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A CROWDSOURCING APPROACH TO CHINESE VOCABULARY LEARNING

Jianxiong Wu

Southern Connecticut State University

ABSTRACT

The fast development of new technology, particularly web-based and mobile technology, has been transforming ways how languages are taught and learned. The current study examines the use of Memrise, a crowdsourcing spaced repetition program, by college students of Chinese, and its effects on Chinese character learning. The findings of the study demonstrate the effectiveness of the program. The study has also identified important factors and conditions that should exist in order for the use of the program to be successful. Based on the findings of the study, suggestions are made for language teachers in regards to using Memrise or similar programs in vocabulary teaching. Even though the current study focuses on Chinese character learning, the findings of the study can be applied to any other languages.

INTRODUCTION

The biggest challenge in studying Chinese is to recognize and write Chinese characters. The learning of Chinese characters is even more difficult for students whose native language is English or any other Roman alphabetic language. Teachers of Chinese always seek better strategies and tools for teaching Chinese characters. The development and application of new technology have opened up new opportunities for making this challenging task easier and more successful.

The majority of the existing research demonstrates that the use of technology enhances foreign and second language vocabulary learning and acquisition (e.g. Al-Seghayer, 2001; Godwin-Jones, 2010; Jones & Plass, 2002; Plass et al., 1998, 2003; Schuetze & Weimer-stuckmann, 2011). Intentional vocabulary learning has been promoted by a number of researchers (e.g. Nation, 2001; Schmitt, 2008). Many computer programs have been developed for vocabulary learning utilizing the spaced repetition and crowdsourcing approaches. However, research in the actual usage of these programs by students and their effects on the learning process and outcome is limited. Particularly, research in CALL-enhanced Chinese character learning and teaching is scarce.

The purpose of this study is to examine the actual usage of Memrise, a crowdsourcing program utilizing the spaced repetition approach, by students of Chinese in an American 4-year university, and its effects on students' Chinese character learning.

LITERATURE REVIEW

CALL-Enhanced Vocabulary Learning

In recent years, research into second language lexical processing has witnessed a revival (Schuetze & Weimer-stuckmann, 2011). Vocabulary knowledge is seen as so essential that it has been described as a prerequisite for successful communication (Nation, 2001). In connection with word learning, a distinction is commonly drawn between incidental and intentional learning. Research in CALL-enhanced vocabulary learning is often carried out along this distinction.

A good portion of the existing studies examines the effects of annotations, glossing, captions and multimedia means on reading comprehension, listening comprehension and incidental vocabulary learning. Studies on vocabulary learning from written text (Al-Seghayer, 2001; Chun & Plass, 1996a, 1996b; Plass et al., 1998, 2003) and aural passages (Jones & Plass, 2002) discover that vocabulary learning can be enhanced if new words are annotated with both verbal input and images rather than when they are annotated with only one of these stimuli.

The study of Yoshii (2006) examined the effectiveness of L1 and L2 glosses on incidental English vocabulary learning in a multimedia environment. The

findings of the study suggest that both L1 and L2 glosses are effective for incidental vocabulary learning and that the effect of additional visual cues on vocabulary learning may rely on the nature of the tasks given.

Sydorenko (2010) studied the relationship between modality of input and vocabulary acquisition in Russian. The major findings of this study suggest that captions facilitate recognition of written word forms while audio facilitates recognition of aural word forms and more word meanings are learned when videos are shown with both audio and captions than with either audio or captions.

Hsu et. al. (2013) investigated the effects of different display modes of video captions on mobile devices, including non-caption, full-caption, and target-word modes, on the English comprehension and vocabulary acquisition of fifth graders. The result of the study shows that both the full-caption group and target-word group outperformed the non-caption group in vocabulary acquisition.

The majority of the previous research indicates that the use of technology enhances foreign and second language comprehension and supports incidental vocabulary learning and acquisition in various ways and to different degrees. On the other hand, a number of researchers in the field have been promoting intentional vocabulary learning. Nation (2001), for example, advocates direct learning of vocabulary with word cards and states that this method of direct learning should be part of an overall vocabulary learning agenda. Oxford (1990) and Schmitt (2008) give particular consideration to rehearsals. Oxford (1990) promotes a staggered processing of learning material in her popular textbook, suggesting seven encounters with the optimal intervals of 15 minutes, 1 hour, 2 hours, 1 day, 4 days, 1 week, and 2 weeks. Studies done on spaced learning in which items are rehearsed over a longer period of time at set intervals have been shown to be more effective than mass learning for a variety of materials, including L2 vocabulary (Baddeley, 1997; Hulstijn, 2001; Mizuno, 1996, 2003) and a computer program can be used to facilitate such study intervals.

Based on the research in lexical processing carried out in cognitive psychology (e.g. Baddeley, 2007; Balota et al., 2007; Carpenter & DeLosch, 2005) which found that spaced learning led to higher retention than massed learning, Schuetze and Weimer-stuckmann (2011) conducted a study to compare uniform and graduated delays in spaced learning with the online German vocabulary program Vivo and their effects on retention in second language vocabulary learning. The results of their studies showed that on long-term retention, a uniform delay led to higher retention rates than a graduated delay.

Oberg (2011) compared the effectiveness of a CALL-based approach and a card-based approach to vocabulary acquisition and retention. The study found that both approaches led to improvement in EFL vocabulary acquisition and retention, and there were no significant differences between the two. However, students in the study expressed a slight preference for the CALL method.

Most research on vocabulary in the context of intentional learning has addressed word associations and/or providing learners with clues (Meara, 2009), task types, and activities that engage learners with words (Barcroft, 2007; Host, Cobb, & Nicolae, 2005; Webb, 2007). In many cases, technology plays an important role in providing a greater number of and more effective ways of engaging learners with words and helping them build word associations.

As Godwin-Jones (2010) observes, in the area of intentional vocabulary learning, some interesting and innovative work is being done which goes beyond simplistic electronic flashcards. For example, the program SuperMemo utilizes the spaced repetition approach based on eleven different spacing algorithms and calculates when it is necessary to review an item just before it is likely to be forgotten. Anki is another popular program utilizing the spaced repetition approach. Anki also uses the concept of “facts” - the basic vocabulary item and its definition/explanation/annotation. For any fact, graphics, links, audio, and notes can be entered as fields. A card can be created in a variety of ways based on the fields entered for that fact. New programs like these have the potential of making intentional vocabulary learning more effective, focused and flexible. However, research to examine the actual usage of these programs by students and their effects on the learning process and outcome is scarce.

As a new area for research in CALL-enhanced vocabulary learning, collaborative and crowdsourcing learning deserves more attention. According to Kessler (2013), technology nowadays offers us the opportunities to participate in the culture around us and to help redefine that culture. This collaborative culture has transformed the frequency and manner of our communication with one another as well as the way we co-construct reality. The potential for incorporating the opportunities presented by this participatory culture into language teaching and learning is enormous. In this participatory culture, learning and teaching will become more and more crowdsourced since students and teachers are co-constructing the learning content and tools. Autonomous learning will be further promoted among students due to the increased sense of ownership attached to the content and tools created by them.

Specifically, in the area of vocabulary learning, some studies have shown that collaborative or peer work with vocabulary building can be beneficial (Horst, Cobb, & Nicolae, 2005; Jones, 2006). According to the study of Kuo & Hooper (2004), having students create their own stories or mnemonic elaborations for remembering vocabulary can be particularly effective. The research of Loucky (2006) has also demonstrated that the more effort a learner puts into figuring out a meaning and how to retain it, the more likely it is to be remembered. Programs such as Anki and Quizlet allow students to create their own vocabulary lists and share them with others. Memrise is a typical crowdsourcing vocabulary learning program, which not only allows users to create their own lists, but also allows users to create their own “Mems” - mnemonic units such as animated gifs, images and unique explanations, and share them with other users. Programs like Memrise can potentially bring many benefits to language learning, such as increased motivation and sense of ownership, saving of efforts and time, and more effective and focused learning. Again, research in the actual usage of these tools by students and their effects on the learning process and outcome is still very limited.

CALL-Enhanced Chinese Character Learning

Research in CALL-enhanced Chinese character learning is particularly scarce. As Wang (2013) points out, while reading research in Chinese has been extensively pursued and research specific to grammatical features has been studied, many of the skill areas and the applications of technology have not been fully explored.

In a study that investigated how different instructional methods affected the learning process of character handwriting among beginning college level learners of Chinese, the learners wrote characters on digital writing tablets and then submitted them to a computer-assisted program (Tsai, Kuo, Horng, & Chen, 2012). When learners made a writing error, they received immediate feedback from the program and were forced to correct the error before continuing. The computer-assisted program improved the quality of the learners’ character handwriting.

Jin (2003) conducted a study of the impact of combining a radical-based strategy with the use of multimedia on Chinese character learning. One hundred and twenty U.S. college students learning Chinese at one Beijing summer school participated. The study compared three modes of learning the Chinese characters:

1. Pinyin + English translation; 2. Stroke order animation + Pinyin + English translation; 3. Pinyin + English translation + Video showing radicals and illustrations. The results show that the recognition rate for characters was highest for the group using Mode 3, medium for the group using Mode 2 and lowest for the group using Mode 1.

Chen et.al. (2013) examined the effects of the radical-derived character teaching delivered on an e-learning platform in a 3-week Chinese course. One hundred and twenty-nine foreign-born Chinese heritage CFL learners participated in the study. Sixty-nine students in the experimental group received the radical-derived character teaching delivered on the e-learning platform in addition to receiving the regular course instruction. Sixty students in the comparison group just received the regular course instruction. The result of the study shows that the experimental group performed significantly better than the comparison group on a phonetic radical awareness test, a semantic radical awareness test, as well as an orthographic knowledge test. However, the better performance of students in the experiment group in this study seemed to be related more to the additional instruction they received than to the technology tool they employed.

Guided by the literature review, the current study attempts to examine the actual usage of Memrise, a crowdsourcing space repetition program, by students of Chinese in the college setting, and its effect on the Chinese character learning and retention. The researcher wants to find out students' overall attitude towards the technology and the specific features of the program that they like. Particularly, the researcher wants to identify important factors and conditions that account for the successful and effective use of the program. Hence, the following research questions are generated for the study.

- A. How much does the use of Memrise improve Chinese character learning?
- B. How do students use Memrise to learn Chinese characters?
- C. What is the attitude of students towards the use of Memrise in general?
- D. What specific features of Memrise do students like?

DESIGN AND IMPLEMENTATION OF THE STUDY

The study spanned over two academic years, involving two third-semester college-level Mandarin Chinese classes. These two classes were offered consecutively in two separate academic years. In both classes, students would need to complete five lessons in the textbook for the semester. After each lesson,

there was a quiz, which included character writing, character recognition, measure words, listening comprehension, reading comprehension, and sentence or paragraph writing. This study used data from the character recognition part of the quiz. In each quiz, students were given 25 Chinese words from the specific lesson. They would need to write both the English meaning and Pinyin (pronunciation) of each word in order to get the full point. The Memrise project was carried out in the second class. Data from the first class were only used to establish the baseline for the comparison of character recognition scores. In this special research set-up, the first class was a control group and the second class was the experimental group. Since these two classes used the same textbook, followed the same syllabus, and were taught by the same teacher, the researcher felt relatively confident that any observable differences in the study should be related to the different treatments in concern.

In the second class, the Memrise project started after the second quiz. The purpose of this arrangement was to compare the character recognition rates before and after the Memrise project to see if there was any noticeable difference in students' character recognition that might be accounted for by the use of Memrise.

Memrise is an online learning tool with courses created by its community. It incorporates a unique way of learning and teaching foreign language words by crowdsourcing Mems, or Mnemonic devices from its community and then imparting them to users through online lessons. Mems created and shared by the community include animated gifs, pictures, unique explanations, sample sentences, etc., intended to make vocabulary learning more interesting and effective. Memrise applies the principle of spacing effect in neurolinguistics and likens learning a word to growing a plant, which requires regular watering at a specific interval determined by intermittent quizzes.

In the Memrise project for this study, students were assigned to work in pairs to create a vocabulary list for one of the lessons they studied for the semester. The resulting vocabulary lists were then shared by all students in the class. When using the vocabulary lists, students could create their own Mems or use available Mems created by their classmates or the community. Students could stick with the same Mems or change them any time they wanted. The teacher of the class required students to use Memrise to learn and review vocabulary for at least 15 minutes a day, starting from Lesson 3.

Character recognition scores were calculated for each of the five quizzes in the semester for both classes. In the second class, the experimental class, students took Quizzes 1 and 2 before the Memrise project and Quizzes 3, 4 and 5 after the Memrise project. Comparisons were made between Quizzes 1 & 2 and Quizzes 4 & 5 to see if any noticeable differences in students' character recognition could be detected. A similar comparison was also made for the first class to see if the differences, if any, already existed due to other factors. The researcher also conducted a private interview with each student in the second class to learn more about their actual experiences in the Memrise project.

RESULTS

Character Recognition

In order to answer Research Question A “How much does the use of Memrise improve students' Chinese character learning?”, the character recognition scores for each of the five quizzes in the second class were first calculated. A comparison was made between the average vocabulary scores of Quizzes 1+2 and the average vocabulary scores of Quizzes 4+5 to see if any differences could be detected. Since the Memrise project started after the second quiz, any improvement made by students in character recognition in later quizzes might be accounted for by the use of Memrise. According to Table 1, the average scores of Quizzes 1+2 were 16.22 while the average scores of Quizzes 4+5 were 19.41. There was an average improvement of 3.19 in Quizzes 4+5 over Quizzes 1+2. A T-Test analysis indicates a significant difference between the two average scores with the P value equal to .01, which is smaller than the .05 preset value to reject the null hypothesis. Therefore, we can confidently say that the average scores of Quizzes 4+5 were significantly higher than those of Quizzes 1+2 for students in Class 2.

Table 1

Vocabulary Scores of Class 2								
Student	Quiz 1	Quiz 2	Quizzes 1+2	Quiz 3	Quiz 4	Quiz 5	Quizzes 4+5	Gain
A	15.5	13.5	14.5	16	22	21.5	21.75	7.25
B	13	14.5	13.75	13.5	13	14.5	13.75	0.00
C	17.5	20	18.75	21.5	21	23.5	22.25	3.50
D	13.5	11	12.25	12	13.5	12.5	13	0.75
E	22.5	20	21.25	24	25	24.5	24.75	3.50
F	8.5	11	9.75	9.5	11	15	13	3.25
G	23	20	21.5	25	23	25	24	2.50
H	18.5	17.5	18	19	21.5	24	22.75	4.75
Average	16.50	15.94	16.22	17.56	18.75	20.06	19.41	3.19
Quizzes 1 + 2	Mean =16.22	SD = 4.30						
Quizzes 3 + 4	Mean =19.41	SD = 5.19						
T-Test	P=0.01	<.05						

However, it can be argued that the differences in the vocabulary scores of the quizzes in Class 2 could be due to other factors, such as the difficulty levels of the characters used in specific quizzes. In order to provide the baseline for a valid comparison, the vocabulary scores for students in Class 1 were also calculated. A similar comparison was made between the average vocabulary scores of Quizzes 1+2 and the average vocabulary scores of Quizzes 4+5. Table 2 summarizes the result.

Table 2
Vocabulary Scores of Class 1

Student	Quiz 1	Quiz 2	Quizzes 1+2	Quiz 3	Quiz 4	Quiz 5	Quizzes 4+5	Gain
A	17.5	15.5	16.5	18	16	16.5	16.25	-0.25
B	13.5	15.5	14.5	12.5	15	14.5	14.75	0.25
C	19	20	19.5	21.5	19.5	20.5	20	0.50
D	15.5	13	14.25	12	13.5	12.5	13	-1.25
E	22.5	21	21.75	23	24	25	24.5	2.75
F	11	12	11.5	9.5	11	15	13	1.50
G	18	17.5	17.75	16	19	16.5	17.75	0.00
H	23.5	20	21.75	22	21	24	22.5	0.75
I	22	25	23.5	24.5	21	23	22	-1.50
J	10	9	9.5	11.5	10.5	12	11.25	1.75
Average	17.56	16.81	17.19	16.81	17.38	18.06	17.72	0.53
Quizzes 1 + 2	Mean =17.19	SD = 4.65						
Quizzes 3 + 4	Mean =17.72	SD = 4.59						
T-Test	P=0.31	>.05						

According to Table 2, there is no statistically significant difference in the average vocabulary scores between Quizzes 1+2 and Quizzes 4+5 for Class 1. The T-test yields a P-value of 0.31, which is much bigger than .05, the preset value to reject the null hypothesis. Therefore, we can claim that the vocabulary quizzes in the study were comparable to one another in terms of difficulty levels. In other words, the improvement observed in Class 2 should be due to the intervention used in the study, that is, the Memrise project.

A close examination also reveals that while the average vocabulary scores of Quizzes 1+2 were higher for students in Class 1, the average vocabulary scores of Quizzes 4+5 were higher for students in Class 2 to the contrary. As Table 3 indicates, even though the statistical analysis does not yield a significant difference between these two groups of students in their vocabulary scores, the reverse pattern was striking and worth noticing.

Table 3
Comparisons between Class 1 and Class 2 in Scores of Quizzes 1+2 and Quizzes 4+5

	Class 1		Class 2	
	Quizzes 1 & 2	Quizzes 3 & 4	Quizzes 1 & 2	Quizzes 3 & 4
Mean	17.19	17.72	16.22	19.41
T-Test	0.70	0.43	>.05	>.05

Overall, the results of the study indicate that the use of Memrise did help students in Class 2 significantly improve their vocabulary scores in the quizzes they took for the class.

Students' Actual Experiences with Memrise

The researcher conducted an interview with each individual student in Class 2, concerning the way they used Memrise, their attitude towards Memrise and the features of Memrise that they liked. The purpose of the interviews was to seek answers to Research Question B “How do students use Memrise to learn Chinese characters?”, Research Questions C “What is the attitude of students towards the use of Memrise in general?”, and Research Question D “What specific features of Memrise do students like?”. This section reports the findings of the interviews.

How did students use Memrise to learn Chinese characters?

In the experimental class, students were asked by the professor to spend at least 15 minutes each day on Memrise. How much time did students actually spend on Memrise each day? According to students' self reports, four students spent up to 30 minutes, three students up to 15 minutes and one student up to an hour. See Table 4 below.

Table 4
How much time did students spend on Memrise each day?

Up to 15 minutes	3	38%
Up to 30 minutes	4	50%
Up to 1 hour	1	13%
Up to 2 hour	0	0%
More than 2 hour	0	0%

Memrise can be used on multiple platforms, including desktop computers, laptop computers, iPads and smartphones. What devices did students use Memrise on in this study? Figure 1 shows that 7 students used the laptop, 5 students used the smartphone, 3 students used the desktop computer and 2 students used the iPad.

As we know, Memrise is a crowdsourcing tool, which encourages users to create Mems and to share them with the community. Then how many Mems did students in this class create? From Table 5, we learn that three students did not create any Mems. The other 5 students created at least one, whereas three students created 3 or more and one student created 6 or more. As we can tell, the participation rate varied greatly among students in this class. Most Mems created by students used images or a combination of images and texts. Figure 2 shows two sample Mems created by students in this class. The Mems created by the community at large also included animated gifs and videos. Students could choose any Mems available or change them any time they wanted.

Figure 1 What devices did students use Memrise on?

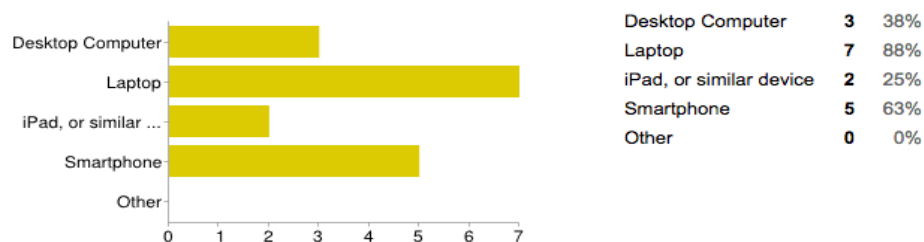
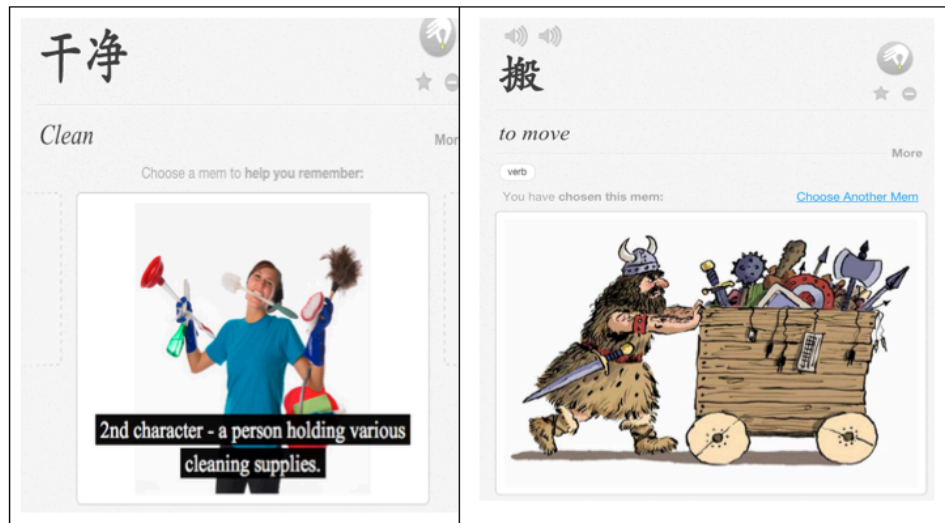


Table 5
How many Mems did students create?

0	3	38%
1	1	13%
2	1	13%
3	1	13%
4	1	13%
5	0	0%
6 or more	1	13%

Figure 2 Sample Mems Created by Students



What was students' attitude towards the use of Memrise in general?

In general, students in this study had a positive attitude towards the use of Memrise, as indicated by Table 6 and Table 7. On a 5-point likert scale, the average score for the group was 4 when students were asked how much they liked the Memrise project. When students were asked how helpful was Memrise for their Chinese character learning, the average score for the group was 4.13. No students in the class said they did not like Memrise or it was not helpful for their Chinese character learning.

Table 6

How much did students like the Memrise project?

1 - Not at all	0	0%
2	0	0%
3	3	38%
4	2	25%
5 - Very much	3	38%

Table 7

How helpful was Memrise for Chinese character learning?

1 - Not at all	0	0%
2	0	0%
3	2	25%
4	3	38%
5 - Very much	3	38%

What were the specific features of Memrise that students liked?

In addition to the general positive student attitudes towards the use of Memrise, the interview also sought to identify the specific features of Memrise that students liked. According to the answers given by students in the interviews, the feature students liked the most was the use of Mems, especially those using animation gifs. Many students mentioned the crowdsourcing feature of Memrise as what they liked. They thought this made creating the word list easy and interesting. Several students mentioned the study reminder. If students used a smartphone or an iPad, they would get regular reminders for studying or reviewing words to make sure that they were “watered” and would keep “growing”. The pronunciation to go with the character was another feature that attracted students. Some students said that they liked the intermittent quizzes, which checked students’ progress and focused on what they missed for further reviews.

What experiences did students want to share with other users?

When asked what experiences they would like to share with other users, students overwhelmingly suggested using a smartphone. One student specifically mentioned that without a smartphone, it was a little bit inconvenient to use the program. Other suggestions included using it regularly and more often, and making good use of available time pockets. Several students mentioned that they either forgot to do it or did not have time to do it. One student specifically suggested that it would be great if Memrise could be used with passage reading and that it had more cultural content.

In-depth Studies of Selected Students

The researcher identified 4 students for a more in-depth study. Two students made the most gains, and the other two made the least gains on the vocabulary quizzes. The researcher wanted to know if any interesting patterns concerning the use of Memrise could be discovered from the interview data of these two pairs of students.

Student A was a female and made the most gains on the vocabulary quizzes. She got 15.5 on the first quiz, 13.5 on the second one, 16 on the third, 22 on the fourth and 21.5 on the fifth. Her average score of Quizzes 4+5 was 21.75, a 7.25 gain over her average score of 14.5 of Quizzes 1+2. Student A liked the Memrise project a lot (5), and thought it was very helpful (5). She spent up to an hour on Memrise each day and she used both her laptop computer and her iPhone for the project. This student also created the most Mems (6 or more) in the class. The suggestion she had for other users was to use it on your smartphone and use it regularly.

Student H was a male and was another top achiever. He got 18.5 on the first quiz, 17.5 on the second one, 19 on the third, 21.5 on the fourth and 24 on the fifth. His average score of Quizzes 4+5 was 22.75, a 4.25 gain over his average score of 18 of Quizzes 1+2. Student H also liked the Memrise project very much (5), and he thought it was very helpful (5). He spent up to 30 minutes every day on Memrise and he did the activities on his laptop and iPad. He created 4 Mems in this class. The suggestion he had for other users was that he wished that Memrise could be used with passage reading and that it had more cultural content.

Student B was a male, one of the low achievers in the study. He got 13 on the first quiz, 14.5 on the second one, 13.5 on the third, 13 on the fourth and 14.5 on the fifth. His average score of Quizzes 4+5 was 13.75, no gain over his average score of 13.75 of Quizzes 1+2. Student B said he liked the Memrise project at the OK level (3) and he also thought it was somewhat helpful (3). He spent up to 15 minutes every day on Memrise and he did the activities on his laptop and desktop computer. He did not create any Mems in this class. The comment he shared with other users was that he did not have a smartphone and it was a little bit inconvenient to use it on computers.

Student D was a male, another low achiever in the study. He got 13.5 on the first quiz, 11 on the second one, 12 on the third, 13.5 on the fourth and 12.5 on the fifth. His average score of Quizzes 4+5 was 13, a 0.75 point gain over his

average score of 12.25 of Quizzes 1+2. Student D said he liked the Memrise project quite a lot (4) and he also thought it was quite helpful (4). He spent up to 30 minutes every day on Memrise and he used both his laptop and his smartphone for the project. He created one Mem in this class. The experience he shared with other users was that he wished he could use it more on his iPhone.

A careful analysis of the interview data from these four students reveals a few patterns. First, both top achievers had a very positive attitude towards the Memrise project and they both thought that Memrise was very helpful for their Chinese character learning. On the other hand, the attitude of the other two students was somewhat subdued. Second, both top achievers spent relatively more time on the project, one up to 30 minutes and one up to an hour per day. On the other hand, the other two students spent relatively less time, one up 15 minutes and the other up to 30 minutes. Third, the two top achievers were much more involved in creating Mems. One created 6 or more and the other created 4. By contrast, the other two students were much less involved. One did not create any Mem and the other created 1. The last pattern revealed is that both the top gainers used their mobile device regularly for the project whereas for the other two students, one did not have a smartphone and the other did not use his iPhone as often as he should for the project.

DISCUSSION

The findings of this study clearly demonstrate the effectiveness of Memrise in helping students learn Chinese characters. Students made significant improvement in the Chinese character recognition tests after they started using Memrise.

Overall, students had a positive attitude towards the Memrise project and believed the use of Memrise was helpful to their Chinese character learning. According to their own reports, on average, they spent up to 30 minutes on Memrise daily. They used Memrise on a variety of devices, including desktop computers, laptop computers, iPads or similar devices, and smartphones, but they used laptop computers and mobile devices the most.

It seems that there are multiple reasons to explain the effectiveness of Memrise in helping students learn Chinese characters. First, the technology used in Memrise is apparently working and producing results. The Mems, the crowdsourcing feature, the mini quizzes, the spaced repetition study reminders,

and the pronunciation are all technology features students like about Memrise. Second, the positive attitude and increased motivation of students should also play a role. Third, the regular use of the program and committed time spent on the project are apparently important. And fourth, to be able to use Memrise on mobile devices has added flexibility and convenience to learning.

The comparison between the two top achievers and the two low achievers in the more in-depth study also confirms the above explanations. Both top achievers used Memrise on their mobile device regularly. Since the study reminders are only available to mobile devices, not being able to use Memrise on mobile devices means losing important advantages like that. Also, in addition to having a more positive attitude towards Memrise and spending more time on the project, both top achievers were much more involved in creating and sharing Mems. This finding corroborates the findings of other studies (e.g. Kuo & Hooper, 2004; Loucky, 2006) that the more effort a learner puts into figuring out a meaning of a word and the way to retain it, the more likely it is to be remembered.

The findings of this study have clear practical implications for foreign and second language vocabulary learning and teaching. A few pedagogical suggestions for language teachers would be:

1. The use of Memrise or similar programs should be promoted in language classes for intentional vocabulary learning. This will be particularly helpful for non-alphabetic languages such as Chinese.
2. In order to achieve a better result, teachers should play an active role in making sure students have a positive attitude towards the activity, use the program regularly, and commit time and effort for the project.
3. The use of mobile devices for the program should be encouraged and promoted.
4. Creating and sharing Mems or other resources should be encouraged and promoted. Many students in the study listed the crowdsourcing feature of the program, i.e., the feature that allows users to create and share Mems, as one of the features they liked the most. They indicated that being able to create and share Mems saved them time, and made vocabulary learning more effective, interesting and engaging. By nature, the Memrise project is a collaborative project that encourages group members to contribute and share. This should help learners involved build a more connected learning community and develop a stronger sense of ownership over what they learn.

CONCLUSION

The findings of this study have shown the effectiveness of Memrise in helping students learn Chinese characters. Important factors and conditions for the successful implementation of the Memrise Project have been identified and examined. They include the effective and attractive technology features of the Memrise program itself, the positive attitude and increased motivation on the part of the students, the committed and regular practice with the program and the use of mobile devices. It is the hope of the researcher that language teachers can benefit from the findings of this study and will be particularly encouraged to use Memrise or other similar programs in teaching Chinese characters or vocabulary in any other languages.

LIMITATIONS AND FUTURE RESEARCH

This study spanned over two academic years and involved two classes. Even though we have high confidence in the validity of the findings, the relatively small sample size may still pose a concern. The same study can be repeated in the future to further verify the findings.

It was noted that in the current study, the teacher played an active role in making sure students would have a positive attitude towards the program, use it regularly, and commit time and efforts for the project. Future studies can further define and examine the role the teacher can play in this aspect. Future research should also look into ways to motivate students to use this kind of technology on their own voluntarily and to develop a strong sense of community and ownership in a collaborative and crowd-sourced learning environment.

ABOUT THE AUTHOR

Dr. Jianxiong Wu serves on the faculty of Southern Connecticut State University. He is Director of the Foreign Language Lab in the Department of World Languages and Literatures, and teaching language, culture and technology courses. His research interests include technology-enhanced language teaching and learning, digital literacy development, mobile and web-based learning, and pedagogy innovation with technology.

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