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## The Effectiveness of Using Memrise Application to Learn Chinese Characters by American Middle School Students - A Pilot Study

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### To cite this article:

Wang, L. C., Lam, E. T. C., & Xiao, C. (2023). The effectiveness of using Memrise application to learn Chinese characters by American middle school students - A pilot study. *International Journal of Technology in Education (IJTE)*, 6(4), 583-592. <https://doi.org/10.46328/ijte.423>

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# The Effectiveness of Using Memrise Application to Learn Chinese Characters by American Middle School Students - A Pilot Study

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## Article Info

### Article History

Received:

09 February 2023

Accepted:

07 September 2023

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### Keywords

Mobile technology

Chinese-as-a-foreign-language

Mandarin Chinese

Mixed Design ANOVA

Memrise app

## Abstract

This study examined the effectiveness of Memrise application in motivating American middle school students to learn Chinese as a foreign language (CFL). Participants ( $N = 27$ ) in the study were middle school students enrolled in CFL courses in an urban public middle school in the Midwestern region of the United States. During the study, the experimental group used the Memrise application while the control group used the traditional paper-made flashcards to learn new Chinese characters. Results of the mixed-design ANOVA indicated that there was no significant ( $p > .05$ ) difference in the scores between students in the experimental and control groups on Chinese characters acquisition. However, the Group main effect was significant ( $p < .001$ ), indicating that the students in the experimental group had stronger motivation in learning CFL than those in the control group. It is suggested that further research should include a larger sample size and other types of CFL learning applications.

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## Introduction

Chinese (primarily Mandarin and Cantonese) is the most spoken language in the world, and as of February 2023, it has at least 1.45 billion Chinese speakers. Mandarin Chinese is one of the hardest language to learn, particularly for those non-native Chinese speakers. As the United States Olympic swimmer Michael Phelps said at the Beijing Olympics in 2008: "Learning Mandarin is harder than winning 8 gold medals in the pool" (China Daily, 2008). It is well-known that Chinese language learning is very challenging for Chinese-as-a-Foreign-Language (CFL) students, particularly learning Chinese characters (also known as *Hanzi*). However, Chinese character literacy is the foundation of learning the Chinese language (Lin et al., 2022).

In the linguistic field, Chinese is classified as an ideographic language because Chinese character is logographic in nature. Each Chinese character has three components: shape, sound, and meaning (Wong et al., 2020). Typically, these three components have not directly associated with each other. To assist CFL students steadily develop a solid foundation of Chinese character learning, Zhan and Cheng (2014) suggested two break-down stages of character learning: (a) first focusing on the sound-meaning connection, and (b) then move on to the sound-meaning-form (i.e., shape) connection of character learning.

Zhou and Li (2022) also stated that because Chinese is a pictorial language in which the sound and shape are not

associated, each character should be learned and practiced in order to write a character correctly (not to mention to learn each character's meaning). Thus, one should at least learn these three featured components (shape, sound, and meaning) of each character in order to learn well for a single Chinese character. In addition, a CFL student needs to be able to recognize approximately 3,000 Chinese characters in order to read a Chinese newspaper (Sung, 2012). Therefore, Chinese character literacy is very complicated and challenging for alphabetic non-native CFL students (e.g., students in the United States).

With the recent advances in instructional technology, can the technology help to shorten the gap in learning Chinese characters for non-native CFL American students? In 2014, Zhan and Cheng positively pointed out that technology can facilitate Chinese character learning. Specifically, modern mobile technologies, such as handheld tablets, smartphones, and iPads, could assist Chinese characters' learning in a more personalized, interactive, and communicative manner. How could modern mobile technologies be able to be integrated into CFL classrooms to help Chinese character learning for CFL students?

In this digital age, more and more K-16 students in the United States are living and learning within a variety of mobile technologies (e.g., smartphones, iPad tablets, smartwatches) that they can connect to the Internet with different types of free-of-charge digital learning applications. Using mobile technologies is part of daily life for some of American students, and it is not difficult at all for them to adapt mobile technologies to learn Chinese characters in the classrooms. With this reason, the authors of the study are interested in integrating mobile technology into CFL courses to see how it works.

## **Review of Literature**

Due to the advances in mobile and networking technologies, a variety of mobile technologies with different mobile devices and mobile applications (or apps) have been developed for K-12 education in the United States and integrated into classrooms in different subject areas. The question is: "Do they work?" When examining mobile and networking technologies among 252 students (105 sixth graders and 147 ninth graders) in rural schools in Russia, Koroleva (2018) found that the use of mobile and networking technologies in rural schools produced better results and proved to be more effective in the accessibility to students of diverse ages than those schools in large cities in Russia. Likewise, Liu et al. (2014) used mobile technology (i.e., iPod touch) to support a 2-year study toward elementary and middle school English language learners in a large United States school district and found that mobile technology had facilitated these learners' language and content learning.

When examining the effect of integrating mobile technology on learning CFL, Lan and Lin (2016) revealed that mobile technology not only could enhance the pragmatic competence of CFL learners but could also make significant improvement in the test-based Mandarin communication performance. In a recent study, Zhou and Li (2022) pointed out that with the recent advanced and affordable instructional digital technologies, more and more mobile-assisted language learning tools have been used at American schools to help CFL students to practice and master character learning due to their easy accessibility and low cost. Thus, anyone who can afford a mobile device such as a cell phone, tablet, or hand-held computer can learn Chinese characters anywhere and anytime at

their own pace.

In terms of the availability of mobile apps for foreign language education, Davudova and Türel (2022) observed that while mobile technologies had been progressed dramatically, more and more mobile apps designed for the development in foreign language learning had been created. Most of those mobile apps are focusing on easy to use, easy to download and update, and/or very affordable to purchase (from Play Store for Android devices and in the App Store for iOS devices), or free of charge. In an experimental study by comparing a mobile app game to conventional paper-pencil method on teaching Chinese character stroke orders, Li and Zhou (2019) found that students using a mobile app were significantly more effective than using paper-pencil method. Later on, they conducted a follow-up study with 30 CFL beginning students by applying a mobile app to seek their perspectives on Chinese character learning and found that learning Chinese character writing using mobile apps was valuable and effective for the CFL beginners' stroke order knowledge and character writing performance (Zhou & Li, 2022).

What are the most popular mobile apps that have been used in foreign language education? Davudova and Türel (2022) identified that “Duolingo” and “Memrise” are the two most preferred free mobile apps for foreign language learning (p. 739). Both apps have advantages and disadvantages when used in the CFL classroom setting. Based on the authors' observations, a lot of CFL educators in the United States have received positive feedbacks from their students after integrating the Memrise apps to help CFL students in learning Chinese characters. Specifically, Memrise (founded in 2010 by Ed Cooke and Ben Whately) is a free web-based language learning app (except for its Pro version). As of April 2023, it provides 23 languages with 65 million learners in 189 countries as well as over 50,000 “Learn with Locals” videos of native speakers to learn authentic languages through its website and its mobile App provided by Apple Store and Google Play (<https://www.memrise.com>).

Furthermore, Memrise is a crowdsourcing spaced repetition vocabulary learning program. It allows users to create their own vocabulary learning lists and share them with others (Wu, 2015). Meanwhile, Memrise permits language educators to create language classes on its website. Typically, students learn the content in the designated target language by matching characters, idioms, phrases, or sentences with definitions or translations (Nicholes, 2016). Mason and Zhang (2017) stated that Memrise provides a range of language and other courses with ready-made flashcards using “mems” (mnemonics) approaches to help learners connect new information with what they already know (p. 104).

Similarly, Lotherington (2018) acknowledged that Memrise uses spaced repetition of digital flashcards combining science, fun and community philosophy in vocabulary memorization to increase how students remember new information and then increase the rate of learning target language. Although Memrise courses created by its community are mainly used to teach language, the courses are also used for other academic and non-academic subjects such as science, music, history, philosophy, and popular culture (Ebadi & Ghuchi, 2018). Recently, Davudova and Türel (2022) acknowledged that Memrise allows users to learn new characters through a multimedia learning path by listening and writing methods accompanied with audio and videos voiced by experts who are native speakers of target language. Consequently, learners can learn to speak their target language like

their mother tongue and observe the authentic culture of the target language.

There are several reasons for selecting Memrise app for the current study based on the features of Memrise and its effectiveness in literature study. In terms of the features of Memrise, Ebadi and Ghuchi (2018) confirmed that because it is free of charge (except for Memrise Pro version) with a simple account creation, individual course content can be uploaded and then be created based on individual instructor's needs, course items can be arranged friendly by individual instructor, and there exists many language translations to all the words in the course (p. 61). Davudova and Türel (2022) asserted that one of the most admired features of the Memrise is that it provides a lot of characters for language learners to learn, and the characters can be repeated as many times as possible until reaching the proficiency level. Another feature is that it is easy to conduct transition between the languages (p. 742). Wiwin et al. (2022) declared that Memrise can be accessed at anytime and anywhere, and it could encourage students to learn independently. It can be downloaded free of charge to students' mobile devices with interactive learning features and an intuitive user interface.

Thus, Memrise is a terrific tool to improve students' English language skills, particularly by expanding their vocabulary learning. In terms of the effectiveness of Memrise usage in language learning, Ebadi and Ghuchi (2018) found that EFL Iranian students who used a blended learning (face-to-face plus asynchronous using of Memrise app outside the scheduled class time) to study English showed better performance in English vocabulary acquisition compared to those who studied using traditional face-to-face exercises in the control group. Moreover, in a quasi-experimental study conducted with Iranian intermediate EFL learners, Esmaeili and Shahrokhi (2020) found that Memrise app had a significant effect on students who used collocation learning and retention.

Could "Memrise" help American CFL middle school students to learn and master Chinese characters? Though mobile learning has become a trend in foreign language education, research on mobile Chinese language learning is just a recent phenomenon. Very few studies have been conducted on using mobile applications to support CFL character learning. The authors of this study were interested in using Memrise app as a learning tool for Chinese language learning, specifically for conducting Chinese character acquisition activities in the classrooms. Therefore, the purpose of the study was to examine the effectiveness of Memrise application as an intervention to help middle school students in the United States to learn Chinese characters as a foreign language. For this reason, the following research questions were developed for this study:

1. Would the Memrise application be more effective than the traditional method for middle school students to learn Chinese characters as a foreign language?
2. Would the Memrise application increase the motivation of middle school students to learn Chinese as a foreign language?

## **Methods**

### **Procedures**

The purpose of the study was to explore the effects of using Memrise application on American middle school

students' progress and perceptions of learning Chinese. Pre- and post-test design was used to assess all students in the experimental and control groups on the effectiveness of Chinese characters' learning after using the Memrise app in their CFL courses. Student participants were recruited from a Midwestern urban public middle school in the United States. One of the researchers who is familiar with the Memrise application was teaching Mandarin at this middle school. Prior to the beginning of the study, the researchers obtained support and permission from the administration to conduct the study.

Parental consent forms were then collected from all participating students. The students were randomly assigned to the experimental and control groups, each consisting of 16 and 11 students. Both groups were scheduled to learn 15 new Chinese characters adapted from the HSK in three different lessons, with five new Chinese characters per lesson (42 minutes). Students in the experimental group were taught how to use Memrise app on their mobile devices to learn and memorize the meaning of those new Chinese characters. Students in the control group used the traditional paper-made flashcards to learn and memorize the same set of new Chinese characters.

### **Participants**

Twenty-seven 6th graders (12 females and 15 males) participated in this study. The age of the students ranges from 11 to 13 years old (mean = 11.56 years  $\pm$ 0.58). All were enrolled in a CFL program as Chinese level one at a Midwestern urban middle school in the United States. The participants were mostly ethnic minorities: 18 African American, five multi racial, two Asian Americans, one Mexican American, and one Caucasian (White). Most of the participants' native/primary language spoken at home was English ( $n = 22$  or 81.48%), followed by Spanish ( $n = 2$  or 7.41%).

### **Instruments**

This study used a pre- and posttest design as well as a pre- and post-survey to collect data. The measuring instrument in this study was designed by one of the co-authors, a Chinese instructor who has substantial experience in the use of Memrise app as a motivational tool in the CFL courses. The content for the tests included 15 Chinese characters adapted from the Hanyu Shuiping Kaoshi (HSK), a standardized test of Chinese, and presented in multiple choice format created by the instructor.

The survey contained the scale Beliefs About Chinese Learning (Lan, 2014) to measure student beliefs about Chinese learning and a section on demographics. The scale contains 17 items, and the respond format is based on a five-point Likert scale (e.g., 1 = "strongly disagree" and 5 = "strongly agree"). Students were asked to rate the extent to which they agreed or disagreed with specific statements about their motivation to learn Chinese, such as "I enjoy learning Chinese." The section on demographics comprises student's grade level, age, gender, level of Chinese study, ethnicity, native English speaker or not, primary language spoken at home, and the student's estimate of weekly time spent studying Chinese. The pre- and post-survey were identical except for the demographic pre-survey which was not included in the post-survey. The same Chinese instructor administered all the tests and surveys in the classroom in the beginning and at the end of the study.

## Data Analysis

The data were analyzed by IBM SPSS: Version 28 (IBM, 2021). The Box's Test was used to test the null hypothesis that covariance matrices of the dependent variables are equal across the two independent groups (i.e., experimental and control groups). The Levene's Test was used to examine the equality of the error variances of the dependent variables. Mixed-design factorial  $2 \times 2$  analysis of variances (ANOVAs) were used to examine student learning development (within-group factor) between the experimental and control groups (between-group factor). The level of statistical significance was set at  $p < 0.05$ . Unless otherwise indicated, all data are presented as mean  $\pm$  standard deviation.

## Results

This study examined students' Chinese characters' learning scores and beliefs about learning Chinese over time. Descriptive statistics of the scores of the experimental and control groups are presented in Table 1. The results of the students' Chinese characters' learning scores and their beliefs about learning Chinese are presented in the next two sections.

Table 1. Descriptive Statistics of the Experimental and Control Groups

Variables	Experimental Group		Control Group	
	Pretest	Posttest	Pretest	Posttest
Learning Chinese Characters	26.44 $\pm$ 13.69	79.75 $\pm$ 21.67	26.18 $\pm$ 12.93	87.82 $\pm$ 20.94
Beliefs About Learning Chinese	3.50 $\pm$ 0.79	3.57 $\pm$ 0.82	3.49 $\pm$ 0.36	3.49 $\pm$ 0.71

### Learning Outcome of Chinese Characters

Results of the Box's Test were not significant ( $F = .052, p = .985$ ), indicating equality of covariance matrices of the dependent variables between the two comparing groups. Likewise, results of the Levene's Test showed that both the pretest ( $F [1,25] = .127, p = .725$ ) and posttest ( $F [1,25] = .065, p = .800$ ) were not significant, indicating the error variances of those two dependent variables are equal across groups. The outcomes of the mixed-design factorial ANOVA revealed that the Development  $\times$  Group interaction was not significant ( $F [1,25] = 0.755, p = .393$ ). Likewise, the Group main effect was not significant ( $F [1,25] = 0.590, p = .450$ ), indicating there was no difference in the scores between the experimental and control groups. However, the Development main effect was significant with a huge effect size and a large power ( $F [1,25] = 143.993, p < .001$ ; partial eta squared = .852, observed power = 1.000). This indicated students in both the experimental and control groups made significant progress towards the end of the semester, regardless of whether they use the Memrise or the traditional method in learning Chinese characters.

### Beliefs about Learning Chinese

The Box's Test was significant ( $F = 2.931, p = .032$ ), indicating that the observed covariance matrices of the

dependent variables were not equal across groups. Likewise, results of the Levene's Test showed that the pretest of the survey was significant ( $F [1,25] = 7.717, p = .010$ ). However, the Levene's Test of the posttest was not significant ( $F [1,25] = .594, p = .448$ ). The outcomes of the mixed-design factorial ANOVA revealed that the Development  $\times$  Group interaction was not significant ( $F [1,25] = .116, p = .736$ ). Likewise, the Development main effect was not significant ( $F [1,25] = .163, p = .690$ ), indicating that both the experimental and control groups did not have significant changes in their beliefs about learning Chinese over the course of their study. However, the Group main effect was significant with a huge effect size and a large power ( $F [1,25] = 688.869, p < .001$ ; partial eta squared = .965, observed power = 1.000). This indicated that the students in the experimental group had stronger opinions or motivation in learning Chinese towards the end of the study while the beliefs of those students in the control group remain unchanged (see Figure 1).

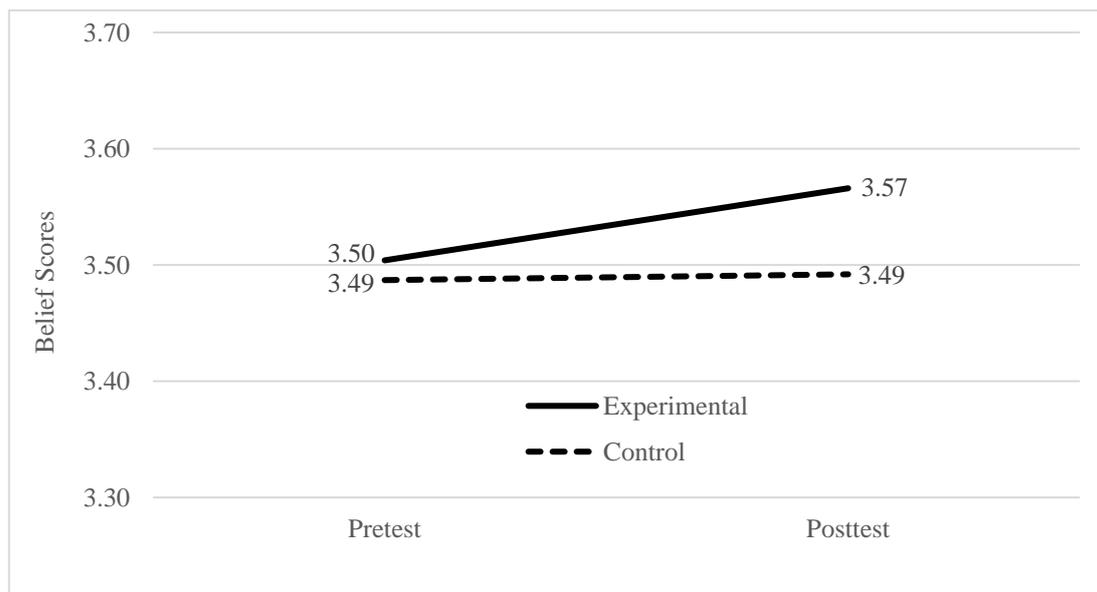


Figure 1. Beliefs about Learning Chinese between Students in the Experimental and Control Groups

## Discussion and Conclusion

The purpose of this study was to examine the effectiveness of Memrise app as a tool to help middle school students to learn Chinese characters as well as their motivation to learn Chinese as a foreign language in general. The first research question investigated whether the Memrise app is more effective than the traditional method (via paper-made flashcards) in learning Chinese characters as a foreign language for middle school students. The answer for the first research question is negative since the findings of the present study revealed that there is no evidence to indicate that the using of the Memrise app is more effective than the traditional classroom method (via paper-made flashcards) in learning Chinese characters as a foreign language.

The outcome is unexpected, particularly when the teacher has received good comments by the students about the use of the Memrise app. This negative result is contradictory with previous studies. For example, the Memrise app is found to be effective for learning Chinese characters for American CFL students (e.g., Wu, 2015) and can improve students' English knowledge, specifically expanding their vocabulary learning (Wiwin et al., 2022).

Besides, the Memrise app is found to be effective in improving English-as-foreign-language learning among Chinese students (e.g., Nicholes, 2016), Iranian students (e.g., Ebadi & Ghuchi, 2018; Esmaeili, 2020; Zohoorian et al., 2022), Indonesian students (e.g., Aminatun & Oktaviani, 2019; Rohim et al., 2022), and Turkish students (e.g., Davudova & Türel, 2022). The major reason for having a non-significant result is probably because of the small sample size in this pilot study.

The second research question in this study assesses whether the Memrise app can increase the motivation of middle school students to learn Chinese as a foreign language in general. The answer to this research question is positive since the “Beliefs About Chinese Learning” scores of the students in the experimental groups are significantly higher than those in the control group. This indicates that the usage of Memrise app can increase the motivation and promote the interest of the students to continue to pursue in learning Chinese as a foreign language. This positive result can be attributed to the Memrise app’s general acceptance by the students (Wu, 2015) as well as its convenience, accessibility, and user friendliness as reported by Zohoorian et al. (2022).

To the best of our knowledge, there are very few, if any, empirical studies focusing on both the effectiveness of using Memrise app as a tool to help American middle school students to learn Chinese characters and their motivation to learn Chinese as a foreign language in general. For this reason, the findings of these empirical study will add knowledge to the field of CFL. Essentially, this pilot study is significant in the sense that it provides valuable hints to CFL teachers as well as other foreign language teachers on potential strategies to improve student performance by using Memrise app in their language classroom teaching and learning application.

Similar to all research studies, this study also has its limitations. First, our findings may be limited by the nature and small size of its sample ( $N = 27$ ). Future studies should address such limitation by including a larger sample size of both male and female participants if one wants to generalize the findings to other populations. Second, our study was conducted in a school district that has limited schedule in its foreign language curricula, in addition to the required schedule for instruction. The researchers had to accommodate time to complete the whole experiment in three lessons (42 minutes per lesson) for each group. To improve generalizability as well as statistical power of the findings, further studies should increase the number of lessons with sufficient time to implement the intervention more thoroughly and consistently over a longer period of time. Third, the instructional content for the study was constrained with 15 new Chinese characters in the HSK level-1 texts. For future studies, the use of more or even the whole HSK level-1 new Chinese characters as the instructional content, the reliability and validity of the study could be more representative. Finally, Memrise app is one of many online language learning applications using spaced repetition. To ensure research findings be generalizable to other language learning applications, future studies may compare Memrise app with other language learning applications such as Duolingo, Pleco, Skritter, Babbel, Busuu, Anki, Cram, and Quizlet to assess the effectiveness of specific language learning applications.

## Note

The first two authors contributed equally to this manuscript.

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