The CATESOL Journal

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Choosing Technology Tools to Meet Pronunciation Teaching and Learning Goals

For decades, researchers and teachers have suggested ways to apply technology in teaching and learning pronunciation, and there are many useful tools that can be used for this purpose. However, many teachers feel unsure about how to teach pronunciation at all, and the idea of using computers, mobile devices, or other technology may make pronunciation teaching seem doubly intimidating. If we look at technology from a different viewpoint, focusing first on the pedagogical tasks that teachers need to perform and then choosing the most effective tools to support each one, we can achieve better results for both teachers and learners. Based on both research and the classroom practice of experienced teachers, this article evaluates a range of available tools to accomplish tasks such as providing a pronunciation model, recording and responding to learners' pronunciation practice, and offering independent practice. The focus is on tools that are readily available to most classroom teachers, practical to learn and use, and free or inexpensive.

As long ago as the late 1800s (Roby, 2004), language teachers were looking for ways to apply newfangled sound-recording technology in teaching. However, it was not long before disillusionment set in. In 1918, a contributor to the *Modern Language Journal* concluded that "The use of the talking machine in teaching languages is by no means new … and the silent verdict brought in by its general abandonment is that it is not worth the trouble it involves" (Clarke, 1918, p. 116).

What is the situation 100 years later? We now have a vast array of technological tools to assist in language teaching and pronuncia-

tion teaching in particular. We have also accumulated ample evidence of the effectiveness of technology in teaching pronunciation (Hincks, 2003; McCrocklin, 2014; Mitra, Tooley, Inamdar, & Dixon, 2003; Neri, Cucchiarini, & Strik, 2003; Neri, Mich, Gerosa, & Giuliani, 2008; Wallace, 2016; and others). However, the sheer numbers and variety of the available technologies may seem daunting to teachers who are simply looking for effective tools to use in their classrooms. But if we look at this topic in a different way, starting with the pedagogical tasks that teachers and students need to perform and considering the most useful tools to accomplish each one, technology can be considerably less intimidating. As Levis (2007) points out, "CAPT [computer assisted pronunciation teaching] applications are tools to meet instructional goals, and the tool should be appropriate to the job" (p. 186).

Selecting Technology Tools

This article looks at technology tools from the viewpoint of teachers who do not have the time, the means, or the desire to become experts in phonetics or acoustic analysis. Their goal is to teach effectively and to guide their students in making their pronunciation more understandable. In order to choose the best tools to help classroom teachers, we need to consider these criteria:

- *Appropriateness to learning objectives*: Will the tool support the teacher in accomplishing specific teaching tasks? Will it help students reach their pronunciation goals?
- *Quality and accuracy*: Does the tool provide accurate information in keeping with sound principles of phonology and pedagogy?
- *Practicality of use*: Is the tool easy to learn and use? Does it work reliably and do what it claims to do?
- *Cost*: Is the tool free, inexpensive, or already available? Particularly in times of budget cuts and tight resources, this is an important consideration.

The tools chosen for inclusion in this article meet these criteria overall; where some do not measure up on some points, that has been noted. This is not intended to be an exhaustive list of all available technological tools, but a selection of some that have proved useful and reliable. In addition, programs or websites designed as a complete course in learning pronunciation are not included here. Inevitably, we must acknowledge that technology changes so fast that by the time this is read, some of it may be out of date, and new tools may have appeared.

We will focus on the following pedagogical tasks that are a common part of pronunciation teaching (Yoshida, 2016):

1. *Providing a pronunciation model.* Students need to hear examples of the pronunciation of individual sounds and words, and also examples of longer stretches of meaningful connected speech. Tech tools can supplement the model that teachers themselves provide.
2. *Recording students' pronunciation practice*. Learners can benefit from recording and listening to their own pronunciation to help them develop the ability to self-correct (Celce-Murcia, Brinton, & Goodwin, 2010). When this recording is done through apps or websites that make the recordings part of a creative project, motivation and interest can be increased.
3. *Collecting and responding to students' recorded practice*. Teachers often listen to learners' recordings and give feedback as a guide for future practice. This process can be simplified through tech tools.
4. *Providing independent pronunciation practice*. Dozens of apps and websites are designed to aid students in independent pronunciation practice, and some programs designed for other purposes can also be adapted for pronunciation practice.

Providing a Pronunciation Model

Models of Individual Sounds and Words

When introducing and practicing individual phonemes and words, in addition to demonstrations by the teacher it is useful to be able to show how sounds and words are produced through sound recordings, sagittal section diagrams, and/or short videos. For many sounds, it is difficult to see what is happening inside the mouth, and tech tools can make it easier for students to understand the mechanics of articulation. The use of these images has been shown to help learners improve their ability to identify sounds and words (Levis, 2007). Three resources that provide a model and illustration of the pronunciation of individual sounds and words are Sounds of Speech, The Phonetics, and YouGlish.

Sounds of Speech. For many years, the best-known website for demonstrating the pronunciation of sounds has been the Phonetics Flash Animation Project of the University of Iowa. The website has recently undergone a revision and is now available at http://soundsofspeech.uiowa.edu/. A related app, Sounds of Speech, is available for

Apple and Android devices and offers similar functions. There is no charge for using the website; the app costs $3.99. Both the website and the app include an animated sagittal section diagram for each phoneme, a written description of how the sound is produced, a short video of a speaker saying the sound, and recorded example words. Figure 1 shows the pronunciation of /n/ from the Sounds of Speech website.

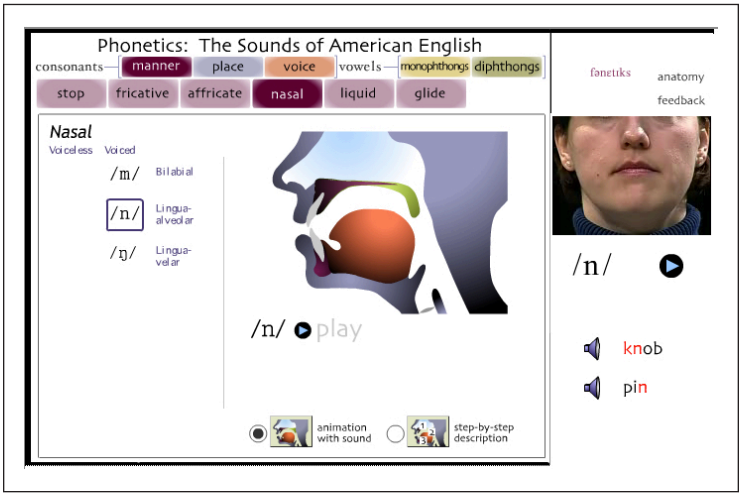

Figure 1. The pronunciation of /n/ as shown on the Sounds of Speech website (http://soundsofspeech.uiowa.edu/). Reproduced by permission of the University of Iowa.

The Phonetics. A similar app created by a team at the Tokyo University of Foreign Studies includes animated illustrations of the articulatory system in a three-dimensional "wire-frame" style, showing the pronunciation of each phoneme along with recorded sample words. The app does not include videos of an actual speaker, as Sounds of Speech does, but full animations are included for a wide range of sample words and minimal pairs. Figure 2 shows the pronunciation of /n/ in The Phonetics. Users have a choice of hearing a man's or woman's voice, and recordings can be played at normal speed or more slowly. The Phonetics costs $7.99 and is available only for Apple devices.[1]

Both of these apps can be used as a model during classroom instruction or for student review and practice outside of class. In addition, dictionaries with sound recordings, such as the *Merriam-Webster Learner's Dictionary* (http://learnersdictionary.com/), the *Longman Dictionary of Contemporary English Online* (http://www.ldoceonline.com/), or any dictionary app or stand-alone electronic dictionary can

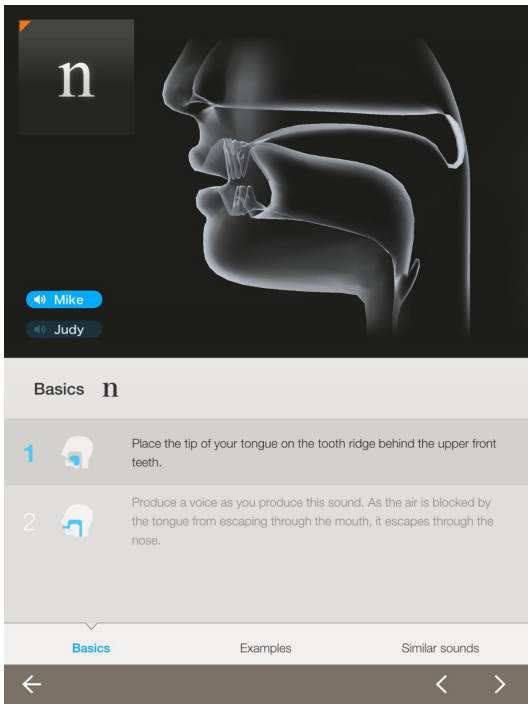

Figure 2. The Phonetics: Sagittal section diagram for the pronunciation of /n/. Reproduced by permission.

provide a convenient model of the pronunciation of individual words. These are especially useful when learners want to check the pronunciation of a new word on their own.

YouGlish. An additional useful resource that bridges the gap between individual words and authentic discourse is YouGlish (http://youglish.com/). This free website acts as a contextualized pronouncing dictionary that searches YouTube videos to provide examples of the pronunciation of chosen words or phrases in natural contexts. Users search for a word or phrase, and YouGlish finds a selection of videos containing it. The videos are set to start playing slightly before the chosen word appears, and users have the option of listening to just the immediate context or the whole video. Subtitles are displayed, and the videos can be played at normal speed, faster, or slower, although the slower speed has a choppy, echoing quality. Users can specify whether they want to search for examples in US, UK, or Australian English.[2]

Models of Connected Speech

However useful it may be to hear individual sounds and words, students also need a model of longer stretches of authentic, connected speech, which can be found in many online sources, including TED Talks (http://www.ted.com), National Public Radio (http://www.npr.org), the British Broadcasting Corporation (http://bbc.co.uk), YouTube (http://youtube.com), and others too numerous to mention. These recordings allow students to hear multiple speech models in addition to their own teacher's voice, which can increase their flexibility in understanding many varieties of English (Levis, 2007). Authentic videos provide useful material for shadowing—an activity in which learners watch a short video multiple times, repeating after the speakers with the goal of precisely imitating the sounds, pauses, and intonation of their speech. Goodwin (2008) describes a successful procedure in which students used shadowing by listening repeatedly to a chosen one-minute video, analyzing it based on pronunciation features they were studying, and imitating it repeatedly until they could come close to the original. Derwing and Munro (2015) also recommend shadowing as an effective practice technique.

Video-collection websites aimed at English learners, such as EnglishCentral (https://www.englishcentral.com) and Voicetube (https://www.voicetube.com), are good sources of short, authentic video clips for imitation and shadowing. Both these sites offer a vast choice of clips on many topics with subtitles and the ability to record the user's imitation of the clip. Voicetube is a free service; EnglishCentral has both free and paid versions, with many of its features available only to "premium members."[3]

Teachers who use authentic videos as models will need to choose carefully, thinking about questions such as these:

- Does the recording include the pronunciation points I want to practice? (Sounds, word stress, intonation patterns, connected speech, etc.)
- Does the speaker's pronunciation provide the model I want to present? Is it clear and spoken at a reasonable speed?
- Is the language overall at a level that my students will understand?
- Is the topic of the video appropriate for my students and learning purpose?

It is also helpful to know whether the source website allows the recording to be played at a slower speed and whether a script is available. If not, the recording can certainly be used successfully, but these features are a nice bonus.

Recording Students' Pronunciation Practice

Teachers often ask students to record their voices as part of pronunciation practice, either with the goal of (a) listening to and analyzing or transcribing the recordings to increase their awareness and ability to self-correct or (b) submitting the recordings to the teacher for feedback. Recording sound has become incredibly easy in recent years, as tape recorders have become a thing of the past, and computers, tablets, and cell phones provide built-in sound and video-recording capability. Even the free sound-recording program Audacity (http://www.audacityteam.org), a favorite of many teachers for more than a decade, has been superseded by easier ways of recording sound—simple apps such as Sound Recorder for Windows, QuickTime Player for Mac, Voice Memos for iPhone, and many free sound-recording apps for Android devices.

In addition to simple recordings of students' pronunciation, recorded practice can also be done in more creative and communicative ways. By producing a video or multimedia project to share with classmates or others, learners believe that they are truly communicating and that there is a purpose for their work. This can result in stronger motivation than if only the teacher will hear the recording, and it provides an extra incentive to use pronunciation in a way that will be understood by listeners. Creating a project also increases the probability that students will practice repeatedly as they rehearse and perfect their final product.

Many tech tools allow learners to create projects combining pictures, words, and sounds for purposeful pronunciation practice. The following are just a few of the available tools:

Narrated Slideshows

If Microsoft PowerPoint or Apple Keynote are available, students can use these tools to make their own narrated stories. The content can be anything that fits the interests of the students, from fairy tales to business communications. In both PowerPoint and Keynote, users can record narration within the application or import sound recorded elsewhere. The finished product can be viewed using the original program or exported as a video to simplify sharing.

Adobe Spark

Available as a website (https://spark.adobe.com/) or as a free app, Adobe Spark lets users create slide shows by choosing pictures or icons, adding words, and then recording narration. Although similar to PowerPoint and Keynote in concept, Adobe Spark has a simpler, extremely user-friendly interface that allows users to get started quickly

and produce slide shows easily. A large library of photos, simple drawings, and background music is included, and users can also upload their own pictures or videos. Finished slide shows can be viewed within the website or app or downloaded as videos. Figure 3 shows the web version of Adobe Spark. While anyone can use the Adobe Spark website, the app version is now available only for Apple devices. An Android version is expected soon, according to the company's website.

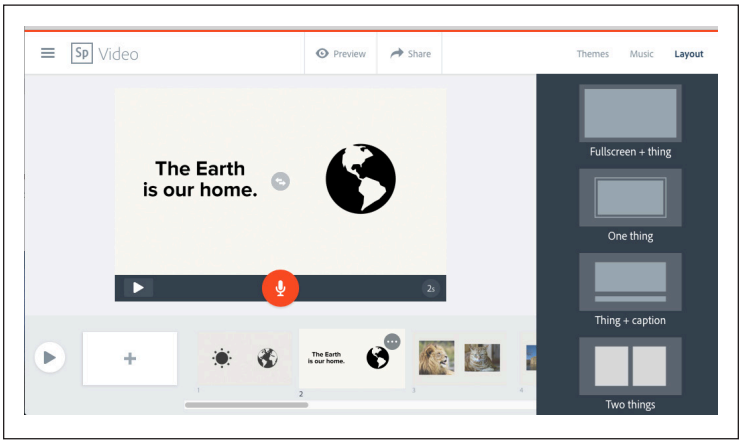

Figure 3. The web version of Adobe Spark. Adobe product screen shot reprinted with permission from Adobe Systems Incorporated.

Voki

Also available either online (http://www.voki.com) or as an app for Apple or Android devices, Voki allows users to choose a "talking head" character, change its appearance and clothing, and then add narration by recording their own voices or typing a script to be read by an artificial voice. Figure 4 shows the Voki "Creator" panel. A primary audience for Voki is teachers who want to create short teaching videos, but it can be used equally well by students to present information or stories to others. A free version allows a limited number of character choices, and paid versions offer more variety and a longer recording time.

Puppet Pals

This child-friendly app for Apple devices lets users make a "puppet show" by choosing characters and backgrounds, moving characters around, and recording dialogue for them. The finished puppet show can be viewed within the app or exported as a movie. The basic program is free, but users can buy extra sets of characters.

Figure 4. The Voki "Creator" panel. Reproduced by permission.

Fotobabble

Using tools on the Fotobabble website (http://www.fotobabble.com) or the iPhone app, users can upload photos, record comments about them, and share them by email, text message, or social media for an interesting way to record speaking and pronunciation practice. In addition to helping students practice pronunciation while expressing their ideas creatively, these tools can also be used by teachers to develop materials that explain course content or that provide a pronunciation model for students to imitate. Students may feel more engaged if they practice with materials made to fit their specific needs by including words they particularly need to be able to say: names of streets in their community, words related to their jobs or activities, or even names of their favorite Starbucks beverages.

Collecting and Responding to Students' Recorded Practice

Receiving feedback is a necessary guide to students in identifying pronunciation mistakes and trying to make their pronunciation more intelligible (Hincks, 2003). Student recordings made for this purpose can be sent to the teacher by email, but this necessitates downloading and saving each recording, then giving feedback in writing or by making another recording, and returning the feedback to students. This certainly works, but teacher workload can be lessened by using one of the following tools:

Learning Management Systems

In schools that already use a learning management system (LMS) such as Canvas, Moodle, or Blackboard, students have the capability to upload sound or video recordings to a central location. Teachers can then comment on the recordings and upload their written or recorded feedback to the LMS. In a typical LMS, recordings can be uploaded either as assignments, in which case only the teacher has access to them, or as part of a discussion forum that is visible to the whole class. In the latter case, students are able to listen to each other's recordings and offer peer feedback, building valuable interaction and support among class members, rather than in only one direction, from teacher to students.

Schoology

If a schoolwide LMS is not available, teachers can easily create their own site through a service such as Schoology (https://www.schoology.com/). The discussion board feature, normally used to share written comments on a given topic, also allows users to upload sound or video recordings or link to a video stored elsewhere, such as on YouTube. In this way, the recordings are collected in one convenient place, and the teacher can listen and respond to them, either by "replying" and typing comments or by recording and uploading feedback. Unfortunately, Schoology does not have the capability of recording within the website; users will need to record sound using another app and then upload the recorded file to the site. Schoology offers both free and paid versions, though the free version offers all the features that most teachers will need.

VoiceThread

VoiceThread is a free website that allows users to post pictures for others to comment on by text, voice, or video (http://voicethread.com/). For use in pronunciation practice, the teacher uploads a picture or video, which appears in the middle of the screen. Students sign in and comment on the picture through sound or video recordings. (Comments can also be typed, though this is not so useful for pronunciation practice, of course.) Icons representing each comment appear around the picture, and the teacher can click to hear each one and respond with comments, as shown in Figure 5.

Providing Independent Pronunciation Practice

Automatic speech recognition (ASR) technology is designed to recognize spoken words and respond or convert them to written text, a process also known as "speech-to-text." Anyone who has asked Siri

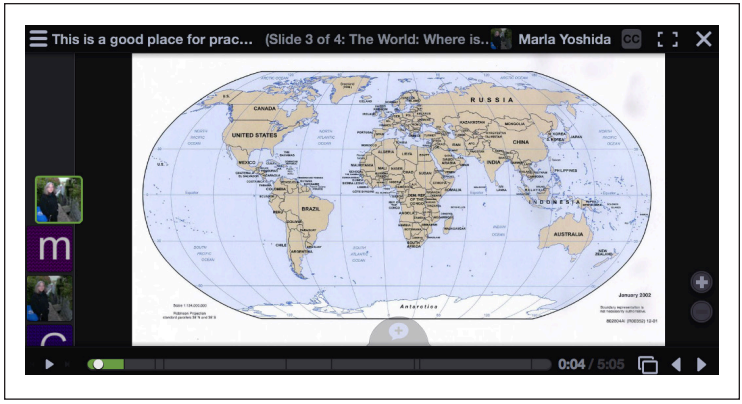

Figure 5. VoiceThread. Reproduced by permission.

for information or dictated a text message or email has experienced ASR. Many teachers and researchers have thought of using speech-to-text dictation programs in teaching pronunciation. The assumption is that if the transcription of a learner's speech is mostly accurate, the learner's pronunciation is acceptably understandable. If many words are transcribed incorrectly, a pronunciation problem must be present.

Research has shown positive results in using ASR for independent pronunciation practice with international teaching assistants (Wallace, 2016), middle-aged adult professionals (Hincks, 2003), and children (Mitra et al., 2003; Neri et al., 2008). As learners dictate to the program and notice words that were not transcribed as intended, they become aware of general areas that cause misunderstanding and try to adjust their pronunciation until their words are transcribed more accurately. An additional advantage of ASR was pointed out by McCrocklin (2014), who found that independent practice with ASR increases learner autonomy as it "allows students to experiment with the language in a safe, private setting" (p. 32).

In the past, users who wanted to try ASR needed to buy a commercial program such as Dragon Naturally Speaking, and of course, such programs are still available. But recently, especially since the introduction of Apple's Siri in 2011, speech-to-text functions have become available as built-in features of programs such as the following:

Computer Operating Systems

If Speech Recognition is enabled in Windows 10, ASR is available for use in Word and many other programs. For Macs using OS X Mavericks or later, turning on the Enhanced Dictation feature allows

users to dictate text without being connected to the Internet. (Earlier versions of Dictation on Macs require Internet access for dictation to work.)

Smartphones or Tablets

Android and iOS devices use ASR through Siri (for Apple devices) and Cortana (available for Android) so that users can dictate text or give voice commands. Any of these speech-to-text tools can provide valuable independent practice, through either formal homework assignments or student-initiated practice. For example, students can be given an assignment to dictate an assigned passage using one of the ASR tools and then compare the transcription to the original passage. By highlighting and analyzing the words that were not transcribed as intended, they can often get a rough idea of where their problems lie. Do the mistaken words often contain /r/ and /l/? Are word-final consonants often missing from the transcription? Students can also use these tools on their own, choosing words they need to be able to say clearly and dictating them repeatedly until they are able to adjust their pronunciation to be transcribed more accurately.

Google Tools

Both Google Docs and Google Voice have limited ASR functions that offer possibilities for teachers of pronunciation.

Google Docs. When used with the Chrome browser (but not other browsers), Google Docs allows users to dictate words to be transcribed into text by choosing Voice Typing in the Tools menu. Google Docs' ASR capability offers opportunities for formal or informal practice as suggested earlier, with the added advantage that transcriptions are stored "in the cloud" so they can easily be shared and accessed from multiple devices by students or teachers.

Google Voice. Some teachers have thought of using voicemail as a way to collect student pronunciation homework, having students call the teacher's phone number and leave a recording. However, teachers may be understandably reluctant to use their personal phone numbers for this purpose. Google Voice offers a solution to this problem. Among its many features, Google Voice can assign the user a new phone number for others to call. Teachers can give this number to students, who call and leave recorded voice messages. The teacher can both listen to the voice recordings and read transcriptions produced by ASR on the Google website, or receive them by email or text. The service is free and is available to anyone in the US, but not in other countries. More information is available at https://voice.google.com/about.

Benefits and Drawbacks of Using ASR

It should be noted that feedback produced by ASR is general rather than specific. Levis (2007) concluded that ASR does not yet have the capability to evaluate particular pronunciation errors; it can only give a general idea that something is wrong. This conclusion seems equally valid a more than a decade later. An additional consideration in using ASR programs with English learners is that these programs have been designed for use by native speakers and "trained" through the use of native speaker voices. This means that these programs are not especially accurate in transcribing the speech of nonnative speakers (Neri et al., 2003). On the other hand, this inability to understand is exactly what makes ASR valuable. If the program could transcribe nonnative speech into the intended words in spite of some inaccuracies of pronunciation, ASR would be like those of us who have become so used to our ESL students' pronunciation that we can understand almost anything, even though a less-experienced listener might be confused. The goal for using ASR in pronunciation teaching is not to make the software adapt so that it can transcribe a learner's words perfectly but to help learners adapt their pronunciation to be understood more easily.

Independent Pronunciation Practice Through Apps

Many apps and programs claim to analyze pronunciation and rate its accuracy. However, most of these cannot deliver all that they promise, and many give inaccurate judgments of users' pronunciation (Derwing & Munro, 2015). Kaiser (2017) tested and compared 105 pronunciation practice apps available for the Apple iPad, focusing on a selection of 30 of them, and has reported his findings in an online seminar sponsored by the Online Language Learning Research Network and in reviews and summaries on his blog, *Today's English in the World* (https://djkaiserphd.wordpress.com/). Many of the apps are free or very inexpensive, or have both free and paid versions with additional features. His overall conclusions include:

1. There is no one "best app" that will fit the needs of every pronunciation teacher or learner. Instead of searching for one perfect app, it would be more productive to ask which apps might be useful to integrate into pronunciation teaching.
2. Many apps that claim to improve pronunciation or analyze pronunciation errors simply do not work or do not judge pronunciation accurately. In many instances, apps accepted incorrect pronunciations as correct and rejected correct ones.

3. Most pronunciation practice apps in Kaiser's study were high-tech versions of audio-lingual–style repetition drills and did not offer useful feedback. Most focused on individual sounds and gave no attention to suprasegmentals.
4. Many apps have been developed with more attention to appearance and flash than to pedagogical principles. Some may be the result of collaboration between a programmer with a great idea and a content expert, possibly of questionable credentials. Kaiser (2017) concludes, "Despite many new 'app affordances' in iOS devices, instruction is often at the service of what is easier to program or what will 'sell' the app than what is best pedagogy" (Slide #45).

In response to the above shortcomings, Kaiser (2017) suggests that teachers ask these questions before using an app:

- What variety of English is used? (British, North American, EIL)
- What is the up-front cost and what in-app costs or subscriptions are hidden?
- Who developed the app and what credentials do they have? (See developer website)
- Does the app address the learner's goals?
- Is material accurate and pedagogically sound? (Slide #44)

Derwing and Munro (2015) similarly urge teachers to "read reviews and recommendations from authoritative sources and then to screen apps carefully before recommending them to students" (p. 124).

Finally, what about programs that display visual representations of speech, such as spectrograms, waveforms, and pitch patterns? These are used as part of many pronunciation apps, and they can also be produced by more specialized tools such as Praat (http://www.praat.org) (Boersma & Weenink, 2017), a free acoustic-analysis program that was developed to meet the needs of phoneticians rather than of language teachers or learners. Figure 6 shows the Praat screen with the waveform, spectrogram, and pitch pattern for the sentence "What do you want to do today?" At first glance, it seems that these graphic depictions should be useful in letting learners compare their own speech with a model and determine what they need to improve. Unfortunately, this turns out not to be so simple. The displays produced by Praat and other programs are not easy for teachers to understand and interpret, and they are even more challenging for students. Derwing

and Munro (2015) point out that "Reading and correctly interpreting spectrograms requires considerable expertise in phonetics. For that reason, these representations are unlikely to be of much use in the classroom" (p. 127).

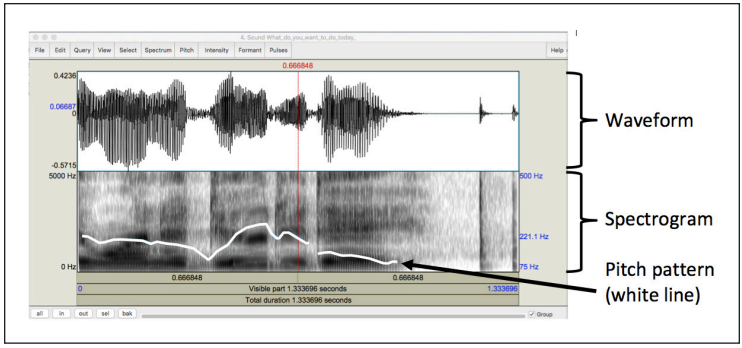

Figure 6. Praat analysis of "What do you want to do today?" Reproduced by permission.

On the other hand, Imber, Maynard, & Parker (2017) report positive results in using Praat for pronunciation practice in university oral language courses. However, they acknowledge that using Praat in this way requires extensive training for both instructors and students—a circumstance that will make it impractical in most teaching situations as the learning curve is simply too steep. However, both Imber et al. and Kaiser (2017) suggest that because visual pitch displays offer a more direct picture of intonation and can be understood more intuitively than spectrograms or waveforms, they could be useful tools in teaching intonation.

Conclusion

Technology can be a valuable tool in teaching and learning pronunciation, but it is not a panacea. There are limitations to what any tool can do and how it can be used. Derwing and Munro (2015) state, "As has been reiterated many times in the CALL [computer-assisted language learning] literature, technology cannot replace teachers, nor is it *necessarily* better than, or even as good as, traditional instructional methods. … [We should] treat technology as one tool among others" (p.130).

As a teacher, your best route is to choose the tools that work the best for you and your students, not necessarily those that seem newest, coolest, or flashiest. Try not to get too attached to a particular website or app; it might disappear or stop working. For example, I would have

liked to discuss Voxopop (http://voxopop.com), a website that I have used in the past for collecting and responding to student practice. Unfortunately, it seems to have gone out of existence. By considering which tools will best accomplish specific teaching goals, along with the quality, accuracy, practicality, and cost of each tool, teachers can find appropriate technology to support their pronunciation teaching and their students' learning.

Author

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Notes

[1]This app is a bit difficult to find on the Apple App Store; search for "The Phonetics Interactive 3D models of oral visualization." More information is available at http://d3492jnbjg00z1.cloudfront.net/.

[2]See Karatay (2017) for a more complete review of YouGlish.

[3]See Jin (2017) for a review of Voicetube and Mills (2011) for a review of EnglishCentral.

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