ISAPh 2016 International Symposium on Applied Phonetics
25-28 March 2016, Nagoya, Japan

Using Venn Diagram and Sensory Integration in Chinese EFL Learners' Pronunciation Drill

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Abstract

Foreign language learners tend to mispronounce sounds in the target language by subconsciously searching and substituting with "similar corresponding sounds" in their native dialects. Correction of EFL pronunciation is thus difficult for both instructors and learners. Yet Critical Period Hypothesis is being increasingly misused by Chinese teachers and researchers as an excuse for not paying attention to learners' pronunciation habits. To address this problem with an effective learning strategy, the paper proposes a two-step approach, i.e., Step 1, the use of Venn diagram as visual organizer by mapping the phones of native language and target language into the sets in a clear and logical manner; and Step 2, the use of sensory integration pronunciation exercise to realize self-monitored oral-motors of the learners. An intensive five-minute instruction with the aid of Venn diagram and sensory integration pronunciation exercise of diphthongs is given to Chinese learners to elicit differences in diphthongs between target language and native language.

Results of phonetic data analyses show that learners made significant improvements in accuracy after the two-step intensive training. Language instructors should therefore be aware of the effects of a) Venn diagram visual aid as a prototype to compare and differentiate the seemingly similar "corresponding sounds" against native language interference, and b) sensory integration in pronunciation training as a positive habit-forming practice.

Keywords: pronunciation accuracy, L2 pronunciation, diphthongs, Venn diagram, sensory integration.

1. Background and aims

Learners of a foreign language are often faced with a difficult task of reaching pronunciation accuracy. Research has suggested that the degree of activation of the L1 and the strength of L1 representations may influence L2 production accuracy. Difficulties in pronunciation training for foreign language learners are mainly caused by native language interference, and the effect of equivalence classification of "similar sounds" in learner perception is due to the establishment of stable phonological representations for sounds in the native language cause identical perception of phonetically different sounds.

With English gaining an increasingly significant role as an international language for communication, Chinese learners are found to invest much time and effort into improving their pronunciation skills by participating in pronunciation correction or accent-reduction programs for possible improvements. Much research attention has been paid to suprasegmental problems like prosody, word stress, tone and intonation for Chinese EFL learners, yet it is worth noting that segmental mispronunciations may sometimes lead to unintelligibility, and weakens the self-confidence of the learner.

Despite its pedagogical importance, studies investigating learning strategies of EFL pronunciations in China are so far scarce and limited. Some researchers argue that there is "no magic formula for teaching students to hear sounds and recognize contrasts that they have not previously met", and "only repeated exposure to the problem sounds in contexts … is most likely to succeed", as quoted in Poedjosoedarmo [1]. Some Chinese teachers and researchers even use Critical Period Hypothesis as an excuse for legitimizing learners' mispronunciation habits. The aim of this paper is to address this problem with an effective learning strategy.

2. The Two-step Approach

Studies investigating behaviors and strategies of language learners found that psychological factors can affect pronunciation practice, the attainment of pronunciation accuracy as indicated in Sardegna [2], Trofimovich [3], and the degree of foreign accent as indicated in Piske [4]. Yet phonetic and phonological awareness of the EFL learners to differentiate pronunciation in target language are often neglected in pronunciation classrooms and

10.21437/ISAPh.2016-23

teaching materials in China. Learners are often required to correct pronunciation through rote and repetitive exercise, thus pronunciation classes are considered 'boring, lack of excitement and interest'.

In a previous study on achievement goals and motivation inventories in a Chinese tertiary level EFL pronunciation class, 66 students from Renmin University of China were enrolled in a special series of 30-hour pronunciation training class series in the 4-day intensive session. The students were then encouraged to write the daily achievement goals feedback. By analyzing the open-ended written feedback, basic phonological awareness-raising issues and multimedia, multi-sensory self-training pronunciation techniques are found to be the two most prominent elements.

In the range of basic awareness-raising techniques, the interactive two-circle Venn diagram is found effective to help learners effectively visualize pronunciation goals to differentiate the "corresponding sounds" in the native language, thus providing a prerequisite condition for further correction. Venn diagram is once discovered to be an effective visual organizer, along with time-lines, concept maps, and flow charts that help students recognize and take control of the mental processes which bear meaning to the study content. Venn diagram reflects a certain kind of thinking pattern about complex content knowledge. From the view of cognitive learning theory, Venn diagram, as one of the graphic representation frames, is the reflection or imitation of semantic memory structures (Schemata). It allows instructors to rapidly focus learner attention and to clarify the purposes and thinking processes. Thus as shown in Figure 1, the diagram can be used as a prototype to differentiate and compare seemingly similar "corresponding sounds" by mapping the segmentals of native language and target language into the sets in a clear logical manner.

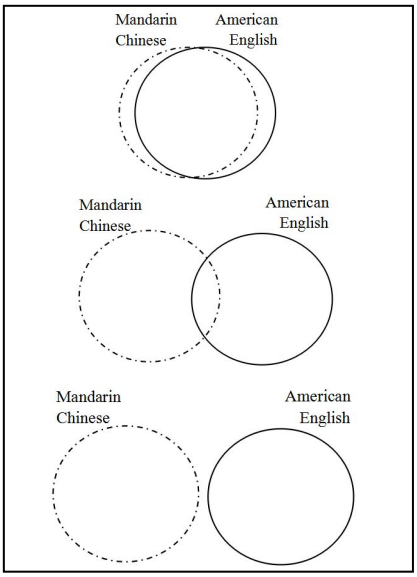

Figure 1: The Venn diagram of Mandarin and English pronunciation.

As for the multi-sensory self-training techniques, sensory integration supports effective retrieval of lip, teeth and tongue position (manner of articulation) of target pronunciation.

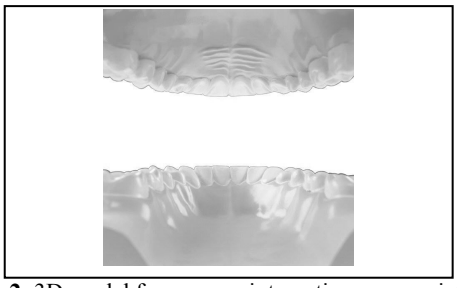

Figure 2: 3D model for sensory integration pronunciation guide.

The design of the intensive teaching is in accordance with a meta competence-oriented model advocated by Wrembel []. The basic consensus is made by acknowledging that acquisition of phonological and phonetic knowledge can be divided to sequential steps from covert to overt, with an increase in explicitness. Both steps strives to empower learners by equipping them with self-monitoring strategies.

3. Methods

3.1. Talkers

Ten male participants aged between 25 to 33, all with normal hearing according to self-report, participated as subjects. All of them have received formal education of English as a first foreign language since primary school (mean age = 6.5 years) for nearly 20 years in China.

Group A was formed by five male participants who are currently post-graduate students majoring in English language and literature. The participants all passed Chinese national College English Test Band 6 (CET-6), and are "competent users" with IELTS overall band test score 6.5, yet with modest oral test score 5.5. The other five participants with a label of Group B were composed of male Chinese who moved to Canada after adolescence and has studied or worked in Canada for above three years, with similar types of prior oral language experience (according to self-reports on pronunciation problems). Two native speakers of North American English are invited to judge the participants' performances and score based on their perception of "foreign accents" with special focus on the four diphthongs.

3.2. Speech materials and procedure

The speech material was recorded on computers using electret condenser microphones Takstar PCK100 positioned about 10 centimeters from the speakers' mouth. The subjects were recorded at a sample frequency of 44,100 Hz via mono channel in quiet and sound retreated rooms.

Four simple words, namely, *kite*, *cake*, *about* and *note* were chosen to elicit production of American English diphthong /ai/, /ei/, /au/and /əu/. Words instead of sentences were used to elicit the pronunciation details of diphthongs. It was decided not to present diphthongs of /ɔi/ and /ju:/. /ɔi/ sound does not exist in mandarin Chinese and major dialects of Chinese, so Chinese learners do not have the usual problem of such substitution; /ju:/ sound is often mispronounced by Chinese learners because of other reasons in confusion with spelling "ou" against Chinese Pinyin phonological representation symbols.

The participants pronounce the sounds of the material between pause and break sounds before and after a five-minute two-step approached instruction.

3.3. Analyses

A total of 80 pieces of recorded sound files were collected before and after the Venn diagram instruction of four diphthongs. Two sets of acoustic measurements were made from the digitized wave forms. The sound files were analyzed with Praat version_6019 by extracting of selected sounds from time 0 and resampling at 0 to 5,000 Hz before analyzing spectrum to linear predictive coding analysis (LPC-burg). Then sliced spectrum at the middle point of each component (center frequencies) of the diphthongs was collected. The F1 and F2 frequencies at starting and ending point were also collected. 40 slices of formants (20 for each half component of the diphthongs) of each sound file were also extracted as a second data set by revising time step settings. Formant frequencies of F1, F2 and F3 were then submitted to standard deviation to show the movements of oral cavities in pronouncing the diphthongs. Preliminary analysis revealed no significant difference in the production of diphthongs between Groups A and B according to the impression of perception from native North American English speakers, i.e., both groups have strong indication of Chinese pronunciation of the four diphthongs. Thus to simplify the results, mean value of the data of ten talkers are then used in subsequent analyses, rendering eight sets of mean frequency data. Group A all have experienced instructions from native English speakers, yet never had a massive language exposure to real-life English use. Group B received an equal amount of formal English education in China, and shared similar oral English experience after they arrived in Canada. Self-reports show identical problems in mispronunciation or Chinese-accented pronunciation problems. This meant that exposure to English-language environments was in fact not a major relevant between-participant factor when it comes to pronunciation correction.

4. Results and discussion

The numbers of standard deviation of F1, F2 and F3 are presented in Table 1a and 1b. Standard deviation of formants are important values indicating either gradual or sudden change of oral cavity. All the F2 value in Table 1b is significantly larger than corresponding F2 value as shown in Table 1a above. The F1, F2 and F3 values of post-test /ei/ in Table 1b are all significantly larger than corresponding F1, F2 and F3 values of pretest /ei/. The F2 and F3 values of post-test /ai/ in Table 1b are all significantly larger than corresponding F2 and F3 values of pretest /ai/.

Table 1a: Standard deviation of F1, F2 and F3 (pretest).

	σF1	σF2	σF3
/ai/	171.7991	218.7316	120.5930
/ei/	76.5195	187.9277	112.7988
/au/	237.7493	144.1150	282.9826
/ou/	110.3934	178.0369	619.1981

Table 1b: Standard deviation of F1, F2 and F3 (post-test).

	σF1	σF2	σF3
/ai'/	190.7866	731.0071	406.3515
/ei'/	475.2800	479.8298	396.2243
/au'/	203.6038	193.4792	82.5848
/ou'/	95.7045	248.7445	116.2878

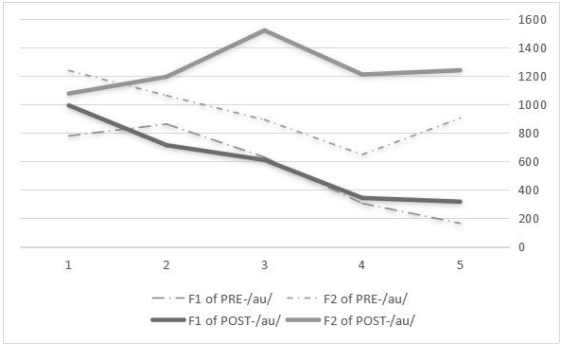

Figure 3: Learner performance of pre-training Chinese-influenced genuine diphthong [aʊ̯] and post-training American English pseudo diphthong [au].

To clearly show the fluctuations of frequencies before and after the intensive training, Figure 2 is illustrated to show F1 and F2 change of /au/ by plots

of line chart. The significant change in standard deviation of F1, F2 and F3 (especially F2) indicates wider rage of change after the Venn diagram training. This suggests that learners can clearly recognize and produce the differences between the genuine (thus low variation in frequency range) Chinese mandarin diphthongs and the pseudo (thus high-fluctuated) American English diphthongs.

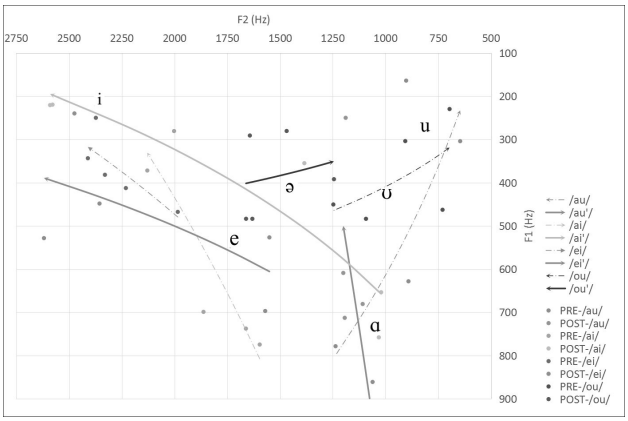

Figure 4: F1, F2 formants of diphthongs in learner performances.

The frequency of formants are described in Figure 3 by dots with F1 as longitudinal axis and F2 as horizontal axis. The change of frequency of F1 and F2 are represented by gliding arrows after logarithm calculation (with arrow showing change of frequency with articulation). As can be seen from the vowel diagram, four diphthongs are presented with eight arrows. Post-test diphthongs are represented by full lines and pretest is represented by dotted lines. As are implied by the dotted arrows in the figure, after the Venn diagram training the [aɪ̯] sound influenced by L1 Chinese has: (i) reached towards the accurate articulation of target language and (ii) increased time and frequency range, thus changed to [ɑi]. The same accuracy was achieved with the diphthong /ei/. The case of /au/ and /əu/ sounds produced by L1 Chinese learners are equally interesting. The [u] sound influenced by Chinese pronunciation has achieved accuracy by moving to [ʊ] in American English after the training, thus having near-native productions of /au/ and /əu/.

The once popular view that the earlier in life that one begins to foster pronunciation of L2, the better one is apt to pronounce the phones, is being questioned increasingly. Flege [6] showed that the foreign accent can still be detected in Chinese adults who had arrived in the US at an average age of 8 years. Flege, Frieda and Nozawa [7] challenged the Critical Period Hypothesis which concluded that critical period for speech ends at the age of 12 to 15 years.

As is shown in the discussion above, to a large extent the problematic features of foreign language pronunciation depend on the learners' first language or native dialect. The beauty of the Venn diagram as a first step approach is its potential of developing personalized learning strategy. For example, Chinese speakers may need to practice with /r/ and /l/ but Malay speakers do not. The first step for the oral language instructor should be to decide personalized problems of the learner. If the learners' first language or native dialect shares certain features with English, the features are very likely to be considered problems. Yet when features of the target language (for example English) do not occur in the learners' first language or native dialect and have significant differences in articulation, then on the other hand are quite less likely to be problems to cope with.

Several improvements might also be introduced to the design of future studies. For instance, number of subjects can be enlarged to 30 to 60, covering male and female learner groups and wider age group such as 23 to 43. Moreover, the sociolinguistic aspect of English pronunciation teaching for Chinese EFL learners in its international context is yet not well understood; The topic has not even been fully researched for a variety of attitudinal and practical reasons. Attitudinally there is a conflict between what is taught in the classroom and the actual language use of English in China. Although public schools in China have been implementing a communicative English teaching approach in the classroom, grammar acquisition and practice other than pronunciation learning often receive much more attention at primary, secondary and tertiary levels of education. The overemphasis on rules and regulations often lead to rote learning; In practical terms, investigation of Chinese EFL learners' pronunciation teaching and learning entails enormous empirical studies and observations by local teachers and researchers who know clearly the differences between phonetics of the two languages as well as Chinese EFL learners' demand. Given the fact that native English speakers are scarce in China, most local English teachers speak English as a foreign language, and usually with typical mispronunciations influenced by their L1 Chinese and local dialects. What further complicates the task is the sheer number of learners from all parts of China, as learners from different regions of China may have different dialects and corresponding phonological patterns. An ongoing project is now being carried out, which is aimed at (i) surveying and evaluating the pronunciation landscape of Chinese EFL learners, with special considerations of massive dialect areas across China and (ii)

examining effects on basic, intermediate and advanced learners.

5. Acknowledgments

I would like to thank Jerry Dai Chao for his sharing of oral English teaching experience. The two-circle Venn diagram approach was originally put into classroom instruction by Jerry Dai Chao in English programs at Victoria Vocational Education Toronto, and has been then adopted by special training programs for advanced EFL learners at Renmin University of China. I would also like to thank the IPA and the organizing committee for providing student award at ISAPh 2016 Nagoya.

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