals and suprasegmentals in English, is reviewed by Sock Wun Phng. One major benefit of this app is its focus on developing production and perception without pushing the goal of accent reduction. The app includes an orthographic representation of the target sounds and IPA symbols. The activities are repetitive, and the app could be improved with the incorporation of game-based learning theory. Giving the activities more focus on meaning would also increase the appeal of the app.

Alif Silpachai reviews *Accent Reduction for Professionals: How to Eliminate Your Accent to Sound More American*, which focuses on accent reduction. Overall, the book is disappointing and shows little understanding of generally accepted research findings. It is also misleading, and encourages speakers to lose their accents in order to avoid discrimination in the workplace, leading to often confusing and contradictory recommendations.

Finally, Taichi Yamashita discusses *Manythings.org,* a Japan-based website designed for learners who wish to study American English independently. This website has several benefits including providing feedback for the learner and repetition in the minimal pair section of the lessons. However, learners do not have the opportunity to produce language, but only to read and listen. The website also focuses on input with less importance placed on meaning or form.

CONCLUSION

The PSLLT Proceedings are now in their 8th year, and the conference in its 9th year. The proceedings have provided a venue for around 200 articles, teaching tips and reviews that are freely available. Many other presentations at the conference have been published in refereed journals. Since 2009, the number of professional books on L2 pronunciation has exploded, there is a dedicated *Journal of Second Language Pronunciation*, several other conferences on L2 pronunciation are regularly scheduled (Accents, English Pronunciation: Issues and Practices, The Phonetics Teaching and Learning Conference, New Sounds, etc.), and L2 pronunciation as a field has expanded well beyond English to include L2 pronunciation of a wide variety of languages. This is exciting, and we look forward to seeing what the next years bring as the field continues to take shape.

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