Examining the role of computer-assisted practice in enhancing learner's perception and retention of Chinese pronunciation (计算机辅助语音训练对学生的汉语语音感知及读音记忆的作用研究)

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Abstract: This paper explores the possibilities of using computer-assisted pronunciation practice in teaching Chinese as a foreign language to help students to have a better perception and retention of what they practice. The initial experiment had 8 participants and a year later 8 more students from the University of Zimbabwe participated in this experimental practice method where participants were recorded producing some Chinese sounds and phrases under strict guidance of the teacher, and then edited audios and videos were given back to the students for their own listening practice. The experiment showed that this method could help students to improve perception as well as retention of the Chinese sounds. The method is also motivational in the sense that it gives students confidence as they can hear themselves producing Chinese phrases better than they would imagine. The method also proved to be an effective self-evaluation tool for Chinese language learners since students could compare their own pronunciation with that of the native speaker. This paper concluded that; though this pronunciation practice is time consuming, it can be an effective teaching method if it is supported by both teachers and students.

摘要: 本文对在非目的语言环境下汉语学习进行了计算机辅助的发音练习实验。十六个津巴布韦大学的学生参加了此实验，在实验录音过程中学生根据老师的发音念汉语声母和短句，最后老师把编好的录音做出来音频给发音人听。实验结果表明，除了增加学生的汉语发音感知及记忆，这种语音练习也能够增加学生的说汉语自信心。这个方法也是一种有效地发音的自我评价工具，因为学生可以把自己的发音和以汉语为母语人的发音比较。虽然这种发音训练耗时，但是如果有师生的配合是有效的语音练习。

Keywords: Computer-assisted practice, sound perception, non-target language environment

关键词: 计算机辅助的辅音练习；语音感知；非目的语言环境

1. Introduction

This paper aims to explore the possibilities of using computer-assisted practice in language teaching in order to help students to have better perception and retention of both new Chinese sounds and vocabulary. The research examines some of the procedures that were applied initially to 8 University of Zimbabwe part one students who were studying Chinese language in Zimbabwe as a way of helping them improve their perception of the Chinese sounds as well as to remember what they practice. The experiment was applied again to 8 more students a year later following same procedures and results were collected through questionnaire methods, discussions as well as observations. According to Gilbert (1995: 1) if learners cannot hear well, they are cut off from the language they are studying, and if they (learners) cannot be understood easily, they are also cut off from conversation with native speakers." Wong (1987) also agrees with this point thus he says that even when the non-native speakers' vocabulary and grammar are excellent, if their pronunciation falls below a certain threshold level; they are unable to communicate efficiently and effectively. This shows that there is the need for all foreign language learners to strive for good pronunciation. However, as Nooteboom (1983) noted, speech production is affected by speech perception, thus there is need to work on speech perception first for the learners to have better pronunciation as well as better listening abilities.

In order to attain better pronunciation one has to have good perception of the target language's sound system. It is not possible for language learners to be able to produce a sound they cannot hear. Fachun Zhang and Pengpeng Yin (2009) also agree with this notion, thus they argue that; "if you cannot hear it [target language sound] then you cannot even attempt to pronounce it, and the problem of perception needs to be overcome before any progress can be made".

In foreign language learning the traditional pronunciation practice methods include; imitating the teacher, listening to native speakers, listening to radio or television programmes, listening to native speakers' recorded audios and reciting, etcetera. These methods are quite effective not only in a non-target language environment but also when learning a given language in its target environment; however, the major challenge we were facing at the University of Zimbabwe during Chinese phonetic and lexical practice was that the teacher would engage students in repetitive practice which were proving to yield little results since the majority of students would forget what they practice and during review of previous lesson the majority of students would have forgotten what they practiced in the previous lesson. The process was not only time consuming but also tiresome and discouraging for both the students and the teacher.

In our classroom phonetic practice the teacher would make the student or students imitate him until the given student or the majority of students are able to at least imitate

the given sound or phrase correctly or just fairly correct. This practice method has the following indirect assumptions:

1. The student has already grasped the sound or given phrase;
2. The student will remember that given sound or phrase;
3. After class the student will be able to imitate the teacher without the teacher's guidance.

After class students would be expected to listen to audios and practice on their own, but many students complained that the voices they were hearing from the Chinese audios were too difficult to imitate and they would not hear anything except just a combination of sounds thus they would forget most of the sounds and phrases learnt in previous class practice. In other words they were "phonologically deaf" as Pierre Badin, Gérard Bailly, and Louis-Jean Boë (1998) would put it. As a result, poor perception of the Chinese sounds was negatively affecting students' pronunciation. Such complains and pronunciation problems in Chinese might not be attributed to Zimbabwean students only but possibly to many other students learning Chinese language. This is possibly because the Chinese sound system is completely tonal and has confusing consonant sounds such as zh[tʂ], ch[tʂʻ], sh[ʂ], j[tɕ], q[tɕʻ] and x[ɕ].

Therefore, in order to improve students' perception of Chinese sounds as well as to help them remember the different sounds and phrases they learn, there was a necessity to engage students into an active practice in the presumption that their pronunciation would in turn improve. This is the reason why there was an attempt to use computer-assisted practice where through the use of sound editing software students would be able to listen to their own voices and compare their own pronunciation with that of the native speaker. The main aim was to improve students' sound perception of the sounds Chinese language which seemed to be "alien" to them.

1.1 Aims and justification

This research aims to show the possibilities of using students' own pronunciation through sound editing software to help improve sound perception of Chinese's sound system, which in turn helps to create a base for pronunciation practice. Though this research is basically based on the University of Zimbabwe's Chinese language teaching and learning experience; it is also expected to benefit other researchers, foreign language teachers and learners who are not necessarily researching, teaching or learning Chinese language only.

This research was carried out after teaching Chinese language for a semester of about 3 months at the University of Zimbabwe. It was observed that even after three months of 6 contact hours per week students were still complaining that they could not understand what they hear from the audios, also some were still forgetting what they would have learnt and some were even still mispronouncing basic Chinese sounds. This was possibly due to the fact that students had low motivation in the subject and apart from practice in class there was no other platform for practicing their pronunciation for

Chinese sounds. Therefore, this research was carried out to provide students with a platform for practice; it was also meant to raise students' listening ability.

1.2 Conceptual framework and hypotheses

This paper is based on the hypothesis that the sounds of a foreign language can be difficult for a learner to perceive if these sounds are uttered by a native speaker of that given foreign language, but they would be easier to grasp if uttered by the learner him/herself. In other words perception for a foreign language's sounds is mainly made difficult to perceive because the sound is produced by a voice that the learner is not used to, thus if the same sound could be produced appropriately by a native voice then the learner would be able to grasp and imitate. Adrian Wagner (2012) argued that perception of unfamiliar foreign language sounds without first language equivalent is troublesome. This therefore implies that in second language learning sound perception of the native language forms the base of acquisition of the target language. Adrian Wagner (ibid) further explained that; "once perception of foreign speech sounds is accurately established, this perception provides a foundation for accurate production". It is also believed that when one has learnt a first language, other speech sounds are typically perceived in terms of the phoneme categories of the native language (Vincent J. etal 2001:103).

In this paper it is therefore hypothesized that it is possible to improve learners' sound perception for a foreign language by recording the learner under teacher's guidance after which among the learner's recorded sounds a correctly produced sound or a closer to standard pronunciation sound will be selected. The learner will then listen to his or her own pronunciation which is native to him or her; this will then form the base of acquiring a foreign sound. By comparing his/her own pronunciation to that of the native speaker, the learner will be able to attain a better perception and pronunciation of the foreign sound.

1.3 Research questions

This research seeks to answer the following questions:

1) Will computer-assisted practice help students improve their perception of Chinese sounds?
2) Will computer-assisted practice help students not to forget what they practice?
3) Will computer-assisted practice motivate students to practice their pronunciation outside the target language's environment, especially in an environment where students are not highly motivated to learn the given target language?

1.4 An overview of sound perception and pronunciation practice

There are much researches relating to sound perception and pronunciation practice in second language learning such as Major, R.C. (1987), Flege, J. E. (1995), and Rochet, B. L. (1995). Many of these researchers agree with the notion that language

learners outside the target language environment normally experience listening challenges. For instance, Flege (1995:234) states that "foreign accents may make non-natives difficult to understand, especially in non-ideal listening conditions." It is also generally agreed that poor sound perception is the main cause for listening challenges. According to Dr. Alfred Tomatis as quoted in Thompson (1993:152); "before children speak a language, they must be able to hear the particular sounds and auditory frequencies of that language". This therefore suggests that the base for good pronunciation is good perception of the target language's sounds. There are many suggestions from different researchers on how to attain good pronunciation; for instance, Patricia Ashby (2012) recommends that at the tertiary level a short introduction course in articulatory phonetics course could be helpful for foreign language learners.

John Field (1995) proposes dictation as one of the ways of promoting lexical perception. However, in order to improve language learners' sound perception and pronunciation practice especially outside the target language environment there have been so much technological developments across the world. Computer-assisted language learning popularly known as (CALL) is one example of such developments. According to Levy (1997: 1) CALL is an attempt to apply computer technology in language teaching. Some scholars call it Technology-enhanced language learning. According to Nazlı Gündüz (2005) in CALL the learner is first presented with a rule and some examples, and then answers a series of questions which test her/his knowledge of the rule and the computer gives appropriate feedback and awards a mark, which may be stored for later inspection for the teacher. Many scholars believe that CALL method can strengthen learning motivation and provide immediate feedback that encourages subsequent learning (Heift & Rimrott, 2008; Hmard, 2006).The method can be used to reinforce what the student has already learnt in the classroom or as a remedial tool to help learners who require additional support. Some of these CALL manifestations include virtual learning environment and Web-based distance learning, below are other computer related language learning methods.

One such development includes the Virtual Talking Head and Speech Mapping proposed by Pierre Badin, Gérard Bailly, and Louis-Jean Boë (1998). In this method the teacher uses audio-visual speech stimuli in order to evaluate and improve the learner's perception of the target language's sounds as well as helping the learner produce the corresponding articulations by acquiring the internalization of the relations between articulatory gestures and resulting sounds. All such methods, however, require skilled and expensive technological support that might not be afforded in developing countries such as Zimbabwe.

Most developed countries are now developing language learning software programs to help language acquisition mostly outside the target language environment. For example, there are so many foreign languages' learning software programs such as; the Rosetta Stone software, the 101 Languages of the World software, the Instant Immersion 33 Languages software, and many others. Such software programs follow the notion that "in second language teaching many teachers test listening rather than teaching it" (Sheerin 1987). The modern language learning software programs allow the learner to

practice their pronunciation by giving the learner an option to record him or herself, and a computer compares the learner's pronunciation to that of the native speaker after which it gives a score for resemblance level.

For example, when using Instant Immersion 33 Languages software, one needs a computer or just a CD player, a sound card and a microphone for the practice. This learning software is more like a game where you play and win or lose. For pronunciation practice the speaker plays a word and immediately repeats it into the microphone, then play back the sequence and can hear the speaker's pronunciation compared to the native speaker. San Antonio, former president of Alamo PC, in a review of the Instant Immersion 33 Languages software, mentioned that at the end of practice session she felt quite confident with several words and phrases. Also she felt the process was quite funny since the program is totally aural and does not require reading. (http://www.alamopc.org/pcalamode/reviews/current/R20040703.shtml).

While all such software programs might be effective in language learning in many countries, the situation is completely different in Africa especially in Zimbabwe. Though at the present many people are now using computers and internet in Zimbabwe, it should be noted that the motivation to learn foreign languages is low and cannot be compared to that of students in developed countries. Also students do not buy these software programs due to economic hardships, lack of interest, lack of information about such software programs, lack of technological know-how, and many other reasons.

There are also other pronunciation learning methods such as shadowing; this is a language learning technique developed by the American Professor Alexander Arguelles, where an audio in the language that you are learning is used as the bases, while listening to the audio, you attempt to repeat immediately after hearing it. This method might be effective if the student is able to discern the sounds he or she hears from the audio, so for the University of Zimbabwe students it could have been ineffective since the students were having problems in imitating what they hear from the audio. At this point it is important to describe the Chinese language learning situation at the University of Zimbabwe.

In the case of the Confucius Institute at the University of Zimbabwe, many students enroll into the Chinese language program not because they like the subject but mainly because they have been given the option by the school authorities. There are a few Short Chinese course students (mainly travelers or business people), and the rest of the students do Chinese as a third subject for their Bachelor of Arts curriculum, a foreign language course for Tourism and Hospitality Degree or as an optional course of Honors in Linguistics Degree. There are also a few curious students from such departments as Psychology and Business Studies. This thus entails that these students are basically over-occupied with other core-courses, and they do not have the motivation to speak Chinese; rather, they just want to pass the course. In order to engage these students and give them confidence that they could speak Chinese, there was therefore the need to directly and indirectly motivate the students, to make them realize that they have the potential to speak Chinese fluently or better than they could imagine.

1.5 Research methods

An experimental approach was used with students varying from early beginners to upper level beginners. Students were recorded producing the 21 Chinese consonants, the four tones and phrases listed in the Appendix 2, and their sounds were edited to make continuous audios which were then given back to the participants as part of their sound practice. The impact of the experiment was then evaluated by both teachers and students.

The whole experiment was evaluated through discussions with other Chinese language teachers. Discussions were quite helpful in terms of providing ideas on how to improve this approach of computer-assisted practice. Apart from discussions, questionnaires were also used to gather information about the students' experience and feelings during the experiment and after watching the videos. Recorded audios were also played to other students who were not part of those who participated in the recording process and questionnaire method was used to gather their comments and opinions on this Chinese learning approach. This was helpful in evaluating the experiment's impact to both the participants and non-participants.

In the follow up experiment done in 2013 Praat software was used for analyzing the students' tone structure before and after the computer-assisted practice. The results were then compared to establish if there was any improvement in students' tone perception.

2. Experiment design and aims

8 students from the Confucius Institute at the University of Zimbabwe participated in the first experiment, for more details about the participants see Appendix1. Before the experiment was done it was advertised both on the Confucius Institute's Facebook group and in class inviting students to participate in the pronunciation practice, only 8 out of 41 students from the 2011 Bachelor of Arts level 1 class responded positively. This was possibly because most students had already lost hope or they were possibly not motivated to learn Chinese. The experiment was divided into two parts: the first was a Chinese lexical and semantic computer-assisted practice, and the second was a Chinese phonetic system computer-assisted pronunciation practice. The experiment was divided into two parts so as to find out if the same method could be applied for other pronunciation practice apart from phonetic practice. The same experiment was later repeated with yet another set of 8 students in 2013 who were selected from among the part one students who were having problems in differentiating between the second and third Chinese tones.

The experiment was designed as a way of capturing and preserving that moment when the student's imitation of the teacher becomes closer to that of the native speaker or when it is completely perfect. Once this moment is captured the student will have an opportunity to listen again to his or her own voice when he or she was producing the Chinese sounds and or phrases appropriately. This would be achieved by editing where

all the wrong sounds would be removed and only the correctly produced sounds would be retained. The assumption here is that some students will forget how to produce a sound despite excellent production during practice in class with the teacher. Therefore, by retaining these well produced sounds, the student will be reminded of his or her ability and then by continuous imitation of his own pronunciation he or she will be able to remember the sounds or phrase without the help of the teacher.

2.1 Materials used

Recording and editing process required; Computer, microphone, recording software, sound editing software, video editing software and a camera. The participants of this experiment were supposed to have any one of the following: computer, cell phone that can play mp3 audios, mp3 player, or anything that could play audios or videos. Some participants did not have personal computers or any of the above so they had to borrow from their friends.

2.2 Task

Four participants for the lexical pronunciation experiment were given short written dialogues which they had to memorize or just familiarize with over a period of 2 days. The dialogues were written in both characters and pinyin because almost all the students could not read Chinese characters by the time of recording. On the day of recording each word or phrase was then read under the guidance of the teacher. During recording the teacher would read the sound or phrase while the student imitate. The whole process was recorded in order to capture that moment when the student would produce his or her best sound. As many sounds as possible were recorded until the teacher feels that the student has managed to imitate the sound or phrase either correctly or just fairly well.

For the phonetic experiment, the other participants were asked to read the 21 Chinese consonants produced with vowels as shown on Appendix 2 and the 4 Chinese tones using the syllable [ma]. For the 2013 follow up experiment, 8 students who were having problems in differentiating between second and third tones were recorded two days before and five days after the experiment and results were compared using Praat analysis. During the pretest the students would produce the syllable [ma] with the four Chinese tones without teacher's guidance; the same was repeated after the experiment. Praat software was then used to analyze the tone structure and levels.

For the lexical and semantic experiment the participants had to do a video recording for the situation in the dialogue. The videos were later combined with the edited phrases which were merged to produce continuous dialogue. The recorded materials were edited and all wrongly produced sounds and or phrases were eliminated; only the correctly produced sounds were retained and were combined with the appropriate video recordings. The dialogues and consonants which were recorded are listed on Appendix 2.

After editing of the videos and audios the major task for the participants was then to listen to their own voices and imitate the sounds or phrases. For the phonetic experiment students would then compare their own pronunciation with the pronunciation they hear from the audios for the native speaker. Since this is a continuous process students were encouraged to keep the videos and audios so that whenever they forget the pronunciation they could refer to audio for pronunciation guide.

2.3 Recording

All the recordings were done in the Confucius Institute's language lab, which was a quiet environment. An Intel Core 3 Toshiba Satellite laptop and a new microphone were used for recording. AVS screen capture was used for all voice recordings. During the recording, students would imitate the teacher's pronunciation while reading the same sound or phrase written on the paper. Since the students could not read Chinese characters by the time of recording, the phrases were written both in pinyin and characters. A given tone, consonant, word or phrase would be repeated for several times until the student manages to produce the sound or phrase correctly or at least next to standard pronunciation. This was following the same practice method in the classroom but this time everything would be recorded in order to capture that moment when the student manages to produce the sound or phrase correctly. Recordings for phrases took a period of three days since there was need to repeat certain phrases for several times and also there was need to shoot the videos, while all the phonetic pronunciation recordings were done in one day only for all the people.

2.4 Editing

AVS Video Editor Software was used for editing the recordings. The researcher preferred to use this software instead of other popular video editors such as Adobe Premiere Elements, Ulead VideoStudio 9.0 Video Editor, Sony Vegas Movie Studio HD Platinum 10 Suite and so forth, mainly because AVS Video Editor is user friendly. It is not complicated, and it does not occupy too much space in the computer. Furthermore, the final video does not need to be reconverted into playable formats as in other software programs. Also AVS Video Editor Software can be downloaded for free. A simple editing process which required somebody who could differentiate between appropriate and inappropriate sounds was involved as described below;

2.5 Editing process

The first stage was to import the audio files to AVS Video editor and then drag the audio file to the sound editing column, where the audio file could be cut, separated and or mixed. This was an important stage because if wrong sounds were mixed this could have given the listeners an inappropriate point of reference during their pronunciation practice. Figures 1 and 2 below show wave sound before and after cutting during the editing process.

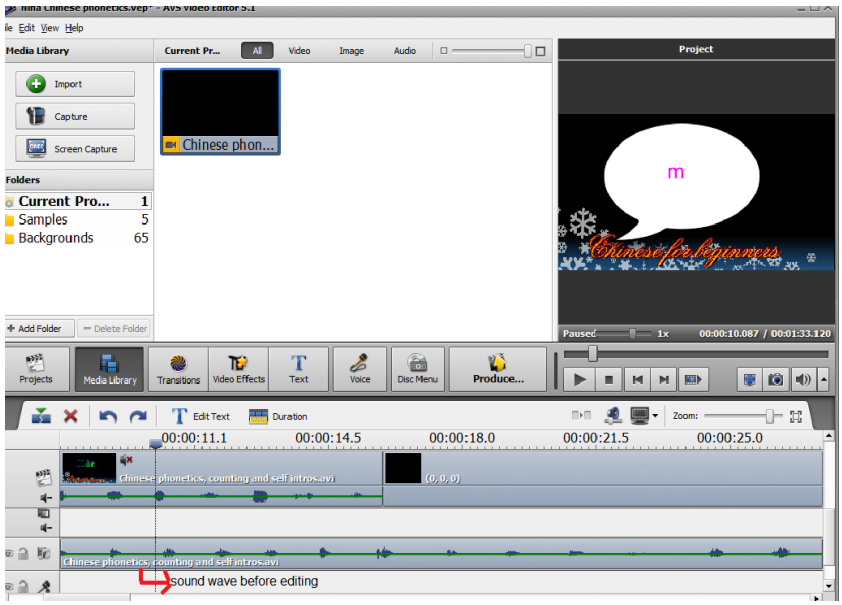

Figure 1 Wave sound before cutting of inappropriate sound [m]

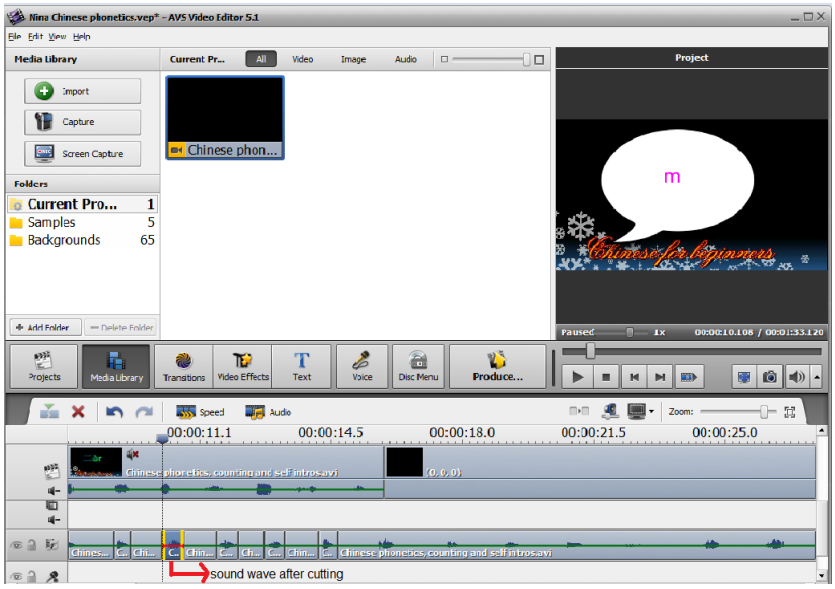

Figure 2 Wave sound after cutting of the inappropriate sound [m]

As can be seen above, subtitles were also added so that students could both listen and read out what they hear. After cutting as shown above; the inappropriate parts and wrongly produced sounds were deleted, the proper or fairly well produced sounds were then organized alternating with native speakers' pronunciation. For the Chinese lexical and semantic computer-aided practice the edited phrases were not alternating with native speakers' pronunciation so as to give an impression of fluent dialogue. Separate audios for the dialogues of native speakers were however made available for comparison and self-evaluation. The edited videos were then produced in AVI video format. The main advantage of the AVS Video Editor is that it allows production of videos in different

formats suitable for different video players as shown in the screen capture below taken during video production.

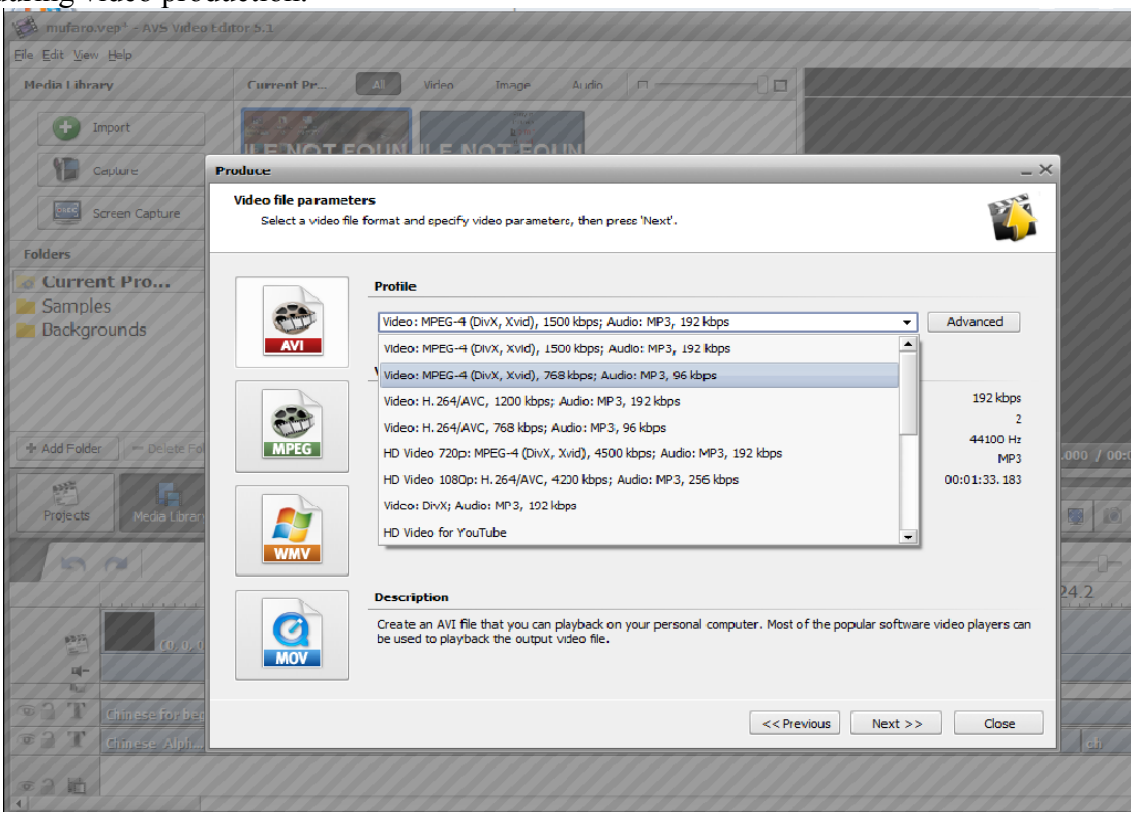

Figure 3 Video formats choice

Two videos for dialogues and two videos for the Chinese consonants and tones were produced and were later converted into mp3 format using some free video converter software programs. This was done to allow all students to have access to their own recordings; those who did not have computers to play the videos would play the audios on their own cell phones or any other mp3 players.

3. Experiment results and observations

The final videos and audios were distributed to participants who after listening to their own voices gave positive feedback. The experiment showed that participants were excited to hear themselves speaking fluent Chinese such that they would keep on playing the audios either on their cell phones or computers. Also it was observed that some participants were even playing these audios to their friends and or family members. Whether the participants were showing off or not it is assumed that by repeatedly playing the audios and videos this was a sign of motivation to learn Chinese, thus there was room for the students to improve their listening and pronunciation skills.

The experiment proved that the recording process is a method of pronunciation practice in itself. As the students follow teacher's pronunciation repeatedly they are in a

way practicing both pronunciation and listening. As observed from this experiment after recording some participants would spontaneously say out sounds, words or phrases they produced during the recording. This shows that the recording process leaves a profound impact on the participants' thoughts, feelings and attitudes towards the target language.

Apart from the above, the experiment also showed that students could imitate themselves better than they could imitate either the teacher or the voices of native speakers they hear from the Chinese audios. This was shown by the fact that the students could no longer forget their pronunciation as they used to do. Thus this showed that during the recording if a student is recorded while imitating the teacher and a next to native pronunciation is captured then student will be able to imitate what he or she hears and achieve better pronunciation.

The 2013 similar experiment which was used for those students who had problems in differentiating the Chinese language's second and third tone showed that students had improved their perception for the Chinese second and third tone hence after the computer assisted practice they could produce these two tones differently. Students were recorded before and after the computer assisted practice and audios were analyzed using Praat software. The Praat analysis followed a simple procedure where mp3 audios would be imported to Praat and annotated to text grid, thus producing a text grid file. Then by simultaneously selecting the original sound as well as the textgrid file and clicking the edit option a textgrid in picture form would then pop up showing tone structures in blue line. Below are the samples from four participants which show the Praat diagrams for Chinese second tone and third tone structures before and after the experiment.

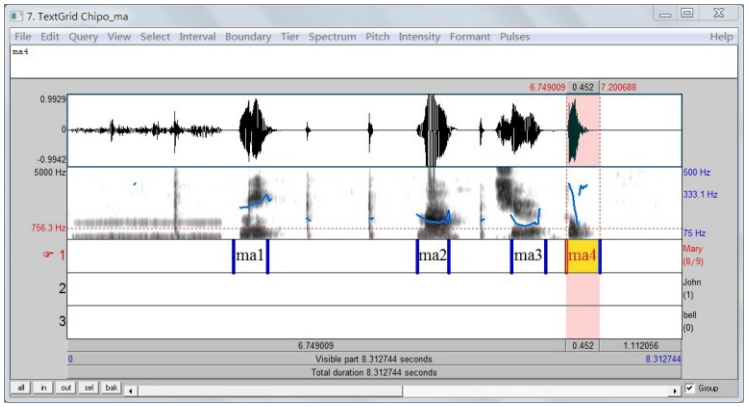

Figure 4 Student A, second and third tone before the experiment

This textgrid picture for the student A shows that the student was producing Chinese second and third tone both as a low slightly curving tone. In these graphs ma 2 represents second tone while ma3 represent third tone which were produced with the sound [ma]. The ma 1 and ma 4 which are not part of this analysis represent first tone and fourth tone respectively. In the textgrid picture above it can be seen that the blue lines above the slot ma2 and ma3 almost look the same. The Chinese second tone is a rising tone while the third tone is a curving tone also known as falling-rising tone (Olle Linge,

2011; Liu & Samuel, 2004). For the audios which were recorded before the computer-assisted tone practice these students could not discern the difference between these two tones as can be seen above and in other textgrid pictures below. After the computer-assisted tone practice the student was recorded again and below is the new tone structure for the student A.

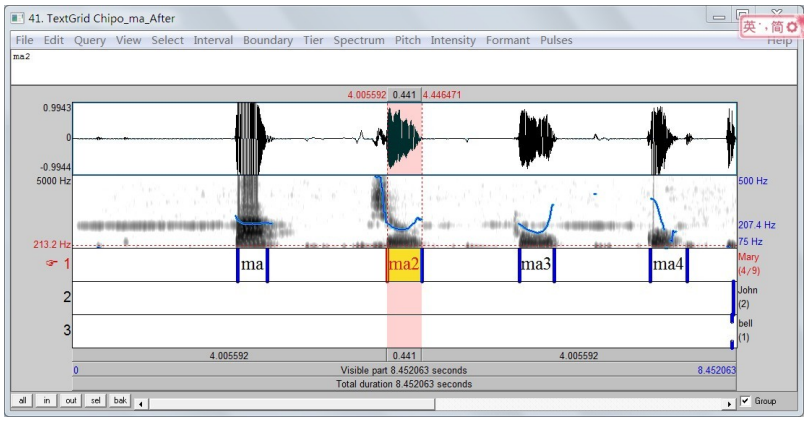

Figure 5 Student A, second and third tone after the experiment

After the computer assisted practice student A could distinguish ma2 and ma3 as can be seen from the above textgrid picture. The blue line above ma3 has a more pronounced curving shape different from that of ma2, showing that this time the student had better perception of these two tones. The same results were also observed for student B below.

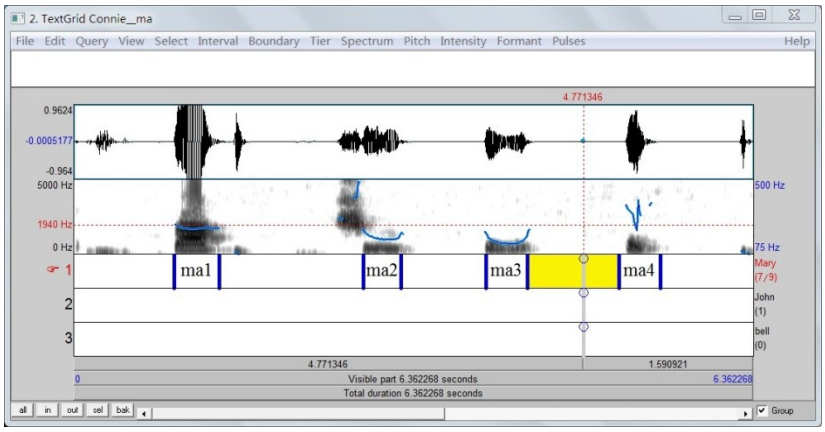

Figure 6 Student B, second and third tone before the experiment

Before the computer-assisted tone practice student B just like the student A was producing ma2 tone almost like ma3 tone both as low and slightly curving tones, but after the practice as can be observed from the textgrid picture below the student's ma2 was now a clear rising tone without any curving shape as before, the student's ma3 could now be differentiated from ma2.

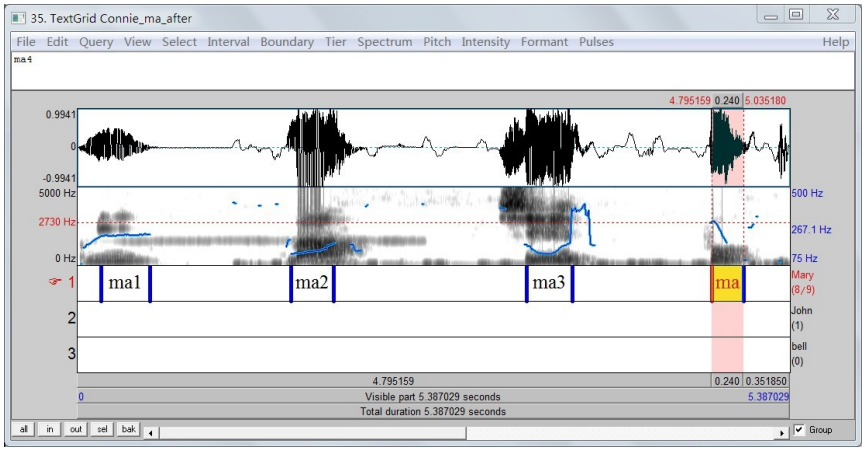

Figure 7 Student B, second and third tone after the experiment

In Figure 8 below just like in the previous cases of student A and B, before the practice student C produced the ma2 and ma3 tones as long low level tones with a slight rise at the end.

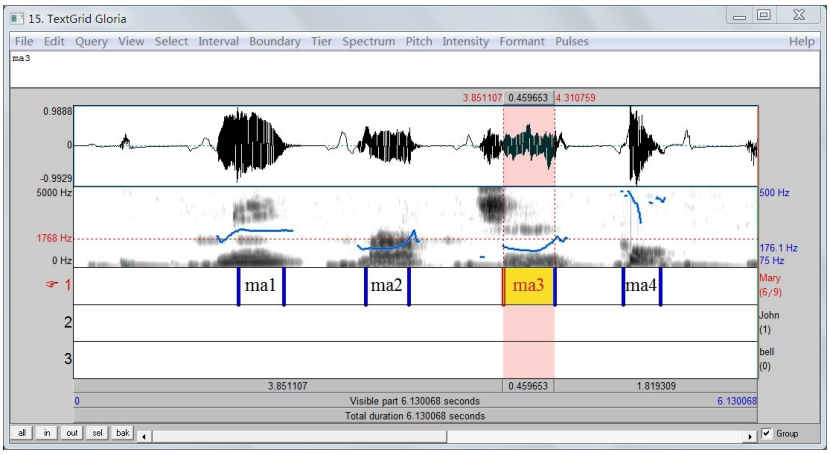

Figure 8 Student C, second and third tone before the experiment

However, after the computer-assisted tone practice the student C's ma2 tone was now a slightly rising tone which can be seen represented by the blue line above the slot labelled ma2, rising just below the red dotted line marked as 1299Hz at the left side and 201Hz at the right end of the picture. Above the ma3 slot the blue line shows a small curving line below the red dotted line as shown in Figure 9 below.

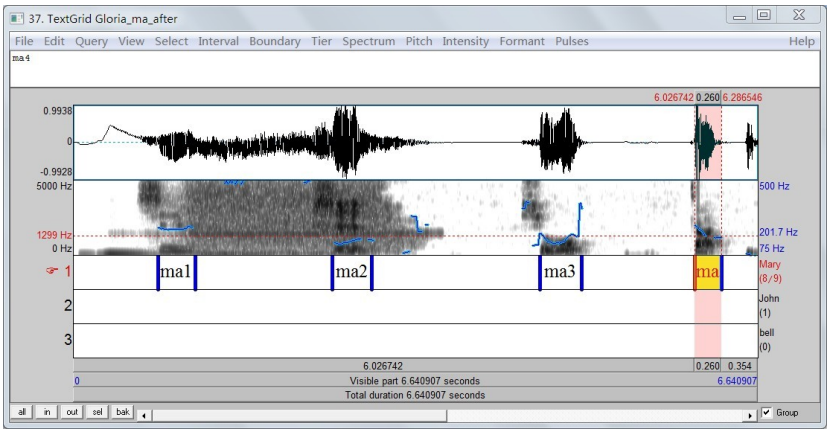

Figure 9 Student C, second and third tone after the experiment

Though the above student C's textgrid picture shows that the student's pronunciation of the Chinese second and third tone was not yet as perfect as it is supposed to be, but it should be noted that unlike before the practice there was now remarkable difference in this student's production of rising and curving tone. The last sample below also shows the same changes as in the above cases.

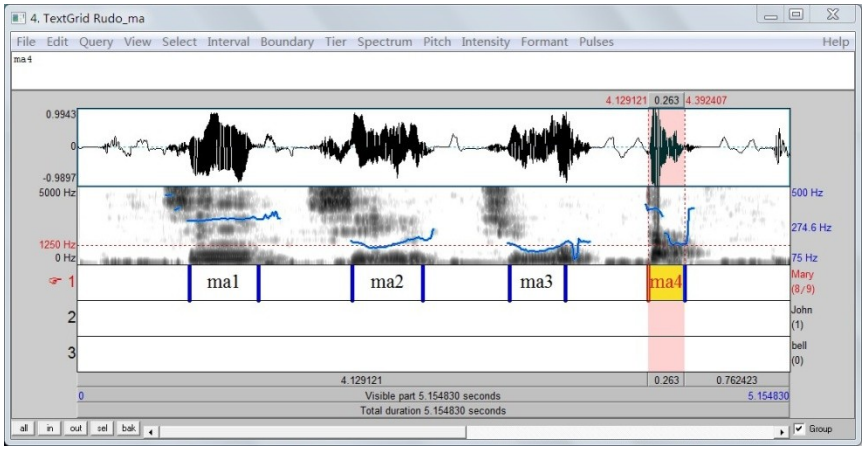

Figure 10 Student D, second and third tone before the experiment

Before the practice student D also could not differentiate between the second and third tone, as can be seen from the above textgrid the ma2 tone and the ma3 tone were looking alike, with a slight curve at the beginning and a long slightly rising end. After the practice it was completely different.

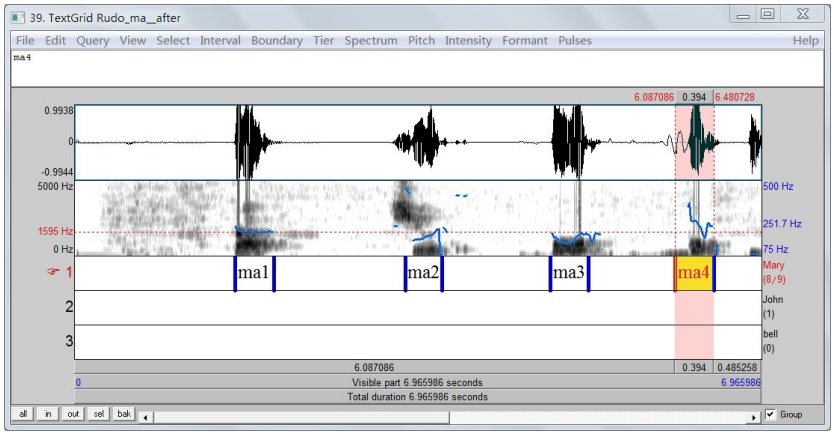

Figure 11 Student D, second and third tone after the experiment

Figure 11 above shows that ma2 unlike on Figure 10 was now rising slightly from below the line 1595Hz while ma3 was falling from the line 1595Hz to some point and then rising back again to 1595Hz, producing a clear curving tone. This suggests that after the computer-assisted tone practice Student D could now differentiate between second tone and third tone. Though this might not be the perfect Chinese third tone, it should be noted that in all the samples of these four students before the computer-assisted tone practice the students were not differentiating the second and third tone, but after this practice all of them were producing these two tones differently.

The above results of the experiment show that this computer-assisted practice method is a potential teaching and learning tool. The 2013 follow up experiment showed that it is possible to solve sound perception problems by giving students a chance to listen to their own pronunciation for a given sound. Below are some of the evaluations of this computer-assisted practice method.

3.1 Experiment evaluation

This experiment was evaluated based on what was observed after the experiment against the situation before the experiment. As already noted students had the problem of forgetting what they would have practiced and most of them could not differentiate between certain pairs of Chinese consonants such as b[p] and p[pʻ], zh[tʂ] and j[tɕ], ch[tʂʻ] and q[tɕʻ], sh[ʂ] and x[ɕ]; but after the experiment it was noted that participants were now able to produce some of these pairs differently without the teacher's guidance. During classroom practice there was a complete difference between the participants of the experiment and those students who had not participated. Those who did not participate in the experiment were still failing to differentiate between most of the above pairs. Those who participated in the lexical experiment could now use some of the words they had used during the experiment in other phrases. This was a sign that the practice method used had the potential to make students remember what they would have practiced. This was due to the fact that during recording the student repeats the imitated sound or phrase several times, and the correct pronunciation is retained so the student can refer back to the correct pronunciation if he or she forgets. In classroom activities we do

not keep the correct pronunciation for the students' future reference thus some students tend to forget what they would have practiced.

The Praat results in the second experiment also showed that after the experiment students were now able to differentiate between the second and third tone which they used to produce the same. Therefore, it can be argued that this computer-assisted practice does have the potential to improve students' perception of the sounds of a given target language.

The experiment was also evaluated through questionnaire method by Chinese language students as well as discussions by teachers in the Confucius Institute at the University of Zimbabwe. Some of the participants commented that they were shocked to hear themselves speaking fluent Chinese and could not believe that it was their voices. This suggests that editing of students' sounds and retaining the correctly produced sounds helped to show the students' potential. All students in this experiment had potential to speak Chinese well but they possibly did not know that until we captured the moments they could imitate the teacher well. Therefore, when they listened to their own voices in the audio they were "shocked" meaning to say they did not know that they can speak like that. Here we concluded that this was going to give students confidence that they can speak Chinese, it was going to give them hope that they will be able to achieve the same fluency they reached in the audio. Unlike in the classroom activities where students do not have a record of their potential, this computer assisted practice keeps student's "best moments" thus it keeps on reminding the student that he or she can make it.

In the questionnaire responses to question 4, students indicated that they were now able to discern the differences between zh[tʂ] and j[tɕ], ch[tʂʻ] and q[tɕʻ], sh[ʂ] and x[ɕ] which they used to feel like they were same sounds. This showed that the students had a new perception of these Chinese consonants.

While 100% of the questionnaire respondents showed that this method is a possible effective method for pronunciation practice, some Chinese language teachers argued that the method was likely to promote pronunciation errors which are directly caused by the students' mother tongue. However, considering that the pronunciation problems which were being experienced were mainly due to lack of motivation, the majority of teachers argued that this method was a crucial part of Chinese pronunciation practice outside the target language environment because it stimulates interest in the target language. Below are some of the motivational aspects, advantages and disadvantages of this computer-aided pronunciation practice.

3. 2 Motivational aspects of the experiment

The process had a two way motivational effect to the Chinese language students. Firstly, it was a direct motivational experience for the participants of the project. In the questionnaire response, some participants mentioned that they were able to produce some of the sounds they used not to be able to pronounce well, this was because they were now

imitating their own voices which they could hear and perceive better than when they were listening to the native speakers' voices.

Secondly, after the experiment the audios and videos were played for the other students who did not participate in the project. After watching the videos the students were asked to fill in a questionnaire. All the respondents of the questionnaires showed that they were now interested in participating in the next pronunciation practice. The aim was not to make the other students participate in the experiment but to show them how their colleagues could speak Chinese. It was observed that the reason why the other students were now willing to join in the project was mainly because they felt that the participants' spoken Chinese had improved. This could be defined as the "cheating effect". The truth is that their Chinese levels were still same at this moment only that due to editing, the recorded speech parts students' pronunciation was now sounding better than before. Therefore, other students were now eager to participate so that they can improve their pronunciation. In a way the other students who were now willing to participate in the experiment wanted to compete with those 8 participants. It should be noted that improved pronunciation is not an instant event, thus in this experiment we cannot prove that the experiment helped students to improve their pronunciation, rather it is assumed that since perception was the major problem then their pronunciation would subsequently improve too.

In this paper it is concluded that computer-aided pronunciation practice does not only help the students to practice their pronunciation but gives them assurance that they can achieve better pronunciation. Under strict teacher's guidance students can produce excellent pronunciations which in turn are the standard measurement of what the student can achieve. However, though there are many advantages for computer-assisted practice, the method has its own shortcomings as will be summarized below.

3.3 Advantages of the computer-assisted pronunciation practice

The process is entertaining, and it is not as serious as in the traditional classroom learning environment. However, this depends on the method used in recording. The video shooting method is more entertaining because it involves students enacting a short story in a given scenario. This is more like recreating the target language's environment. However, if students are not interested in acting they might find it tiresome, boring or childish.

The other advantage of this method is that, by allowing students to listen to their own voices while speaking a foreign sound it becomes clearer and easier to imitate. In other words the sound is made simple to perceive. In this case the sound is made simple to perceive in the sense that a foreign sound is turned into a local sound by the learner him or herself.

The other major advantage of computer-aided pronunciation practice is that it is affordable and easy to use hence it is appropriate for developing countries such as Zimbabwe. A one day workshop would be enough to train both teachers and students on

how to use the software to edit the sounds and produce audios and/or videos. Therefore, if this method is well implemented, any teacher even if he or she does not have sound or video editing knowledge can still use it as a teaching method.

3.4 Disadvantages of the computer-assisted phonetic practice

The whole process can be tiresome and time consuming if there are many students. For instance, in this experiment to record four students for lexical and semantic pronunciation experiment it took almost 3 days. Also the whole process still depends on the willingness of the students to participate. If the students are not willing to participate in the recording process then the effect of the whole process will fail.

3.5 Recommendations

From the results of this experiment it was revealed that this method is more effective and practical for the phonetic practice than lexical or semantic practice. This was shown by the fact that the recording and editing for lexical and semantic pronunciation experiment took three days while that for phonetics took one day. Due to the fact that for longer phrases both recording and editing requires more time and care, it is more tiresome thus it is not practical for daily learning practice. As shown from the results of the 2013 experiment where students who had pronunciation challenges in Chinese tones were engaged using this method and there was a clear improvement for those who were confusing second tone and third tone, it is recommended that for those students who might be having serious pronunciation problems for words and phrases this can be a good remedial activity.

4. Conclusions

This research shows that giving the language learner an opportunity to listen to his or her own voice while producing sounds for the target language is a helpful technique in learning a foreign language for it helps to improve perception of target language's new sounds through self-evaluation. Also, this computer-assisted practice can be a way of motivating language learners outside the target language environment. By capturing students' correct pronunciation, students are even able to forecast the level of fluency they can achieve thus giving them hope in learning the target language. The recording on its own is a way of preserving student's correct pronunciation thus when the student forgets the pronunciation he or she can still refer back to the audio and be able to imitate his own pronunciation. Apart from that, this computer-aided pronunciation practice is also affordable; the researcher suggests that language learners can use this practice method with even cheap and locally accessible resources. Instead of using expensive computers and editing software, a simple phone with a recorder can be used for recording and then compare the pronunciation of the recorded sounds with that of the native speakers. The objective is for the learner to feel the difference between his or her own pronunciation with that of the native speaker.

This research had a limited number of 16 participants only, thus it might be argued that the sample was not large enough to provide empirical evidence of what the experiment tries to prove. This was mainly due to the nature of students' studies at the University of Zimbabwe where students are always busy with other studies. However, the results from the first sample in 2012 and the second sample in 2013 shows that it is a worth trying method. It can be adopted as a foreign language learning and teaching technique. It is hoped that more extensive research projects will be carried out in the field of computer-assisted pronunciation practice so as to effectively utilize the ever growing Information and Communication Technology (ICT) in this digital literacy 21st century.

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Appendix 1

Participants for the 2012 practice

Participants	Age group	Period of study at the time of recording	Experiment Item
A	19-25	3 months	Lexical practice
B	19-25	3 months	Lexical practice
C	19-25	3 months	Lexical practice
D	19-25	3 months	Lexical practice
E	19-25	3 months	Phonetic practice
F	19-25	3 months	Phonetic practice
G	19-25	3 months	Phonetic practice
H	19-25	3 months	Phonetic practice

Participants for the 2013 tone differentiation experiment

A	19-25	3 -5months	TONE DIFFERENTIATION
B	19-25	3 -5months	
C	19-25	3-5 months	
D	19-25	3-5 months	
E	19-25	3-5 months	
F	19-25	3-5 months	
G	19-25	3 -5months	
H	19-25	3-5 months	

Appendix 2

Recordings

Recorded Chinese phonetic sounds	
E-H	
consonants	Tones
bo po mo fo, da ta na la, ga ka ha, ji qi xi, zhi chi shi ri, zi ci si	First tone mā Second tone má Third tone mǎ Fourth Tone mà

Recorded dialogue and Participants:	
Phrases for the first pair	Phrases for the second pair
A: 你是学生吗？nǐ shì xué shēng ma ？ B: 是，我是学生。Shì, wǒ shì xué shēng. A: 你是哪个大学的学生？nǐ shì nǎ gè dà xué de xué shēng? B: 我是津巴布韦大学的学生？wǒ shì jīn bā bù wéi dà xué de xué shēng? A: 你的专业是什么？nǐ de zhuān yè shì shén me? B: 我的专业是语言学，你呢？wǒ de zhuān yè shì yǔ yán xué, nǐ ne? A: 我的专业是汉语。 你住在哪？wǒ de zhuān yè shì hàn yǔ. nǐ zhù zài nǎ? B: 我住在 Kuwadzana，你呢？wǒ zhù zài Kuwadzana, nǐ ne? A: 我住在乐山 wǒ zhù zài lè shān. B: 乐山是什么？lè shān shì shén me? A: 乐山是 Mt Pleasant。 Lè shān shì Mt Pleasant. B: 知道了，谢谢。zhī dàole, xiè xiè. A：不客气 bú kè qì.	A：喂，你好 wèi, nǐ hǎo. B： 喂， 你找谁？ wèi, nǐ zhǎo shuí? A：Tatenda 在家吗？Tatenda zài jiā ma? B：我就是 wǒ jiù shì. A：是吗？ 我好想你。shì ma？ wǒ hǎo xiǎng nǐ. B：我也是 wǒ yě shì. A：你什么时候来我家？nǐ shén me shí hòu lái wǒ jiā? B 今天下午 jīn tiān xià wǔ. A：好吧，下午见 hǎo ba, xià wǔ jiàn. B：一会儿见。yìhuìr jiàn.

Appendix 3

Questionnaire sample

Computer-aided Chinese Language phonetic practice Questionnaire
汉语计算机辅助的发音练习调查表

DATE 日期：_____Age 年龄:_____
INSTITUTION 机构:_____

1. What is your Chinese proficiency level? 你的汉语水平是几级？_____
2. How long have you been studying Chinese? 你学了汉语多长时间？_____
3. What made you did you participate in this project？ If you didn't participate would you participate in such activities next time? Why? 如果你参加了，你为什么参加了？如果你没参加，下次你会参加吗？为什么？
   _____
   _____
4. Did you learn something from the roles you played? Or after watching the videos did you learn something? 通过这次的汉语表演活动你学到了什么？看这些视频之后你觉得对你的汉语水平有收获吗？_____
   _____
   _____
5. Do you think such pronunciation practices are useful to Chinese language students? 你觉得这样的汉语发音练习对学生有用吗？_____
   _____
   _____
   _____
6. Do you think teachers should use such pronunciation teaching methods? 你觉得老师可以用这样的方法来教汉语发音吗?_____
   _____
   _____

ANY OTHER COMMENTS 其他意见：
_____
_____

Please don't write your name, this questionnaire is for academic purposes, whatever information you contribute, shall be used towards the development of teaching and learning of Chinese language.
Thank you for your contribution.