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# Building Tone Resources for Second Language Learners from Phonetic Documentation: Cherokee Examples

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Lexical tone is a linguistic feature which can present difficulties for second language learners wanting to revitalize their heritage language. This is true not only from the standpoint of understanding and pronunciation, but also because tone is often under-documented and resources are limited or too technical to be useful to community members. Even with these challenges, carefully attending to the intricacies of a language's sound system allows learners to express themselves more "authentically" or "naturally," which can be important for confidence and acceptance as language users. Learners can be trained to distinguish tones by attending to acoustic or auditory cues related to tone (e.g., pitch contour). This paper describes multimedia resources designed to focus learner attention on perceiving tone – visual and audio accompaniments helping to increase the perception of tone in Cherokee, a severely endangered Native American language. We created resources for tone in the form of an electronic presentation containing explanations, example recordings, and intuitive images to provide audio and visual support for language learners. Presentation and format choices were collaboratively designed based on community requests, with an explicit attempt to de-jargonize materials and make them less technical and more accessible to community members.

**1. Language and language loss: Cherokee**[1] Cherokee is a polysynthetic Native American language categorized as severely endangered on the UNESCO scale (UNESCO 2003). No children are known to be learning it as a first language (L1), and fewer than 10% of tribal members consider themselves fluent speakers (Cherokee Nation 2003). The sole member of the southern branch of Iroquoian languages, Cherokee is the only Iroquoian language with lexical tone (Cook 1979; Johnson 2005; Lindsey

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1985; Montgomery-Anderson 2008; 2015; Pulte & Feeling 1975; Scancarelli 1987; Uchihara 2009; 2013; 2016; Wright 1996). This feature of the language presents difficulties for second language (L2) learners working to revitalize their heritage language, not only from the standpoint of understanding and pronunciation, but also because there are limited resources (e.g., few speakers metalinguistically aware of these specific characteristics, lack of representation in the writing systems, and limited documentation or description of tone; Herrick et al. 2015). Furthermore, even when there are excellent sources rich with linguistic data and often containing in-depth linguistic analyses (for Cherokee see e.g., Feeling et al. 2010; Montgomery-Anderson 2008, 2015; Poell 2004; Pulte & Feeling 1975; Scancarelli 1987; Uchihara 2009; 2013; 2016; Wright 1996), community members are often unable or unwilling to wade through the technical linguistic detail in order to turn the sources into useful teaching materials. Despite these challenges, learners often find it worth carefully attending to the intricacies of a language's sound system because expressing oneself more "authentically" or "naturally" can be important for confidence and acceptance as language users (Carpenter 1997; Hinton & Hale 2001) rather than being discouraged by derision for accents (Miyashita & Chatsis 2013).

To address these challenges, we strove to 1) document Cherokee tone and vowel length, as well as 2) create accessible and jargon-lite learning and practice materials. This paper focuses on incorporating information acquired during the documentation phase to create tools to aid learners with learning tone. See Herrick et al. (2015) for a description of activities related to the first component of the project that emphasized raising awareness of vowel length and tone, understanding their critical roles in Cherokee, and capacity building with respect to these components of the language. That project reached what Hyman (2014) described as *Stage I* of the study of a tone language. In working with speakers and learners, we followed many of the canonical techniques for studying tone languages (see e.g., Cruz & Woodbury 2014 and other papers in the highly recommended *LD&C* article series edited by Bird & Hyman 2014). In our work, we started with small, morphologically simple words and built in complexity over time, and even tried a few less canonical techniques (see Herrick et al. 2015). Although we focus on shorter words here, we do wish to make explicit that a key difference between Cherokee and most other tonal languages is that Cherokee is a polysynthetic language and is filled with rather long, multi-syllable words as opposed to primarily mono- and di-syllabic words. In addition, while most documentation focuses on working solely with native speakers, our work incorporates both native speakers and language learners. This paper describes basic characteristics of Cherokee tone, discusses why tonal features can be difficult for L2 learners, touches on how enhancements can aid learning, and illustrates how we designed resources and incorporated supportive features highlighting components to scaffold how learners perceive and practice tone at an introductory level in Cherokee.

**2. Characteristics of Cherokee tone** Based on an acoustic analysis, Herrick et al. (2015) found a strong match to the Pulte & Feeling (1975) grammar and dictionary descriptions of Cherokee vowel length and tone. Most published work agrees that

Cherokee possesses mid (sometimes called "low") and high level tones, a low falling tone, a high falling tone, a rising tone, and a super-high tone (high rising) (see e.g., Herrick et al. 2015; Montgomery-Anderson 2008; 2015; Poell 2004; Pulte & Feeling 1975; Scancarelli 1987; Uchihara 2013; 2016; Wright 1996). This labeling can be termed the "traditional" description of Cherokee tone. An alternative view notes that long vowels can host the full range of tones while short vowels appear limited to the level tones, and this has led some to propose a slightly simplified but more abstract phonological analysis of tone (see e.g., Montgomery-Anderson 2008; 2015). Such linguistic sources are often jargon-rich, technical, and difficult for non-specialists like community members to work through. In the case of Cherokee tone, the fact that the terminology and representation of tone differs from source to source creates additional difficulty. To provide information in a useable form, our approach here follows the traditional model represented in Table 1 with example entries from the Pulte & Feeling (1975) dictionary.

**Table 1.** Illustration of Cherokee tones (data from Pulte & Feeling 1975)

| Tonal description | Pulte & Feeling | IPA | Gloss |
|---|---|---|---|
| low-fall | sv$^{1}$gi | sʌ̀ːgî | 'onion' |
| mid (short vowel) | ạ$^{2}$ma | āmâ | 'water' |
| mid | sa$^{2}$sa | sāːsâ | 'goose' |
| rising | we$^{23}$sa | wĕːsâ | 'cat' |
| high (short vowel) | ạʔ$^{3}$ni | áʔnî | 'strawberry' |
| high | a$^{3}$ma | áːmâ | 'salt' |
| falling | kịyu$^{32}$ga | kīyûːgâ | 'chipmunk' |
| super-high | ga$^{4}$du | gắːdû | 'bread' |

A small dot under a vowel indicates it is short in duration (the absence of a dot indicates a long vowel) and the superscript numbers represent rough pitch contours, where 1 is the low end and 4 is the high end of the scale. Pulte & Feeling (1975) note that the super-high tone labeled as [4] is actually a [3]-to-[4] rising tone, and the low-fall labeled as [1] is a fall from [2] to [1] (see also Herrick et al. 2015 or Uchihara 2013; 2016 on this point). Final vowels are predictably a high-falling tone, and, following conventions of Pulte & Feeling (1975), they are not marked. We also include a column with more traditional IPA transcriptions. We note that the [ʌ] in [sʌ̀ːgî] is a nasalized vowel, but we have removed the nasal diacritic to make the tone diacritic more easily visible.

While such a system is accessible to those adept at interpreting such linguistically-rich representations, it can be difficult for those who are less comfortable doing so or less familiar with this technical linguistics jargon. Community members felt that a more intuitive presentation of tone would be helpful – especially for beginning language learners who lack native speaker intuitions (Herrick et al. 2015).

**3. Challenges to learnability and enhanced input for tone** Simply put, learning to perceive and produce tone in an L2 can be challenging for L1 speakers of non-tonal

languages (Bluhme & Burr 1971; Iverson et al. 2003; Kiriloff 1969; Orie 2006; Shen 1989; Wang et al. 1999). A full review of this topic would lead us astray; however, we share an overview of the ideas as follows. Learners bring L1 understandings of pitch to second language learning (Broselow et al. 1987; Chandrasekaran et al. 2010; Orie 2006; White 1981), and this creates interference because of the difference in functional load carried by pitch (or fundamental frequency) in tonal versus non-tonal languages. Acoustic cues habitually attended to in the L1 serve different purposes in the L2, meaning the learner is likely not sensitive to the specific associations for the L2 (Gandour 1983; Jongman & Moore 2000). Difficulty for learning is associated with pronunciation predispositions from the L1 (Cook 1996), especially with non-tone language speakers weighting acoustic cues for tone such as "height" (level pitch patterns) and "direction" (pitch changes or trajectories) differently from tone-language speakers (Gandour 1983). Important acoustic information with respect to tones, such as fundamental frequency (Howie 1976), amplitude (Whalen & Xu 1992), and duration (Fu et al. 1998) provide vital phonological information. And as Cruz & Woodbury (2014) note for Chatino, although tone can be intimidating and formidable, its many roles make it critical to a language and thus, important for learners.

Learning tone can be overwhelming and frustrating (Orie 2006), especially if the complexity of linguistic descriptions and documentation are inaccessible or perceived as less than helpful for language learning and revitalization (Penfield & Tucker 2011; Rice 2011). Resources need to be useable – transformed from technical to teachable and learnable (Cope & Penfield 2011; Penfield & Tucker 2011) – in ways that are responsive to community needs through collaborative endeavors that take into consideration specific variations within each community (Herrick et al. 2015; Grinevald 2003; Yamada 2007). Though challenges exist, learners can be guided to distinguish phonemic contrasts and tones (Bradlow et al. 1999; Lively et al. 1993; Logan et al. 1991; Sereno & Wang 2007; Wang et al. 1999; Wang et al. 2001; Wang et al. 2003; Wang et al. 2006; Wayland & Guion 2004; Wayland & Li 2008; Wong & Perrachione 2007). Re-focusing learners' attention on the relevant linguistic components of a language and reducing emphasis on less important information guides learners' perceptions about what to pay attention to in the language they are learning (Chandrasekaran et al. 2010; Francis & Nusbaum 2002; Francis et al. 2008; Nosofsky 1987). In our work on Cherokee, we responded to these concerns by incorporating community feedback to build tone learning resources to provide easy repetition of recordings of short words with clear and intuitive visual cues.

Although communication, not metalinguistic understanding, is often the goal of language lessons, sometimes focusing on specific linguistic components can facilitate overall language development. Our use of explicit instruction and visual cues to assist learners with tone is well supported in the literature. Porretta & Tucker (2015) found that providing information about specific features of an L2 can advance learners' processing of non-native contrasts. Additionally, research on L2 learning and lesson design advocates incorporating enrichments to create opportunities for learners to notice linguistic features of interest (Lyster 2004; Sharwood Smith 1993; Sharwood

Smith & Truscott 2014). Emphasizing specific components by enhancing salience through different techniques (e.g., explanation, bolding, highlighting, differentiated fonts, colors) aids learners' ability to focus on target characteristics. This focus, in turn, serves to encourage development of metalinguistic skills. Second language learners benefit from recognition and awareness of enhanced linguistic features, particularly by adding intuitive visualizations of pitch (Schaefer et al. 2016). Native speakers of a language, in contrast, are more likely to know that words that mean different things simply sound different, but they may not have the metalinguistic skills to be explicitly aware of tones, for example, or how to describe them (Himmelmann & Ladd 2008). Second language learners can use explicit metalinguistic instruction to help in the acquisition of native-like tones (Wang et al. 1999). To increase salience of tones, studies have recommended visual and audio accompaniments (Bluhme & Burr 1971; Chun 1998; Chun et al. 2013; Hardison 2004; Levis & Pickering 2004; Liu et al. 2011). This entails creating multi-modal input to support learners' perception. In addition to improving the ability to accurately perceive and identify tones, this has been shown to both improve that perception and also to generalize to production (Wang et al. 1999). That is, developing the ability to perceive tonal differences can be used as a base for teaching the production of tone at a future time.

Our design process for enhancement kept in mind research findings that suggest the complexity and potential confusion of input associated with tones can be lessened by providing visual pitch contours with written forms accompanying audio materials (e.g., Liu et al. 2011; Schaefer et al. 2016) and presenting tones in pairs (e.g., Wang et al. 1999). Additionally, Liu et al. (2011:1122) indicate that "multimodal training that combines visual and auditory training can be even more effective, especially if the use of two modalities is designed to support learner attention to tone information." For our project, some participants reported that they had an easier time distinguishing Cherokee tones after they were introduced to the visuals of pitch tracks that we extracted from Praat (Boersma & Weenink 2013). This approach has also been noted to help learners of other tonal languages (Liu et al. 2011; Wang et al. 1999). We followed the learners' preference and developed enhanced input in the form of extracted images to accompany recorded examples of the various Cherokee tones.

Cherokee learners participating in the documentation portion of the project (Herrick et al. 2015) indicated that they were more comfortable with listening tasks than speaking ones, so we focused on collaboratively developing a set of listening resources for review and practice of tones. This included raising the profile of language use in the community and fostering the use of language in varying domains (such as the home, ceremonies, school, workplace, etc.). We found that a multi-pronged approach to the materials, using both visual and acoustic strategies, was advocated for by participants and well-received as support material. One of our goals, in terms of success, was creating a collaborative sense of community between speakers, learners, and teachers. In order to encourage learning and value what participants were able to do in the language as something to build on, rather than a deficit-view focusing on what they were not able to do, we provided the support requested for learning tones in a form that was accessible for their learning.

**4. Building Cherokee tone resources for learner practice** Technically documented information can be difficult for communities to use. We sought to make the data accessible, keeping in mind Penfield & Tucker's (2011) admonition to understand community needs and to structure information in useable, useful forms. For this portion of our work, the overall objective was to develop and promote viable approaches to the teaching and learning of Cherokee tone.

We incorporated data and techniques from the documentation processes (Herrick et al. 2015) into opportunities for students learning Cherokee at Northeastern State University (NSU) Tahlequah, Oklahoma, to practice tone. Through discussions with faculty and students, we determined that Microsoft's PowerPoint would serve as an appropriate delivery mode because most people had access to this presentation program, it had an easy interface, and the format was familiar, requiring little or no training for users. These factors, along with the ability to insert audio we had recorded and to easily insert and edit images, made it an effective format choice for learning aids.

Feedback from participants in documentation and training sessions (discussed in Herrick et al. 2015), in addition to informal discussions with speakers and learners, allowed us to shape information into a trial lesson for use at NSU. This pilot study consisted of a brief lecture with an accompanying PowerPoint that contained explanations, multiple examples, visual contours for Cherokee tones, embedded audio, guided note-taking materials, and practice exercises. After the lesson, participants completed a follow-up questionnaire to share their reactions to the material presented. They stated that the recordings and visuals were helpful and requested more examples be added. Additionally, their language teacher stated he could foresee posting such lesson ideas on his Blackboard site (the university online learning management system) for his classes. Making the materials available online allows students to continue practicing and developing their skills in Cherokee tone within and beyond the classroom. Based on student responses to this NSU lesson, we made further refinements to our resources and developed stand-alone resources that would allow learners to practice on their own. These practice materials contain explanations, multiple examples with audio and visual contours for Cherokee tones, and other practice slides. Overall format choices (e.g., Romanized representations, inclusion of translations and audio, grouping by tone, and visual enhancements) were based on community requests and reflect the collaborative aspect of this project. In what follows, we present some examples and explanations of the types of slides we created for this project.

We compiled a small set of audio recordings[2] of two-to-three syllable words to illustrate all six Cherokee tones as the audio base for the learner tools. Then, we used Praat to extract pitch tracks from the relevant tone in each word. The perti-

[2]Three speakers participated in these recording sessions. The data presented here are averages from a single native speaker – an elder acknowledged in the community as being one of the best speakers (male, L1 Cherokee, over 65). The PowerPoint materials we created made use of recordings from two speakers (both male, both raised with Cherokee as the language of the home during early childhood, one over 40, the other over 50) with the possibility for the community to add speakers and recordings in the future. These two speakers are also acknowledged as excellent speakers in the community.

nent tone-bearing vowel of each word was marked and labeled in a TextGrid (see Figure 1). We used a script to measure the pitch of each tone at five equidistant points (780 total measurements for the data set), and next averaged and plotted the points for each tone as a line graph. The result was a visual representation of the pitch changes for each of the six tones which we referred to as "tone art" (see Figure 2 and Figures 6-9 below; for more detail see Herrick et al. 2015). Finally, to assist learners in developing a better sense of the acoustic quality of each tone, we created a set of individual PowerPoint slides that paired the visual "tone art" for each tone with audio recordings of words illustrating that specific tone (see especially Figure 6 below; an example PowerPoint with embedded audio can be downloaded at https://tinyurl.com/y89pphgb).

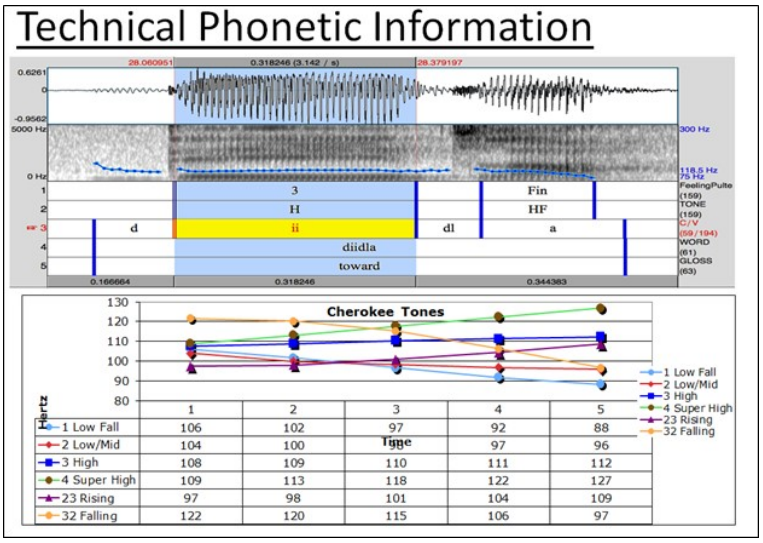


**Figure 1.** Praat TextGrid and line graph

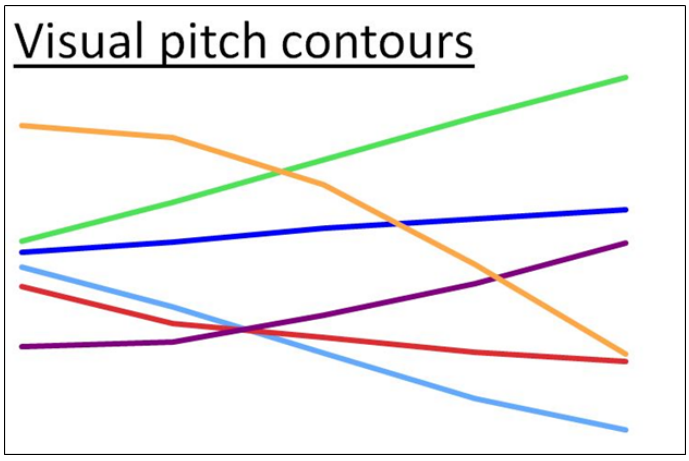


**Figure 2.** "Tone Art" slide illustrating visual representations of pitch contours

Initial explanatory slides in the presentation contained background metalinguistic information and explanations (Figure 3). These focused on de-jargonizing technical linguistic information to convey relevant information useful to language learners. This follows Porretta & Tucker's (2015) suggestion that learners can benefit from information about unique features of a language.

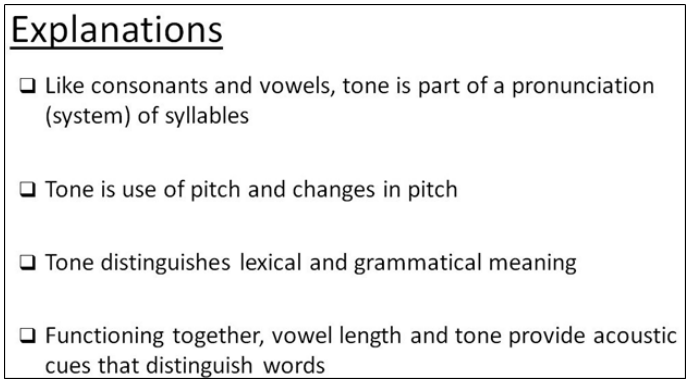


**Figure 3.** Explanations and definitions of tone

Slides with examples attempted to clarify the complexity of spoken versus written representations by presenting background metalinguistic information with examples from commonly known vocabulary (Figure 4). This, again, addressed metalinguistic understanding by explicitly pointing out the ways in which traditional written forms might not overtly indicate subtle yet crucial linguistic information relevant to pronunciation. This also served as a way to introduce and motivate the importance of linguistic features like tone and vowel length.

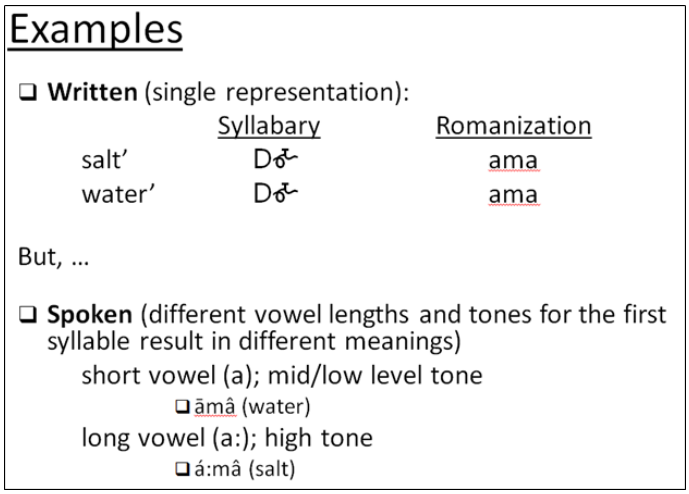


**Figure 4.** Examples of how tone works

Specific design enhancements sought to make information noticeable and more comprehensible to learners. This included emphasizing key information with bolding,

color, and increased font size to draw learners' attention and focus to the pertinent characteristics, as shown in Figure 5.

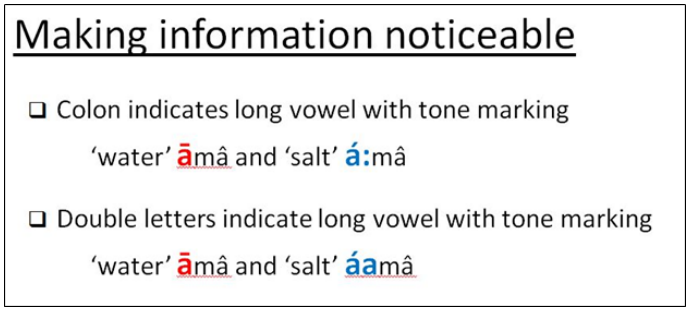


**Figure 5.** Example use of bolding, color, and font size to make tonal features more salient

The next step was to introduce visual representations of tone and explain, briefly, how we created those images. This was done with Figures 1 and 2 and by discussing the six tones, one by one. For each tone, we created a slide similar to that shown in Figure 6. The name for each tone was given in the upper left of the slide. Below this, we provided several examples of (relatively) common words containing that tone (learners requested that we include English translations and that the Cherokee be spelled in Romanized characters rather than syllabary). The portion of the word containing the tone was bolded and set in a distinct color, and audio files were embedded in the slide. To the right of the examples, we presented the tone art – a visual representation of the pitch values associated with the tone. In the upper right corner, we presented the tone art for all six tones, with the image for the tone we wanted learners to focus on bolded and in color so that it was salient and in visual context with reference to the other tones.

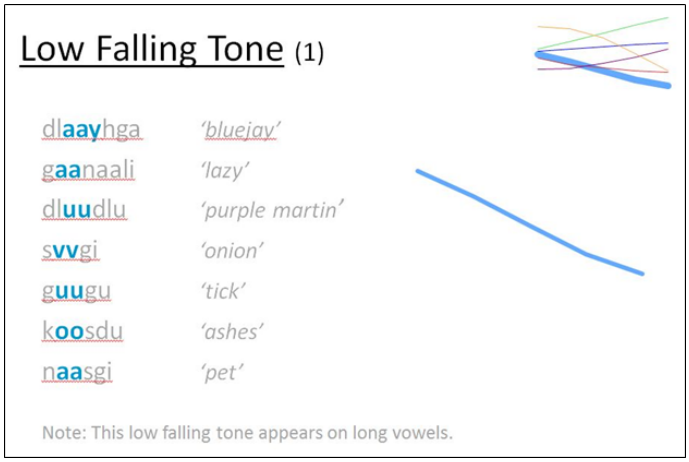


**Figure 6.** Example of enhancements for a tone

To provide practice opportunities, we set up contrasting pairs of tones (see Figure 7). Again, we used bolding, font size, color, audio, and visual images to enhance the salience of each tone. This moved learners from focusing on one sound's characteristics to a finite comparison with another as a way to further build metalinguistic understanding of the characteristics of tone.

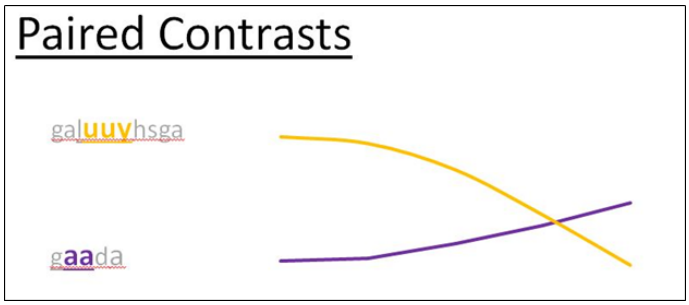


**Figure 7.** Example illustrating paired contrasts of rising and falling tones with images, color, font size, and bolding enhancements

Other practice opportunities allowed learners to check if they could identify the correct tone when limited to two and then three choices (instead of all six; Figure 8; left slide). As learning progressed, transitioning to less and less aid was part of a pedagogic sequence in which the illustrations could be changed from color to black and white so that the visual was still available, but less distinct. These were also varied by removing the tone art images (which were used initially to enhance learning and awareness) so that, as learners became more familiar with the tones, they would not come to depend upon the support scaffolding (Figure 8; right slide).

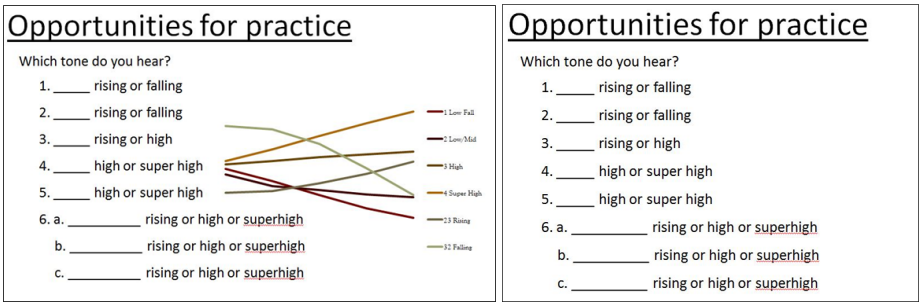


**Figure 8.** Examples illustrating practice opportunities with and without visual pitch contour aids

Slides with an overview of all the information presented initially as explanations and/or as summary information contained enhancements (e.g., visual images, color, bolding, font size, auditory) to provide multi-modal opportunities for learners to perceive tone (Figure 9). With such scaffolded supports, the materials gave learners multiple ways to access the new knowledge about the ways in which tone works to convey information in Cherokee.

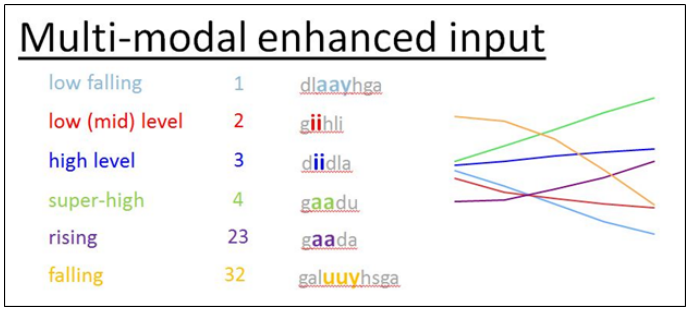


**Figure 9.** Example of tone information enhanced by complementary visual pitch contours, color, and bolding

**5. Future enhancements of resources for learning tone** Overall, the work described here has begun to fill a community need for accessible materials that provide language learners with an introduction to and practice with lexical tone. These resources were created in collaboration with the community as part of a larger linguistic documentation project (Herrick et al. 2015), and use and development of language support materials such as these will enhance opportunities for Cherokee language learning. Learners requested opportunities to be able to listen and re-listen to tones on their own. The slides, which included audio files, explanations, and visual accompaniments, provided that opportunity in a stand-alone format, and also worked well in a classroom setting. The materials offered salient and focused attention on the linguistic aspects that needed input exposure, primarily, perceiving tone. Furthermore, these resources were designed to take highly technical linguistic information and present it in as salient, non-technical, intuitive, and accessible a way as possible.

Future work should build on and enhance the currently available materials. Establishing model words to serve as exemplars for tones as reference touchstones can be helpful. Language teachers/mentors will need to work with learners to determine which specific examples will be most useful. Some specific audio areas to be considered include a need for female voices in recordings, additional exemplars with short vowels, longer words, and eventually sentences incorporating not only lexical tone, but also the role of tone with respect to grammatical interactions (syntactic and morphological) and overall prosody. Each of these additional pieces can provide more resources to build a richer context of the functions of tone in Cherokee.

Another area for potential development that could be useful for learners includes more sophisticated software programs that have additional interactive features (e.g., toggling for each word allowing learners to play and replay a single word rather than an entire set, simultaneous movement along the visual lines as the audio plays, and the ability to record and compare one's own recording to the pitch track of the target sounds). Comparison tasks are fairly easily done with programs such as Praat and have been used for teaching and learning a variety of linguistic features such as stress and intonation in EFL (Gorjian et al. 2013; Le & Brook 2011) and tone in Chinese (Chun et al. 2013). Additionally, mobile-friendly webpages (e.g., Google Forms using quiz questions matched with feedback about accuracy) and other easy

access platforms would allow learners to listen to and practice Cherokee tones. In the absence of such resources, our work here is a first step, and we hope that this paper will provide other communities with a model for creating enhanced, accessible tone learning aids using readily available technology for converting highly technical linguistic documentation into intuitive, accessible, and teachable formats.

## References

Bird, Steven & Larry Hyman (eds.). 2014. How to study a tone language. Special series of themed articles, *Language Documentation & Conservation* 8.

Bluhme, Hermann & Ronald Burr. 1971. An audio-visual display of pitch for teaching Chinese tones. *Studies in Linguistics* 22. 51–57.

Boersma, Paul & David Weenink. 2013. *Praat: Doing phonetics by computer* (Version 5.3.39), http://www.praat.org.

Bradlow, Ann R., Reiko Akahane-Yamada, David Pisoni & Yoh'ichi Tohkura. 1999. Training Japanese listeners to identify English /r/ and /l/: Long-term retention of learning in perception and production. *Attention, Perception, & Psychophysics* 61(5). 977–985.

Broselow, Ellen, Richard Hurtig & Catherine Ringen. 1987. The perception of second language prosody. In Ioup, Georgette & Steven Weinberger (eds.), *Interlanguage phonology: The acquisition of a second language sound system*, 350–362. Cambridge, MA: Newbury House.

Carpenter, Veronica. 1997. Teaching children to "unlearn" the sounds of English. In Reyhner, Jon (ed.), *Teaching indigenous languages*, 31–39. Flagstaff, AZ: Northern Arizona University.

Chandrasekaran, Bharath, Padma D. Sampath & Patrick C.M. Wong. 2010. Individual variability in cue-weighting and lexical tone learning. *The Journal of the Acoustical Society of America* 128(1). 456–465.

Cherokee Nation. 2003. Ga-du-gi: A vision for working together to preserve the Cherokee language. Report of a needs assessment survey and a 10-year language revitalization plan. Final report submitted in fulfillment of FY 2001 DHS ANA grant #90-nl-0189.

Chun, Dorothy M. 1998. Signal analysis software for teaching discourse intonation. *Language Learning & Technology* 2(1). 61–77.

Chun, Dorothy, Yan Jiang & Natalia Avila. 2013. Visualization of tone for learning Mandarin Chinese. In Levis, John & Shannon McCrocklin (eds.), *Proceedings of the 5th Pronunciation in Second Language Learning and Teaching Conference*, 79–89. Ames, IA: Iowa State University.

Cook, Vivian. 1996. *Second language learning and language teaching*, 2nd ed. London: Arnold.

Cook, William Hinton. 1979. *A grammar of North Carolina Cherokee*. New Haven, CT: Yale University. Doctoral dissertation.

Cope, Lida & Susan D. Penfield. 2011. Applied linguist needed: Cross-disciplinary networking for revitalization and education in endangered language contexts. *Language and Education* 25(4). 267–271.

Cruz, Emiliana & Anthony C. Woodbury. 2014. Finding a way into a family of tone languages: The story and methods of the Chatino Language Documentation Project. *Language Documentation & Conservation* 8: 490-524. http://hdl.handle.net/10125/24615.

Feeling, Durbin, Christine Armer, Charles Foster, Marcellino Berardo & Sean O'Neill. 2010. Why revisit published data of an endangered language with native speakers? An illustration from Cherokee. *Language Documentation & Conservation* 4. 1–21. http://hdl.handle.net/10125/4464.

Francis, Alexander L., Valter Ciocca, Lian Ma & Kimberly Fenn. 2008. Perceptual learning of Cantonese lexical tones by tone and non-tone language speakers. *Journal of Phonetics* 36(2). 268–294.

Francis, Alexander L. & Howard C. Nusbaum. 2002. Selective attention and the acquisition of new phonetic categories. *Journal of Experimental Psychology: Human Perception and Performance* 28(2). 349–366.

Fu, Qian-Jie, Fan-Gang Zeng, Robert V. Shannon & Sigfrid D. Soli. 1998. Importance of tonal envelope cues in Chinese speech recognition. *The Journal of the Acoustical Society of America* 104(1). 505–510.

Gandour, Jackson. 1983. Tone perception in far eastern languages. *Journal of Phonetics* 11. 149–175.

Gorjian, Bahman, Hayati Abdolmajid & Arisa Pourkhoni. 2013. Using Praat software in teaching prosodic features to EFL learners. *Procedia – Social and Behavioral Sciences* 84. 34–40.

Grinevald, Colette. 2003. Speakers and documentation of endangered languages. In Austin, Peter K. (ed.), *Language Documentation and Description* 1, 52–72. London: Hans Rausing Endangered Languages Project.

Hardison, Debra M. 2004. Generalization of computer-assisted prosody training: Quantitative and qualitative findings. *Language Learning & Technology* 8(1). 34–52.

Herrick, Dylan, Marcellino Berardo, Durbin Feeling, Tracy Hirata-Edds & Lizette Peter. 2015. Collaborative documentation and revitalization of Cherokee tone. *Language Documentation & Conservation* 9. 12-31. http://hdl.handle.net/10125/24630.

Himmelmann, Nikolaus P. & Robert D. Ladd. 2008. Prosodic description: An introduction for fieldworkers. *Language Documentation & Conservation* 2(2). 244–274. http://hdl.handle.net/10125/4345.

Hinton, Leanne & Ken Hale. 2001. *The green book of language revitalization in practice*. San Diego, CA: Academic Press.

Howie, John Marshall. 1976. *Acoustical studies of Mandarin vowels and tones*. Cambridge, England: Cambridge University Press.

Hyman, Larry M. 2014. How to study a tone language, with exemplification from Oku (Grassfields Bantu, Cameroon). *Language Documentation & Conservation* 8. 525–562. http://hdl.handle.net/10125/24624.

Iverson, Paul, Patricia Kuhl, Reiko Akahane-Yamada, Eugen Diesch, Yoh'ich Tohkura, Andreas Kettermann & Claudia Siebert. 2003. A perceptual interference account of acquisition difficulties for non-native phonemes. *Cognition* 87. B47–B57.

Johnson, Keith. 2005. *Tone and pitch accent in Cherokee nouns*. Berkeley, CA: University of California Berkeley. Unpublished ms.

Jongman, Allard & Corinne B. Moore. 2000. The role of language experience in speaker and rate normalization processes. *Proceedings of the 6th International Conference on Spoken Language Processing*, October 16–20, 2000, Beijing, China. 62–65.

Kiriloff, Constantine. 1969. On the auditory perception of tones in Mandarin. *Phonetica* 20. 63–67.

Le, Hang Thu & Jennifer Brook. 2011. Using Praat to teach intonation to ESL students. *Hawai'i Pacific University TESOL Working Paper Series* 9(1, 2). 2–15.

Levis, John & Lucy Pickering. 2004. Teaching intonation in discourse using speech visualization technology. *System* 32(4). 505–524.

Lindsey, Geoffrey Alan. 1985. *Intonation and interrogation: Tonal structure and the expression of a pragmatic function in English and other languages*. Los Angeles, CA: UCLA. Doctoral dissertation.

Liu, Ying, Min Wang, Charles A. Perfetti, Brian Brubaker, Sumei Wu & Brian MacWhinney. 2011. Learning a tonal language by attending to the tone: An in-vivo experiment. *Language Learning* 61(4). 1119–1141.

Lively, Scott E., John S. Logan & David B. Pisoni. 1993. Training Japanese listeners to identify English /r/ and /l/. II: The role of phonetic environment and talker variability in learning new perceptual categories. *The Journal of the Acoustical Society of America* 94(3). 1242–1255.

Logan, John S., Scott E. Lively & David B. Pisoni. 1991. Training Japanese listeners to identify English /r/ and /l/: A first report. *The Journal of the Acoustical Society of America* 89(2). 874–886.

Lyster, Roy. 2004. Differential effects of prompts and recasts in form-focused instruction. *Studies in Second Language Acquisition* 26(3). 399–432.

Miyashita, Mizuki & Annabelle Chatsis. 2013. Collaborative development of Blackfoot language courses. *Language Documentation & Conservation* 7. 302–330. http://hdl.handle.net/10125/4597.

Montgomery-Anderson, Brad. 2008. *A reference grammar of Oklahoma Cherokee*. Lawrence, KS: University of Kansas. Doctoral dissertation.

Montgomery-Anderson, Brad. 2015. *Cherokee: Reference grammar*. Norman, OK: University of Oklahoma Press.

Nosofsky, Robert M. 1987. Attention and learning processes in the identification and categorization of integral stimuli. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 13(1). 87–108.

Orie, Olanike. 2006. L2 acquisition and Yoruba tones: Issues and challenges. In Arasanyin, Olaoba F. & Michael A. Pemberton (eds.), *Selected Proceedings of the 36th Annual Conference on African Linguistics*, 121–128. Somerville, MA: Cascadilla.

Penfield, Susan D. & Benjamin V. Tucker. 2011. From documenting to revitalizing an endangered language: Where do applied linguists fit? *Language and Education* 25(4). 291–305.
Poell, Nathan. 2004. A phonetic study of the vowels and tones of Western Cherokee. Lawrence, KS: University of Kansas. Master's thesis.
Porretta, Vincent J. & Benjamin V. Tucker. 2015. Perception of non-native consonant length contrast: The role of attention in phonetic processing. *Second Language Research* 31(2). 239–265.
Pulte, William & Durbin Feeling. 1975. *Cherokee-English dictionary*. Tahlequah, OK: Heritage Publishers.
Rice, Sally. 2011. Applied field linguistics: Delivering linguistic training to speakers of endangered languages. *Language and Education* 25(4). 319–338.
Scancarelli, Janine. 1987. *Grammatical relations and verb agreement in Cherokee*. Los Angeles, CA: UCLA. Doctoral dissertation.
Schaefer, Rebecca S., Lilian J. Beijer, Wiel Sueskens, Toni C.M. Rietveld & Makiko Sadakata. 2016. Intuitive visualizations of pitch and loudness in speech. *Psychonomic Bulletin & Review* 23. 548–555.
Sereno, Joan A. & Yue Wang. 2007. Behavioral and cortical effects of learning a second language: The acquisition of tone. In Bohn, Ocke-Schwen & Murray J. Munro (eds.), *Language experience in second language speech learning*, 239–258. New York: John Benjamins Publishing Company.
Sharwood Smith, Michael. 1993. Input enhancement in instructed SLA: Theoretical bases. *Studies in Second Language Acquisition* 15(2). 165–179.
Sharwood Smith, Michael & John Truscott. 2014. *The multilingual mind: A modular processing perspective*. Cambridge: Cambridge University Press.
Shen, Xiaonan Susan. 1989. Toward a register approach in teaching Mandarin tones. *Journal of Chinese Language Teachers Association* 24(3). 27–48.
Uchihara, Hiroto. 2009. High tone in Oklahoma Cherokee. *International Journal of American Linguistics* 75(3). 317–36.
Uchihara, Hiroto. 2013. *Tone and accent in Oklahoma Cherokee*. Buffalo, NY: University at Buffalo SUNY. Doctoral dissertation.
Uchihara, Hiroto. 2016. *Tone and accent in Oklahoma Cherokee*. Oxford: Oxford University Press.
UNESCO. 2003. Language vitality and endangerment. Presented at the *International Expert Meeting on UNESCO Programme Safeguarding of Endangered Languages*, Paris, March 10–12, 2003.
Wang, Yue, Allard Jongman & Joan A. Sereno. 2001. Dichotic perception of Mandarin tones by Chinese and American listeners. *Brain and Language* 78(3). 332–348.
Wang, Yue, Allard Jongman & Joan A. Sereno. 2003. Acoustic and perceptual evaluation of Mandarin tone productions before and after perceptual training. *The Journal of the Acoustical Society of America* 113(2). 1033–1043.
Wang, Yue, Allard Jongman & Joan A. Sereno. 2006. Second language acquisition and processing of Mandarin tone. In Li, Ping, Elizabeth Bates, Li Hai Tan & Ovid J.L.

Tzeng (eds.), *Handbook of Chinese psycholinguistics*, 250–256. Cambridge: Cambridge University Press.
Wang, Yue, Michelle M. Spence, Allard Jongman & Joan A. Sereno. 1999. Training American listeners to perceive Mandarin tones. *The Journal of the Acoustical Society of America* 106(6). 3649–3658.
Wayland, Ratree P. & Susan G. Guion. 2004. Training English and Chinese listeners to perceive Thai tones: A preliminary report. *Language Learning* 54(4). 681–712.
Wayland, Ratree P. & Bin Li. 2008. Effects of two training procedures in cross-language perceptions of tones. *Journal of Phonetics* 36(2). 250–267.
Whalen, Douglas & Yi Xu. 1992. Information for Mandarin tones in the amplitude contour and in brief segments. *Phonetica* 49(1). 25–47.
White, Caryn. 1981. Tonal pronunciation errors and interference from English intonation. *Journal of Chinese Language Teachers Association* 16(2). 27–56.
Wong, Patrick C.M. & Tyler K. Perrachione. 2007. Learning pitch patterns in lexical identification by native English-speaking adults. *Applied Psycholinguistics* 28(4). 565–585.
Wright, Richard. 1996. Tone and accent in Oklahoma Cherokee. In Munro, Pamela (ed.), *Cherokee Papers from UCLA*, 11–22. Los Angeles, CA: UCLA.
Yamada, Racquel-María. 2007. Collaborative linguistic fieldwork: Practical application of the empowerment model. *Language Documentation & Conservation* 1(2). 257–282. http://hdl.handle.net/10125/1717.

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