TEACHING AMERICAN ENGLISH SOUNDS TO BLIND AND LOW VISION LEARNERS USING ASSISTIVE TECHNOLOGY

Maritza Medina Gonzalez

MA in TESOL

Michigan State University

# ABSTRACT

This project was designed to improve the inclusive nature of courses on language learning and teaching through the creation of Adaptive English Phonetic tools (ADEPT) to provide better access to the International Phonetic Alphabet (IPA) symbols and the sounds they represent for blind and low vision learners and teachers of American English as a second or foreign language. This approach involved the integration of auditory and tactual information to facilitate the development of phonological literacy based on the effectiveness of multisensory training protocols. ADEPT consists of sets of tactile IPA symbol cards, and a companion website based on the Universal Design for Learning framework. Each IPA symbol card includes the symbol, its typographical description, and a reference number associated with the website (all with corresponding Braille notations). The website includes printed and audio-recorded information on the articulation of American English consonants and vowels with recordings of each sound in isolation and in sample words. The pedagogical efficacy of these tools was tested with 21 adult learners of English in Colombia with a focus on vowel production. A pretest-posttest design involving the delayed repetition technique was used. Learners’ productions of short sentences with multiple exemplars of American English vowels were audio-recorded. Native-speaker ratings revealed a significant improvement in learners’ pronunciation after 10 weeks of instruction. Qualitative data included pre- and post-study interviews and the researcher’s instructional notes. Learners described the auditory-tactual approach as “invaluable”. Field testing of the symbol cards indicated that they should be 3D printed for sustainability. In sum, ADEPT can facilitate a collaborative learning environment for sighted and non-sighted individuals.

# INTRODUCTION

Knowledge of phonetics (how speech sounds are produced, transmitted, and perceived) is critical to the general study of language, and more specifically, the development of phonological literacy among language learners and teachers (Hardison, 2014). Phonetics should be taught with the same importance as other linguistic elements in classes focused on English as a foreign language (EFL). As an English teacher for many years in mainstream schools and a social organization, I was aware of the limited range of pedagogical materials available to teach phonetics to EFL learners. Therefore, it became important to me to consider the design of possible strategies or tools for pedagogical purposes, emphasizing, in particular, the need to create didactic materials based on the Universal Design for Learning (UDL) guidelines from the Center for Applied Special Technologies (CAST, 2018) for all learners, even those who have visual impairments and may lack easy access to a dictionary or multimodal resource for phonetic symbols. To address this need, Adaptive English Phonetic Tools (ADEPT) were created that can be used in many different inclusive educational contexts.

Based on my experiences as an English teacher and student, ADEPT can fill many gaps in the EFL classroom in my country, Colombia, as well as in a range of visually impaired communities, allowing these learners to grow more easily in their oral skills, become more cognizant of their ownabilities, and understand better the importance of the production and perception of the different sounds that shape the English language.

# OVERVIEW OF THE STUDY

The current study had three main objectives. The first was to develop sets of tactile materials appropriate for visually impaired learners of English to help them learn IPA symbols and the sounds they represent in American English. These materials needed to be designed so they could be easily reproduced for use in a range of educational contexts, and as inexpensively as possible. The second objective was to design an accessible companion website following UDL guidelines to be used by learners in conjunction with the tactile materials. By putting these tools together, ADEPT (Adaptive English Phonetic Tools) was created. The third objective was to test the pedagogical efficacy of this multisensory (auditory and tactual) input with a visually impaired learner population. Specifically, it was important to determine if the tools resulted in significant improvement in learners’ English pronunciation, and how they responded to their use.

To address the study’s objectives, both quantitative and qualitative research methods were employed. A pretest-posttest design was used to assess the impact of training on learners’ English pronunciation with a focus on American English vowels, which are more challenging than consonants for L1 Spanish speakers.

This data collection served to field test ADEPT with EFL learners. Because the study was not designed to compare instructional methods, no attempt was made to establish a control group. Qualitative data included pre- and post-training interviews with the learners, the instructor’s daily records kept during the training period, and the learners’ oral and written feedback on the perceived value of the training materials and procedure.

# ADEPT COMPONENTS

1. Tactual IPA symbol cards:

Four sets of 45 tactile IPA symbol cards were prepared. Each set included symbols for the consonants and vowels found in American English as this was the English variety of interest to the participants in the study. The symbols primarily represented the phonemic inventory although additional cards were created based on the difficulties that some frequently occurring sounds present for many L2 English learners, including native Spanish speakers; for example, a card was prepared for each voiceless aspirated stop (e.g., the first sound in pet, top, catch), the flap (e.g., the medial consonant sound in city), r-colored (rhotacized) vowels (e.g., bird, teacher), and each diphthong (a single vowel with continuously changing quality) (e.g., buy, loud, toy). The front and back mid vowels were also treated as diphthongs (i.e., [eɪ] and [oʊ]) following Ladefoged and Disner (2012).

In the upper left corner of each card, a sequence number was printed as a tactile numerical character, along with its Braille representation. This sequence number referred the user to additional information on the companion website (described below). The tactile IPA symbol, was centrally located with its corresponding representation in Braille to the right. Below the symbol was the typographical description in Braille with its standard orthography representation. In doing so, the information on each of these cards was accessible to both sighted and non-sighted users for collaborative learning.

1. Companion Website:

A website was developed by Info Innova in Colombia to be used in conjunction with the IPA phonetic symbol cards although the site can be used independently (see <http://thesis.medinago.msu.domains/>).

It was organized according to three criteria: a) the need for a user-friendly design, b) comments and suggestions from various test users who were involved with language teaching and assistive technology, and c) the principles of Web Content Accessibility Guidelines (WCAG) 2.0. The site includes a) the names of the phonetic symbols that represent the sounds of American English, b) the typographical description of the symbols, c) information on how the consonant and vowel sounds are produced with reference to the usual descriptive characteristics for consonants (e.g., place and manner of articulation, voicing status) and vowels (e.g., height, backness, rounding), and d) recordings of each sound in isolation and in frequently occurring words. The site also includes specific technical details for the production of the symbol cards. For users, there are setup instructions for a Windows 10 computer.

# DATA ANALYSIS

After 10 weeks of training in the production and comprehension of the American English sounds, starting with a pretest and finalizing with a posttest, these are part of the results:

Of the 21 participants in the study, data from four had to be omitted from analysis because of either failure to follow task instructions or too few attempts at production during the pretest recordings. The number of target vowel sounds attempted by each of the remaining 17 participants was tabulated and used as the number of possible points for a given sentence. Participants were not penalized for failing to produce a specific target because it could have been due to reasons other than production ability such as limitations in memory recall.

Rater judgments were evaluated for inter-rater reliability using intraclass correlation coefficient. Cronbach’s alpha was very good at .98. A mean score was then calculated for each sentence produced by each participant in the pretest and posttest. Percent correct was then calculated for each participant to represent production accuracy as a proportion of the total attempts made in the pretest and posttest. In some cases, a participant could not recall a specific word but substituted one of similar meaning. The substitution was included in the analysis if the word contained the target vowel. For example, substitution of the word “job” for work was not included, but substitution of “around” for throughout in the phrase throughout the world was included as was the substitution of the word “government” for governor because the target vowel was present. These meaning-based substitutions were also an indication that at least some of the participants were focused on meaning versus form during the task. This focus was also evident when a participant resorted to Spanish in order to express the meaning of a sentence; this occurred only twice.

In addition to the quantitative data, three instruments provided information on the participants’ perspectives on the training program and recommendations for future use: a) two interviews with the participants (one at the beginning and the other at the end of the study; b) the teacher notes written after each training session, and c) a collection of comments sent by the students by email.

# CONCLUSIONS

The teaching of language is similar across all kinds of students. Disabilities are not obstacles to language learning with good materials and instructional methods that provide an inclusive ESL or EFL classroom. Multisensory input, whether a combination of auditory, visual, and/or tactual, enriches language acquisition as do cooperative learning environments and the process of empowering learners by giving them a true sense of the purpose of learning another language.

Language teachers everywhere can encourage in their classrooms the relevance of phonetic study to improve oral skills in any language and the importance of cooperative learning to incorporate a true environment of inclusive education.