

## Gamification in American High School Students' Chinese Learning: A Case Study of Using Speed Mandarin (汉语学习的游戏化: 用 Speed Mandarin 教美国高中生汉语的案例研究)

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**Abstract:** The purpose of this study was to investigate the effectiveness of using gamification in the form of the Speed Mandarin computer program to facilitate American high school students' learning of Chinese as a foreign language. Paired sampling was used with a total number of 60 students in an urban high school setting. Students in the experimental group used Speed Mandarin throughout a 16-week academic semester. Pre- and post-treatment questionnaires were used to examine students' beliefs about their abilities to read Chinese, understand spoken Chinese, speak Chinese, acquire new Chinese vocabulary, and use a variety of learning strategies to master Chinese. Data were also gathered about their level of motivation to learn Chinese. Data analysis via one-way ANOVA with the experimental condition as the between-group measure showed significance for the effect of Speed Mandarin on students' belief in their ability to speak Chinese, but showed no significant effects on reading, listening, or vocabulary acquisition. Nor was there any significant difference in language learning strategies or motivation for learning Chinese. Suggestions are provided for potential use of Speed Mandarin in high school Chinese classes as well as for further research. Further research is needed in order to investigate possible relationships between the use of Speed Mandarin and increases in student confidence in other areas of language learning, as well as increases in actual student performance.

**摘要:** 这项研究的目的是调查使用 Speed Mandarin 计算机程序游戏以促进美国高中生学习汉语的有效性。某市区高中共有 60 名学生参加了配对抽样。实验组的学生在整个 16 周的学期中都使用 Speed Mandarin。用实施前后的问卷来检验学生对他们掌握汉语能力的信念（汉语阅读、听力理解、汉语会话、和词汇学习）以及使用各种学习策略来精通汉语。还收集了有关他们学习汉语的动机水平的数据。通过单因素方差分析以实验条件作为组间度量进行的数据分析显示，学习策略和 Speed Mandarin 对学生汉语会话能力的影响具有显著性，但

对汉语阅读, 听力理解或词汇学习没有显著影响, 对汉语学习策略或学习动机也没有显著影响。我们探讨在普通高中汉语课程中如何使用 Speed Mandarin 研究提出建议。至于使用 Speed Mandarin 与学生在其他语言学习领域的信心增强, 并对后续学生实际成绩提高之间的可能关系, 也需要进一步的调查研究。

**Keywords:** Gamification, Mandarin Chinese, educational technology, foreign language education, perceived competence

**关键词:** 游戏化、汉语普通话、教育技术、外语教育、能力信念

## 1. Introduction

According to the 2017 national statistics on the study of foreign languages, Chinese is fourth in popularity in the USA, behind Spanish, French, and German (in that order). The National K-12 Foreign Language Enrollment Survey Report shows that 9.7 million K-12 U.S. students are studying a major (second) language. Among them, approximately 227,000 students have enrolled in Chinese language courses, falling behind 7.36 million in Spanish courses, 1.29 million in French, and almost 331,000 in German (American Councils for International Education, 2017, p. 8). Regarding the distribution of high school students enrolled in Less Commonly Taught Languages (LCTL) among various states,

The explosion of Chinese enrollment and in the number of high school LCTL programs offering Chinese is a dominant feature in the landscape of LCTL education in the U.S. Enrollment in Chinese classes has grown to the largest proportion of all students enrolled in Flagship languages (Arabic, Chinese, Hindi/Urdu, Korean, Persian, Portuguese, Russian, Swahili, and Turkish), accounting for 80% of total number of high school students enrolled in these languages in the U.S. (American Councils for International Education, 2017, p.18).

However, major differences between the structure of English and Chinese make Chinese much more difficult for many Western learners than Spanish, French, or German. English (and many other Western languages) use discrete alphabets to construct words that are then combined grammatically into sentences. Chinese characters are not constructed from an alphabet; they may be pictographs, simple ideograms, combined ideograms, or semantic-phonetic compounds (Linge, 2018). To make matters more complex, Chinese is a tonal language (whereas English is not). In other words, a change in pronounced tone can change the meaning of a spoken Chinese word (sometimes in dramatic ways), while tone in English does not convey information about the meaning of the word being pronounced (Grasu, 2015). Along with the widespread adoption of technologies in American life, this has caused educators and researchers to pay more attention to the potential of technology in teaching and learning Chinese. Students are now eager to use different technologies, and they are skilled and interested in these technologies (Prensky, 2001).

In this study, we examine the use of Speed Mandarin,<sup>1</sup> a mobile Chinese learning game app, in learning of Chinese. More specifically, we explore whether using Speed Mandarin can support Chinese learning among native English speakers in high school and provide some suggestions to assist educators in better using Speed Mandarin in high school Chinese classes. Speed Mandarin is chosen because one of the co-authors of this study had prior experience in using Speed Mandarin with high school students.

## 2. Review of Literature

Gamification as a term originated in the digital media industry. The first documented use dates back to 2008, but the term only entered widespread adoption in the second half of 2010 (Deterding, Dixon, Khaled, & Nacke, 2011). Zichermann and Cunningham (2011) defined gamification as the “use of game based thinking and game-related functions to help users solve problems and to draw their interest.” It is easy to confuse gamification with game-based learning. In practice it is a matter of emphasis, and there is potential overlap between the two categories. Gamification has learning as its primary goal, and employs game play as a means to that end. Game-based learning has the playing of a game as its primary goal, with a secondary function of learning. One might think of this as a continuum, with a grey area in the middle where learning and game play share an equal level of emphasis. For example, Duolingo<sup>2</sup> is a free popular language-learning website and Smartphone app for learning foreign languages. Its main purpose is education, but it provides instruction and practice in a game format that makes the lessons more motivational. It is a clear example of gamification. For a clear example of game-based learning, imagine a game that students have played for recreational purposes for years—something like Monopoly.<sup>3</sup> Then consider a foreign language version of that same game. It is still primarily a game that could be played for fun. But some foreign language acquisition would creep into the game-playing process. What about the area of overlap? It is not at all clear which category to use if a foreign-language teacher brings foreign-language Monopoly into the classroom with substantial educational goals. The best way to think about it is probably to put it into both categories simultaneously.

Hunicke, LeBlanc, and Zubek (2004) created a formal scheme (the MDA framework) for analyzing the use of games. It formalizes the consumption of games by breaking them into their distinct components (rules, system, and fun) and establishing their design counterparts—the MDA framework (mechanics, dynamics and aesthetics). Game mechanics (or game dynamics) are an important part of gamification. These two terms are closely related and sometimes used interchangeably (Bunchball, 2010). Game mechanics are the various actions, behaviors, and control mechanisms that are used to “gamify” an activity, such as points, levels and challenges. Game dynamics are the results of motivations, which include reward, status, achievement, etc. (Bunchball, 2010). Game

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<sup>1</sup> See <https://www.speedmandarin.org>

<sup>2</sup> See <https://www.duolingo.com>

<sup>3</sup> See <https://monopoly.hasbro.com>

aesthetics defines the desirable emotional responses evoked in the player, when he or she interacts with the game system (Hunicke, LeBlanc, & Zubek, 2004).

The purpose of applying gamification in teaching and learning Chinese is to motivate learners. Lee and Hammer (2011) stated that one of the central problems of high school students in the U.S. is lack of self-motivation and the increasing number of drop-outs. Motivation includes two parts: intrinsic motivation and extrinsic motivation. Intrinsic motivation refers to behavior that is driven by internal rewards. In other words, the motivation to engage in a behavior arises from within the individual because it is naturally satisfying to you. This contrasts with extrinsic motivation, which involves engaging in a behavior in order to earn external rewards or avoid punishment (Cherry, 2019). The primary responsibility for learning lies with the student; the teacher is present to assist. One form that assistance takes is for the teacher to help students engage with the content and find robust sources of motivation—presumably both intrinsic and extrinsic.

Technology in education and gamification in particular are often (but not always) motivational. With the growing popularity of both, a variety of software has come into being that seeks to harness the potential of gamification for foreign language learning. Some are general-purpose language learning programs that can be used for a variety of different languages. Examples of these include Duolingo and Mondly.<sup>4</sup> Some are created specifically for a single language. In the case of Chinese, one could cite both Speed Mandarin and Lingo Bus<sup>5</sup> as examples. The authors of this study chose to investigate the use of Speed Mandarin in an American high school setting. The program provides illustrations to link each Chinese character visually to its meaning and also provides a rhyme with mnemonic value. For example, mǎo [cat, 猫 (simplified)/ 貓 (traditional)] catches mouse, in which the rhyme between “mao” and “mouse” provides mnemonic value. It includes monitoring functions that teachers can use to record students' learning. Since it is available for Android, iOS, and on the web (and since every student at the high school where this study was conducted is equipped with a Chromebook and a mobile phone), access was not a problem.

### 3. Rationale and Research Questions

Major differences between English and Chinese make Chinese difficult for many Western learners. English is phonetic. It uses words spelled out in a Western alphabet, and the meaning of English words remains constant regardless of the tones used to pronounce the word. This means that one must learn only two things to learn a new English word: its spelling and its meaning. Chinese represents words with unique characters rather than spelling them with an alphabet, and it also employs pronunciation and tone to indicate changes in meaning. Chinese is a tonal language. For example, when someone says “tang” they could mean soup (tāng 汤/湯), sugar (táng 糖/糖), lie down (tǎng 躺/躺), or hot (tàng 烫/燙). This means that one must learn four things when learning a new word in Chinese: the shape of its unique character, its pronunciation, the tone(s) associated with its

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<sup>4</sup> See <https://www.mondly.com>

<sup>5</sup> See <https://www.lingobus.com>

pronunciation, and its meaning(s). The Chinese language is immensely different from English. An English speaker must make the leap from viewing a cryptic-looking symbol (or set of symbols) that is *not* a “spelling” of a word to recognizing its meaning, pronunciation, and tone(s). The symbols do not contain hints about the pronunciation or tones in the way that English spelling does; there is no “phonetic” approach to sounding out a Chinese word. For this reason, Chinese teachers use a great deal of synchronous drill and practice. They say “Here is a Chinese character; here is the meaning, the pronunciation and the tone. Now memorize it.” Many American students find this extremely difficult and frustrating, and they look for some way of representing Chinese words visually in a way that would convey information about pronunciation and tone. Best practice in foreign language education generally discourages this type of approach (i.e. using one’s native language to spell out the foreign language), but such a system does exist in the form of pinyin. But there is a strong tendency for English speakers to misinterpret pinyin. Pinyin uses Western letters and diacritical marks to spell out the pronunciation of Chinese words, but there are two problems. The most critical one is that while the diacritical marks used in pinyin are mostly familiar to English speakers, the *meaning* of those marks is different in pinyin. For example, the pinyin version of the Chinese word for soup is tāng 汤/湯. To an English speaker, this would normally indicate a long “a” (as in “table”). However, in pinyin, this diacritical mark indicates a flat tone rather than a specific vowel pronunciation. In this case, “tāng” should be pronounced using the velar nasal (i.e. rear nasal) sounding like “tung” or “tongue” rather than using the alveolar nasal (i.e. front nasal) as “tang” or “taing.” The second problem is that pinyin tends to give English speakers the idea that one can spell Chinese words using a Western alphabet, which is simply not true. Pinyin is a bridge to recognizing Chinese characters rather than an alternative, spelling-based way of writing Chinese words.

One way of avoiding the problems introduced by pinyin is to add gamification techniques to the conventional drill and practice method for learning Chinese characters. Speed Mandarin is one program that takes this approach.

The major purpose of this study was to investigate the effectiveness of using Speed Mandarin to facilitate American high school students learning Chinese as a foreign language. Based on this purpose, the following research questions were addressed:

1. Do students using Speed Mandarin perceive their Chinese language learning (in the areas of reading, listening, speaking, and vocabulary acquisition) to be superior to that of students studying the same content without using Speed Mandarin?
2. Do students using Speed Mandarin perceive themselves as more likely to use a variety of Chinese learning strategies than students studying the same content without using Speed Mandarin?
3. Do students using Speed Mandarin perceive themselves as more highly motivated to learn Chinese than students studying the same content without using Speed Mandarin?

Our hypothesis is that students using Speed Mandarin will perceive themselves in a more positive light on all of these factors than their classmates studying the same content without Speed Mandarin.

## **4. Method**

### **4.1 Research Design**

The purpose of the study is to explore the effects of using Speed Mandarin on American high school students' perceptions about different aspects of learning Chinese. Pre- and post-surveys were administered to all students in the control and experimental groups at the beginning and end of one academic semester. The pre-surveys were used to collect demographic information, and the post-surveys were used to collect data on students' perspectives on their Chinese language learning competencies (in the areas of reading, listening, speaking, and vocabulary acquisition), usage of Chinese learning strategies, and motivation for learning Chinese. During the semester, the experimental group made regular use of Speed Mandarin, and the control group used conventional drill-and-practice learning activities in their Chinese class.

### **4.2 Sample**

All the participants in this study were enrolled in a Chinese as a foreign language program at a Midwestern urban high school in the U.S. The Chinese classes met daily and lasted 30 minutes. The study consists of 60 participants (female=32, male=28). Fifty-four were classified as Chinese Level 1 ("novice low" on the ACTFL scale; American Council on the Teaching of Foreign Languages, 2012), and six were classified as Chinese Level 2 ("intermediate low" on the ACTFL scale). Twenty-four were in eighth grade, fifteen were in ninth grade, sixteen were in tenth grade, and five were in eleventh grade. The average age is 16, with a range from 15-17 years old. The participants were mostly ethnic minorities, including fifty-five African-American, two Asian American (Filipino), and three Caucasian (White). All participants reported that English was their native language and their primary language spoken at home. An experienced Chinese teacher skilled in the use of Speed Mandarin taught all the participants. Fifty-two participants indicated that they studied Chinese for approximately five hours a week, while eight of them reported longer Chinese study time that ranged from six to nine hours.

### **4.3 Instruments**

This study used a questionnaire (see Appendix A) to collect data before and after the treatment period. The pre-survey questionnaire contained general demographic questions not included in the post-survey version. Otherwise, the two were identical and contained scales for "confidence in ability to learn Chinese," "language learning strategies," and "beliefs about Chinese learning."

Demographic information comprised student's grade level, age, gender, level of Chinese study, ethnicity, native language, primary language spoken in the home, and the student's estimate of weekly time spent studying Chinese.

The scale for “confidence in ability to learn Chinese” contained a total of 20 questions divided evenly among four areas of competency: reading, listening, speaking, and vocabulary. It was adapted from an instrument developed by the National Foreign Language Resource Center (2000). For this scale, students are asked to rate their confidence in their own ability to complete a specified Chinese language learning task, such as figuring out a phrase they do not understand. Students may rate their confidence from 0 (not sure at all) to 100 (completely sure).

The scale for “language learning strategies” contained 28 questions and used a five-point Likert scale, where 1 represents “never or almost never true” and 5 “always or almost always true.” This scale came from Ardasheva and Tretter (2013) and was based on an original scale developed by Oxford (1990). For this scale, students were asked to rate how frequently they used specified strategies as part of their Chinese language learning process, such as looking for words in Chinese that sound like words in their native language.

The scale for “beliefs about Chinese learning” contained 17 items and also used a five-point Likert scale, where 1 represents “strongly disagree” and 5 “strongly agree.” This scale was a shortened version of an instrument developed by Lan (2014) to measure student beliefs about Chinese learning. Students were asked to rate the extent to which they agreed or disagreed with specific statements about their motivation to learn Chinese, such as having personal plans to continue studying Chinese.

One should note that for both the “language learning strategies” scale and the “beliefs about Chinese learning” scale, a five-point Likert scale was used rather than the more common seven- or nine-point scale. This decision was made to reduce potential confusion on the part of the student. Dawes (2002) has found very little difference between these scale formats in terms of variation about the skewness, mean, and kurtosis. A Likert scale was chosen to allow the uncovering of degrees of opinion on the part of the students in the study.

#### **4.4 Procedure**

Student participants were recruited from a Midwestern urban high school in the U.S. One of the researchers who is familiar with the Speed Mandarin gamification application was teaching Mandarin at this high school. Prior to the beginning of the study, the researchers obtained support and permission from the administration to conduct the study in all Mandarin classes taught by this teacher. Parental consent forms were then collected from all participating students. The students were randomly assigned to the control and the experimental groups, each consisting of 30 students. Students in the experimental group were taught how to use Speed Mandarin on their mobile devices to learn new Chinese characters. Students in the control group used the traditional method (i.e., vocal drill and repetition) to learn the same set of characters. Both groups met daily for Mandarin lessons and spent the same amount of time (30 minutes) on each session. The thirty minutes of daily practice time (using Speed Mandarin or traditional methods) took place during Chinese class at school. The experiment continued for one semester. All subjects completed pre- and post-survey questionnaires administered by the Chinese language teacher.

## 4.5 Data Analysis

Data analysis was conducted in three steps. First, we examined gender differences in the students' Chinese competencies, language learning strategies, and motivation for learning Chinese by conducting one-way analysis of variance with gender as the between group measure. Second, we explored the relationships among these learning outcomes by conducting bivariate Pearson correlation analysis. Third, we tested our hypothesis regarding the effect of the intervention on these learning outcomes by conducting one-way analysis of variance with the experimental condition as the between group measure. As one would expect, the first two steps were preliminary and were not intended to test our hypothesis or to answer our research questions for the study. Only the third step was to test our hypothesis for the study.

Table 1 presents descriptive statistics (means and standard deviations) of outcome variables for female and male students, and inferential statistics (F-values and p-values) in the analysis of variance between the two groups on each outcome variable. The outcome variables include four perceived Chinese language learning competency variables in the four aspects of Chinese language learning (i.e., reading comprehension, listening comprehension, spoken communication, and vocabulary acquisition), one variable on Chinese language learning strategies, and one variable on motivation for Chinese language learning. Descriptive statistics on these variables were fairly commensurate between the two groups. Inferential statistics show no significant differences between female and male students on any of the outcome variables. This indicates that students of both genders reported similar perceived levels of their Chinese language competencies in all four areas (reading, listening, speaking, and vocabulary), similar frequency of using language learning strategies, and similar level of motivation for learning Chinese as a foreign language. The data in Tables 1, 2, and 3 represents post-surveys results only.

**Table 1 Gender Differences in Chinese Competencies, Language Learning Strategies, and Motivation for Learning Chinese**

<i>Variables</i>	Female (n=32)		Male (n=28)		<i>F</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Reading Competency	3.46	.23	3.46	.27	.007	.934
Listening Competency	3.50	.33	3.38	.37	1.807	.184
Speaking Competency	3.60	.35	3.50	.36	1.196	.279
Vocabulary Competency	3.39	.27	3.44	.37	.256	.615
Learning Strategies	3.54	.16	3.54	.20	.036	.850
Motivation	3.50	.19	3.46	.16	.858	.358

Table 2 indicates the correlation coefficients among the outcome variables. Chinese reading competency was significantly correlated to Chinese speaking competency ( $r = .54$ ,  $p < .01$ ) and Chinese vocabulary competency ( $r = .72$ ,  $p < .01$ ). Chinese listening competency was not correlated to any of the other three competencies. The extent students used language learning strategies was not related to their motivation for learning Chinese.

Neither student use of language learning strategies nor student motivation for learning Chinese was related to any of the four Chinese language competencies.

**Table 2 Correlation Coefficients among Chinese Competencies, Language Learning Strategies, and Motivation for Learning Chinese**

	1	2	3	4	5	6
1. Reading Competency	—					
2. Listening Competency	.21	—				
3. Speaking Competency	<b>.54**</b>	.15	—			
4. Vocabulary Competency	<b>.72**</b>	.20	.17	—		
5. Learning Strategies	-.03	-.06	.12	-.01	—	
6. Motivation	-.06	.07	-.19	.08	.11	—

Note. \*\*  $p < .01$ .

Table 3 shows descriptive statistics (means and standard deviations) of outcome variables for the control and experimental groups, and inferential statistics (F-value and p-value) in the analysis of variance between the two groups on each outcome variable. Means on these variables were largely comparable between the two groups except for two variables—Chinese listening competency (3.37 vs. 3.51) and Chinese speaking competency (3.46 vs. 3.65). Inferential analysis finds only significant difference in Chinese speaking competency,  $F(1, 58) = 4.415$ ,  $p = .04$ . The experimental group reported higher level of Chinese speaking competency than the control group did. There was no significant difference in the other three competencies. Nor was there any significant difference in language learning strategies or motivation for learning Chinese.

The data below show that the only significant result was that students in the experimental group (i.e. those who used Speed Mandarin) were significantly more likely that students in the control group to perceive themselves as competent in speaking Mandarin Chinese.

**Table 3 Comparison of Control and Experimental Groups in Chinese Competencies, Language Learning Strategies, and Motivation for Learning Chinese**

Variables	Control (n=30)		Experimental (n=30)		F	p
	M	SD	M	SD		
Reading Competency	3.48	.22	3.44	.27	.395	.532
Listening Competency	3.37	.34	3.51	.36	2.438	.124
Speaking Competency	<b>3.46*</b>	.34	<b>3.65*</b>	.35	4.415	<b>.040</b>
Vocabulary Competency	3.43	.30	3.40	.34	.103	.749
Learning Strategies	3.55	.18	3.54	.19	.041	.840
Motivation	3.47	.21	3.49	.14	.117	.733

Note. \*  $p < .05$ .

## 5. Results

We found no significant gender differences in any of the measures. The results of our data analysis provide partial support for our hypothesis. Students who studied Chinese in a classroom using the gamification Speed Mandarin perceived a higher level of competency than those who were not exposed to the use of this application in one area of Chinese language learning (speaking) but not in the other three competencies, in learning strategies, or in motivation. It is possible that this finding can be attributed to the intentionally playful and bold ways that the actors pronounced Chinese words and phrases in the video-gamification based components of the application.

## 6. Discussion

We were able to find support for the hypothesis that the use of Speed Mandarin would significantly increase students' belief in their own ability to speak Chinese, as compared to their classmates who were not using Speed Mandarin during the same time period. This is a modest but positive result; confidence in one's ability to succeed is a very real contributor to success. We were unable to find definitive support for the hypothesis that the use of Speed Mandarin would also increase students' belief in their ability to read, to listen to Chinese, to acquire new Chinese vocabulary, or in their motivation to learn Chinese. It is possible that learning motivation and/or learning strategies might be better addressed through incorporating Speed Mandarin (or other similar apps or programs) differently into the Chinese teaching/learning process. In this study the program was used simply for regular practice. If one component of the learning process required students to implement different learning strategies in combination with regular use of the program, or if student formative evaluation was monitored during the course of program usage and students received regular performance updates that could reflect any immediate impact on their Chinese learning, it is possible that significant results would be present. Both of those are promising areas for future research.

Innovative learning approaches and applications like gamification are increasingly mentioned in related literature. Experimental studies examining the effects of these applications, which are quite new to the literature, on the education process are few in number. But most of these studies demonstrate that these learning approaches can meet 21st century students' needs and demands and provide innovative solutions to current pedagogical problem (Deterding et al., 2011; Zichermann & Cunningham, 2011; Saritaş, Yildiz, & Şenel, 2015).

## 7. Suggestions and Limitations

Based on our findings, we tentatively recommend the use of programs like Speed Mandarin in teaching Chinese for the purpose of increasing students' confidence in their own ability to speak a difficult language successfully. This study had a number of limitations, and conducting additional research that addresses these limitations might well provide more definitive conclusions. Most notably, the research design is missing measures of actual student performance as opposed to student perceptions of performance; adding

objective outcome measures would significantly strengthen the design. Enlarging the sample size from the relatively small number of 60 would also be helpful, as would including a representative sample from a variety of different schools.

## 8. Conclusions

This study provides a preliminary examination of using gamification (in the form of the Speed Mandarin program) as a tool in Chinese learning for urban high school students. The use of Speed Mandarin was found to significantly improve students' confidence in their own ability to speak Chinese, though no significant effects were found on students' confidence in their abilities to read Chinese, understand spoken Chinese, acquire new Chinese vocabulary, or use a variety of learning strategies, or on their motivation to learn Chinese. Since self-confidence plays an important role in language learning, gamification in the form of Speed Mandarin appears useful in at least one area of Chinese language instruction – that of learning to speak the language aloud. Further research is needed in order to investigate possible relationships between the use of Speed Mandarin and increases in student confidence in other areas of language learning, as well as increases in actual student performance.

Further research is needed with a more robust experimental design and a larger sample size. In the interim, we found positive (and no negative) outcomes associated with the use of Speed Mandarin, and feel comfortable recommending its use in the teaching and learning of Chinese.

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