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The Application of Multimedia Strategies for Learning Chinese Characters

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Abstract: The purpose of this study was to examine the effects of multimedia instructional strategies on foreign novices' learning performance and cognitive load in learning Chinese characters. Two types of multimedia strategies, including visual-cue (ViS) and voice-cue (VoS), and two types of practice, including visual-cue (ViP) and voice-cue (VoP), were employed in the experimental instruction. Participants were 109 foreign novices and were randomly assigned to one of the four experimental groups. The results showed that the VoS –VoP learners performed better than their counterparts in Chinese character stroke and writing.
Keywords: Multimedia learning, Language learning, Instructional strategy

1. Introduction

In recent years, learning Chinese has become a pervasive need in the western societies. Accordingly, research on learning Chinese for non-native novices has been focused by researchers. With the increasing usage of information technology, the application of multimedia technology in learning Chinese has been a trend. Due to the fact that Chinese characters are the basic subjects for beginners, identifying Chinese characters and comprehending the meanings of Chinese characters has become a critical and also the very first learning task for foreign novices. However, each Chinese character just looks like a picture for foreign learners and it is hard for them to memorize the strokes and meaning of a Chinese character. According to the dual-coding theory [1], representing information, such as Chinese characters, with visual and verbal codes can enhance leaning performance. In light of these concerns, the purpose of this study was to examine the effects of type of multimedia strategy on foreign novices' learning of identifying Chinese characters and comprehending the meanings of Chinese characters.

2 Literature Review

2.1 Learning Chinese Characters

Chinese characters were developed by drawing pictures of objects' shape and form without their sound [2], and were known as picture-shaped words. Unlike alphabetic language system, Chinese characters have five main structures, including shape, radical, stokes, sound and meaning [3], [4]. Therefore, there are two challenges for non-native learners to learn Chinese characters, the first challenge is the complexity of the graphic configuration of Chinese characters and the other is the lack of obvious sound-script correspondence [4]. Therefore, for novices, Chinese characters are considered one of the most challenging languages to learn due to its graphical character nature [3]. Furthermore, Kuo and Hooper [2] pointed that in traditional Chinese language teachers often ignored the unique visual and verbal information of Chinese characters which always confuses non-native novices. Moreover, there have been many studies conducted the impact of cognitive processing on

character learning and there is evidence that providing visual cues for recall results in better performance [3]. Thus, it was important for Chinese language teachers to employ suitable teaching methods and learning strategies for non-native novices to learning Chinese characters better.

According to Shen's research [4], the most heavily used strategies are orthographic-knowledge-based strategies which making use of the three aspects of radical knowledge, including graphemics, semantics and phonetics. In this way, foreign learners could use the three aspects of radical knowledge as cues to encode characters and transform to their cognitive progresses. Taft and Chung [5] mentioned that emphasizing the radical structure at the time when learners encountered firstly is the most effective way to link the relationship of character and radicals. In addition, well-designed multimedia was suggested to be beneficial to novices [6]. Therefore, in the very beginning of learning Chinese language, multimedia has the potentiality to serve as a means of delivering the radical information of Chinese characters and, at the same time, providing rich cues for novices to link the relationship of character and radicals.

2.2 Multimedia Theory

The dual-coding theory referred to two parts of people's mental structure and information processing: verbal system and nonverbal system [1], [7]. The two systems construct verbal and picture representations separately. Therefore, the individual did encode when receiving information from sense organ with both of two systems. It was just like what Mayer and Moreno [8] cited that receiving words and pictures at the same time had better effect and encoded and store into long term memory more easily. Mayer and Moreno [9] mentioned that Multimedia instructions enhanced learning with presenting words and pictures, since multimedia attracted learners' attention. Therefore, Multimedia instructions applied words, pictures, sounds, videos, animations and so on to transmit contents to enhance the learning effect [10]. Moreover, multimedia instructions provided learners with making meaningful hyperlink to the contents. The principles which were offered by Meyer and Moreno [8] were: multimedia principle, spatial contiguity principle, temporal contiguity principle, coherence principle, modality principle, redundancy principle and personalization principle.

3 Methods

The participants were 81 Caucasian non-native novices who were new students of a mandarin training center located in Taipei, Taiwan. The participants had studied Chinese for less than two months. Two types of multimedia strategies were implemented in the instructional presentation, including character-radical-highlighted strategy (CRH) and character-stroke-sound strategy (CSS). Moreover, two types of multimedia strategies, including visual-cue (ViC) and voice-cue (VoC), were implemented in the practice session. Participants were randomly assigned to one of the four experimental groups.

An Internet-based e-learning course on learning "the Chinese character basics" was implemented and delivered using a Moodle platform. The experimental instruction consisted of three learning units, and each unit was designed for 2-hour self-paced learning. The content knowledge of the experimental instruction included (a) the 18 Chinese character strokes, (b) the formation of Chinese characters and (c) the 20 common Chinese

character radicals with 160 corresponding Chinese characters consisting of the common radicals.

3.1 The Chinese Characters Test

The purpose of the Chinese character test is a multiple-choice test consisting 25 questions designed to assess the participants' beginning behavior and prior knowledge of Chinese characters. Each question was 1 point and total scores were 25 points. The test was developed by the researchers and examined by the experts. The reliability coefficient were Cronbach's $\alpha = .878$.

3.2 The Multimedia Chinese Characters Instruction

The multimedia Chinese characters instruction was developed by the researchers and examined by the experts. According to the two types of multimedia strategies (ViS and VoS) and two types of practice (ViP and VoP), the multimedia Chinese characters instruction was divided to four groups. Participants were randomly assigned to four groups. Table 1 showed the design of four groups:

Table 1: Introduction of multimedia instruction

Group	Types of multimedia strategies	Types of practice	Instructional features
1	visual-cue (ViS)	visual-cue (ViP)	Teaching components highlighted in red and exercise with components highlighted in red.
2	visual-cue (ViS)	voice-cue (VoP)	Teaching components highlighted in red and exercise with components sounded.
3	voice-cue (VoS)	visual-cue (ViP)	Teaching components with sound on strokes and exercise with components highlighted in red.
4	voice-cue (VoS)	voice-cue (VoP)	Teaching components with sound on strokes and exercise with components sounded.

3.2.1 Visual cue strategy (ViS) vs. Voice cue strategy (VoS)

The program spoke the sound of the character and the character's components in red while other strokes in black to be distinguished (see Figure 1). The system spoke the sound of the character firstly, and then spoke the sounds of every stroke (see Figure 2).

Figure 1. Visual cue strategies (ViS)

Figure 2. Sound on strokes strategies (VoS).

3.2.3 Visual cue of practice (ViP) vs. Voice cue of practice (VoP)

The practice program with visual-cue was given to learners after learners completed the Chinese characters courses. First the system showed the whole character, spoke the sound after learners pressed the button, and then showed the flash animation (see Figure 3). The practice program with voice-cue spoke the sound of the character, and then spoke the sound of each stroke with showing each stroke. The system stopped when the whole character was presented (see Figure 4).

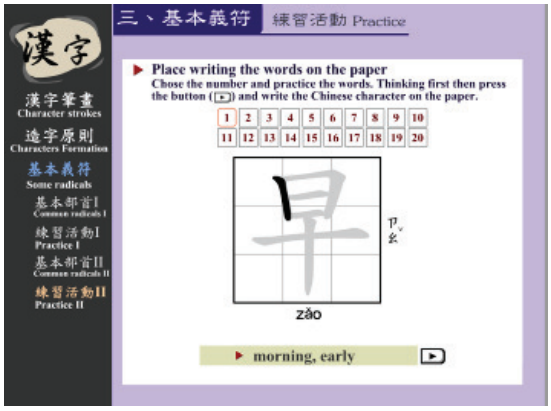

Figure 3. Visual cue of practice (ViP)

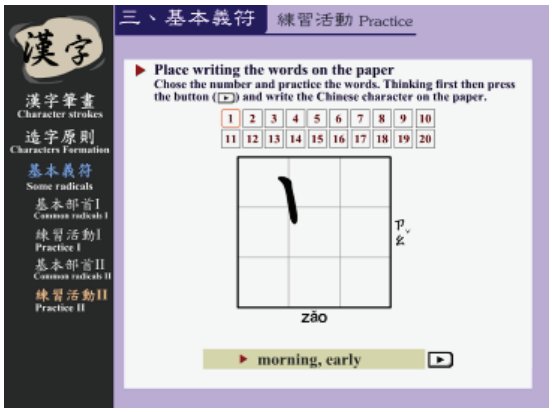

Figure 4. Voice cue of practice (VoP)

3.3 The Chinese Characters Performance Test

The Chinese characters performance test was given to students after they completed the multimedia Chinese characters instruction. The test was designed as a paper-and pencil test to access students' performance on three parts: (a) Chinese characters' strokes, (b) Chinese characters' components, and (c) Chinese characters' writing. The total questions were 30, each question was 1 point, and total scores were 30 points. The reliability coefficient were Cronbach's $\alpha = .885$.

4 Results

4.1 Analysis of Learning Performance

In order to understand the learners' learning performance on Chinese characters under different types of multimedia strategies and practice, the study used the MANCONA to analyze the learning performance on three parts: (a) characters' strokes, (b) characters' components, and (c) characters' writing. The MANCONA summary of learning performance on learning Chinese characters was shown in Table 2.

The MANCONA indicates a significant interaction for characters strokes ($F_{(1,76)} = 11.502$, $p = .001$) and for characters writing ($F_{(1,76)} = 18.280$, $p < .001$). However, no significant interaction effect for characters components ($F_{(1,76)} = 11.502$, $p = .001$) was found. The main effects for characters components ($F_{(1,76)} = 6.109$, $p = .016$) showed a significant effect.

Therefore, it revealed that types of display had a significant effect for learning the characters components.

The interaction effect of multimedia strategies and practice on learning performance was shown in Figure 5. In learning characters' strokes, the group 4 (VoS-VoP) had better learning performance. Moreover, in learning characters' writing, the group 1 and group 4 had better learning performance.

Table 2 MANCOVA summary of learning performance on learning Chinese characters

Variables	Type of questions	Type III Sum of Squares	df	Mean Square	F	Sig.
The Chinese characters prior test	Characters' strokes	29.474	1	29.474	9.733*	.003
	Characters' components	28.996	1	28.996	14.501*	.000
	Characters' writing	287.830	1	287.830	75.559*	.000
Type of multimedia strategies	Characters' strokes	9.723	1	9.723	3.211	.077
	Characters' components	12.216	1	12.216	6.109*	.016
	Characters' writing	4.004	1	4.004	1.051	.309
Type of practice	Characters' strokes	.282	1	.282	.093	.761
	Characters' components	1.069	1	1.069	.534	.467
	Characters' writing	1.064	1	1.064	.279	.599
Type of multimedia strategies × Type of practice	Characters' strokes	34.833	1	34.833	11.502*	.001
	Characters' components	.228	1	.228	.114	.737
	Characters' writing	69.634	1	69.634	18.280*	.000
Error	Characters' strokes	230.155	76	3.028		
	Characters' components	151.967	76	2.000		
	Characters' writing	289.510	76	3.809		

*p< .05

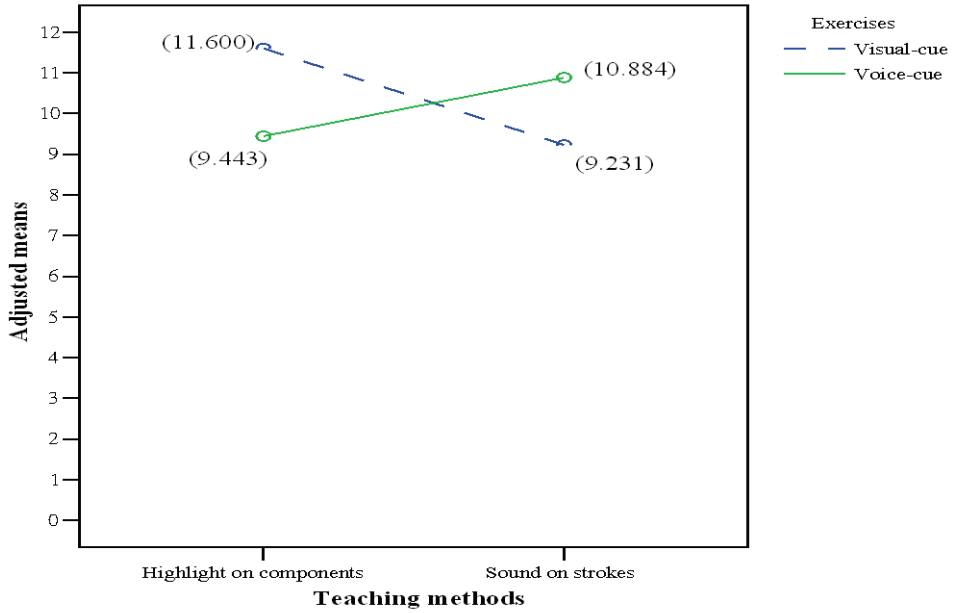

Figure 5. The interaction effect of the multimedia strategies and practice on learning performance in characters' writing

5 Conclusions and Suggestions

The findings of this study present two implications for the design of multimedia Chinese characters instruction. First, in the dimension of learning performance, learners of group 4 (VoS-VoP) had better learning performance in characters' strokes and writing. It implied

that VoS and VoP provided learners with necessary demand and inform the names of strokes at the proper time which could be easily memorized. Therefore, VoS and VoP supported learners' learning on strokes and writing. Second, it may imply that the application of VoS and VoP gave learners real-time information which mentioned how to write the whole characters with voice-cue of strokes [11]. The voice-cue may help learners became more focus on their learning on multimedia instruction and sustained their attention. Thus, learners resulted in better performance. In conclusion, the results suggested that multimedia instruction with voice presentation and practice (VoS and VoP) could enhance learners' learning performance on strokes and writing.

Acknowledgments

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