第二言語としての日本語の語彙習得

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Lexical Acquisition in Japanese as a Second Language:
The Effect of Visual and Written Mnemonic Cues on Memorization of Hiragana

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Abstract

This study investigated effective approaches in memorizing Japanese *hiragana* syllabaries, focusing on the effect of audio and visual aids. A total of twenty-four undergraduate students with no prior experience in studying Japanese participated in the study. Participants were randomly categorized into four different experimental groups: Control group (shown *hiragana* only), Group 1 (shown *hiragana* + associated image), Group 2 (shown *hiragana* + associated image + English mnemonic sentence), and Group 3 (shown *hiragana* + English mnemonic sentence). They received 15-minute memory training session that consisted of learning *hiragana* with or without study aids. Then they took the immediate posttest to assess how much they can recall *hiragana*. They were also given the delayed posttest a week after the experiment from the same procedure with the immediate posttest. Followings were hypothesized: 1) Visual cues will facilitate better recall of *hiragana* 2) English mnemonic cues will facilitate better recall of *hiragana*. 3) Having both visual and mnemonic cues will facilitate the best recall of *hiragana*. 4) Visual cues will facilitate better recall of *hiragana* than mnemonic cues.

Consistent with the existing theory; namely, Dual Coding Theory (DCT), the hypotheses 1, 2, and 3 were supported. The study results indicated that visual aids were better memorization tool than English mnemonic cues. Although the study results were in line with previous literature, no statistical significance among the four groups was found. Further analysis on the structure of individual *hiragana* syllabaries suggested that depending on the shapes and structures of *hiragana* syllabaries, students had easier or more difficult time memorizing the *hiragana*. These analyses suggested the potential for modifying Japanese language classroom instructions, so that students can most effectively learn *hiragana*.

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Many researchers have investigated effective ways to improve human memory. They have proposed various theories and strategies regarding memory, such as Dual Coding Theory, keyword mnemonic method, and word recognition. Moreover, those methods have been used in the fields of education, and language acquisition is one of them. Researchers and educators have examined closely the effect of those strategies, and suggested their role to be helpful in learning a foreign language. However, those studies were limited to languages that employ roman alphabets. Few studies have shown the effect of these learning strategies on languages that are orthographical, such as Japanese. Through examining the role of existing theories and strategies, the present study will contribute to the further development of language instruction in classrooms. Thus, the present study primarily focused on investigating the effectiveness of audio and visual aids on memorization of Japanese *hiragana*.

Dual Coding Theory

Paivio's (1986) Dual Coding Theory (DCT) has been widely accepted as a mainstream theory on human memory and cognition. DCT captured enormous attention from cognitive psychologists because of its systematic and objective approach to the study of imagery and its role in associative learning. Although early researchers recognized the importance of imagery on memory, studies were only sporadic and occasional at that time. Since the introduction of DCT, numerous researchers have conducted studies on memory, and the researchers continue to make reference to its theory.

Dual Coding Theory suggests that human memory consists of two subsystems: verbal and nonverbal. The verbal system stores linguistic information, whereas the nonverbal system stores visual or imagery information. Both systems are structurally distinct and function independently from each other (Vekiri, 2002). Although the two systems are distinct, when they are correspondent to the same object, they can have an additive effect on recall, forming associative connections between the verbal and visual representations (Paivio, 1991; Vekiri, 2002). For example, one can make a connection between the word dog (verbal information) and an image of a dog (visual information). Therefore, when hearing the word dog, the mental image of a dog can be formulated, encoded, and stored to memory as one set of information. Based on this hypothesis, Paivio (1992) stated that both verbal and nonverbal information are effective in distinctive encoding, and they promote efficient retrieval from memory. In addition, information is stored and retrieved more effectively when it has both verbal and nonverbal codes than when it is single coded (Paivio, 1975). This is because when one code is lost or cannot be used, the other code that is available can still be used (Kuo & Hooper, 2004).

Furthermore, DCT also suggests that concrete words are better recalled than abstract words (Paivio and Clerk, 1999). Concrete words are ones that evoke images more easily than abstract words. In previous example, a noun tree is a concrete word because one can picture an image of tree in his or her mind. Based on their classic experiments, the researchers concluded

that concreteness of a word had a positive effect on memorization of a new word (Paivio, 1963; Paivio, 1965).

Keyword Mnemonic

In learning a foreign language, one of the challenges that most language learners face is vocabulary learning, in other words, lexical acquisition. Numerous researchers have investigated effective methods for lexical acquisition. The keyword mnemonic method, for example, has been widely recognized and used as an effective method for learning vocabulary, since it was first introduced by Atkinson and Raugh in1975.

In keyword method, one aspect of a word becomes a cue to the sound of the foreign word. In other words, when the meaning or the sound of the foreign word is given, "it acts as cue to recall the image, which, in turn, cues recall of the other aspect" (Fritz et al., 2006, p. 500). A learner first identifies a keyword in first language (L1) that is phonetically similar to the foreign word. Then the learner establishes a visual association between the L1 keyword and the foreign word (Campos, Amor, & Gonzalez, 2004). Researchers suggested that when the learners generate mental image on their own, the information becomes more memorable because the image creates association between the sound and its meaning (Fritz et al, 2006).

Although many researchers have claimed the effectiveness of the keyword method, its long term effect has been questioned. Wang et al. (1999) claimed that the effect of the keyword method is only temporal. The effectiveness of the keyword method, therefore, depends upon the quality of the keyword images (Beaton et al., 2005; Ellis & Beaton, 1993). The researchers suggested that "both receptive and productive learning were facilitated by the keyword mnemonic, but only when good images were formed by the learner" (p. 500). Furthermore, recent research by Campos et al. (2004) investigated the difference in recall between self-generated and peer-generated mnemonics group. In peer generated mnemonics group, subjects were given mnemonics given by the experimenters. They suggested that peer-generated mnemonics group had better recall both in short-term and long-term. Consequently, although the keyword method is an effective method for lexical acquisition, it requires learners to have a great amount of creativity to produce appropriate images for certain words, thus making it difficult for them to have any long-term effect of the method.

Word Recognition

Many researchers suggested that word recognition is also one of the more basic and critical processes in language learning, and they found a direct correlation between reading ability and word recognition skills from children to adults (Cunningham, Stanovich, & Wilson, 1990; Stanovich, 1982, 1991a, 1991b). Other researchers have suggested that word recognition also plays an important role in second language learning. They claimed that word recognition skills were essential in second language reading (Chikamatsu, 2003; Grabe, 1991; Haynes & Carr, 1990; Koda, 1992, 1994, 1996). However, the process by which a learner develops second language word recognition has not been researched entirely because the previous studies concerning word recognition skills focused mainly on English as either a first or second language and other Indo-European languages (Chikamatsu, 2006).

For the users of alphabetical languages, one of the challenges they face is to familiarize themselves to the new writing system, and to effectively memorize unfamiliar characters. Wang, Liu, and Perfetti (2004) expressed the difficulty for second language learners in Chinese. Because Chinese has high orthographic complexity in its writing system, learners often find it very difficult to learn and memorize how to read and write. Harris and Hatano (1999), for example, stated that depending on the writing systems and teaching methods, reading process may differ considerably.

To investigate the effective approaches to learning Chinese characters, Kuo and Hoper (2002) studied 92 high school students, using different types of instruction. The researchers randomly categorized students into five treatment groups: translation, verbal mnemonics, visual mnemonics, dual coding mnemonics, or self-generated mnemonics. Students in each group were asked to memorize 30 Chinese characters that appeared on the computer screen, then to take a posttest to measure the ability to recognize the characters. The posttest scores suggested that students in the self-generated mnemonics group had higher posttest scores, although statistically not significant. Based on the findings, the researchers concluded that generating one's own association between a symbol and its meaning was an effective strategy to memorize Chinese characters. However, the researchers posed a question regarding instructional efficiency, stating that the self-generation group tool significantly longer time than other groups. Thus, they suggested that future studies should explore the effectiveness of self-generated mnemonics in actual classroom settings.

Japanese Language

In recent years, interest in learning non-alphabetical languages as a second language (L2) has grown rapidly. Japanese is one of the languages that are non-alphabetical and employ highly complex writing system. In contrast to other alphabetical languages, such as English, Japanese has three different types of writing system with two types of syllabic *kana* characters (*hiragana* and *katakana*) and characters that originate from Chinese characters (*kanji*). (Chikamatsu, 2006; Koyama, Hansen, & Stein, 2008). Each *kana* symbol or letter represents one mora, a representation of syllabic unit of sound with a vowel and a consonant. *Hiragana* consists of 46 characters and is used primarily for grammatical or function words, inflectional endings, and for some content words. *Katakana* also consists of 46 characters with the same syllabic sound, and is used to write loan words (the words taken mainly from Western languages) onomatopoeic expressions, and scientific terms (Hatasa, 2002, Koyama, Hansen, & Stein, 2008).

At elementary schools in Japan, children are introduced to *hiragana* and *katakana* in their first grade. Because *kana* is highly orthographic, Japanese children learn *kana* reading quickly even before formal education, although kana writing is not acquired as fast compared to its reading (Shimamura & Mikami, 1994). Similarly, at undergraduate language classes, learners of Japanese as L2 are usually introduced to both *hiragana* and *katakana* in their first week of instruction, and they are extensively used in writing and reading materials in class (Chikamatsu, 2006). Then the learners are introduced to another writing system *kanji*, a logographic system used primarily for content words.

Word Recognition in Japanese

To investigate word recognition skills in Japanese as a second language, Chikamatsu (2006) focused on college students who studied Japanese with their first language in English. The researcher compared two experimental groups of different Japanese proficiency levels (Japanese 102 and 202, second semester of first- and second year Japanese). The lexical judgment of *hiragana* and *katakana* was tested. The participants were shown a series of visually familiar and unfamiliar words both in *hiragana* and *katakana* on the computer screen and asked to answer by pushing the keyboard button if they recognized them as Japanese words. As predicted, the results suggested that the group of students with higher proficiency level demonstrated faster response speed. Moreover, lower proficiency students showed slower response time with unfamiliar words. The researcher concluded that the differences in response time occurred because word recognition skills are developmental; higher proficiency level students had more developed word recognition skills than lower proficiency students.

Present Study

Using pictorial mnemonics and audio aids, the present study aimed to investigate the effect of audio and visual aids on the lexical acquisition of Japanese *hiragana* as a second language. Many studies, including Paivio's Dual Coding Theory, have suggested that both visual and audio aids help foreign language learners develop their lexical memory through associative learning. More specifically, the keyword mnemonic method is one of the more effective strategies in language learning. In particular, Kuo et al. (2002) suggested that this method is effective for learning Chinese characters. In addition, Chikamatsu (2006) argued word recognition as one of the more essential skills in acquiring a second language. Although these studies provided insights into the effective strategies for learning a foreign language, more study of effective strategies at the very beginning of language learning is still needed. Thus, the present study focuses on learners with no previous Japanese language experience.

Method

Participants and Settings

The present study was conducted at Soka University of America, Aliso Viejo. A total of 24 undergraduate full-time students participated in the study. Based on snowballing procedures, participants were limited to and selected from those with no experience in Japanese language: 9 freshmen (37.5%), 8 sophomores (33%), 5 juniors (20%), and 2 seniors (8%). Of the participants, 16 were female (66.6%) and 8 were male (33.3%). Participants' ages ranged from 18 years old to 24 years old. English was the first language of 16 students (66%), and 3 students (12%) listed 2 or more languages as their first language. Demographic data, such as sex, age, first language(s), and language learning experiences, were collected for analysis purposes (see Table 1).

Potential participants were notified about the study through e-mail with an explanation of the purpose of the study (see Appendix F). They were asked to respond if they were willing to participate in the experiment and to schedule dates for the experiment. When scheduling

appointments, the researcher confirmed with participants that they had no experience with the Japanese language. They were told that participation was voluntary and that they could stop participating at any time. Data from participants were treated confidentially and stored on a drive to which only the researcher had access.

Procedure

Treatment. The experiment was conducted in a printer room of one of the university dormitories. The experiment consisted of two parts: 1) *hiragana* memorization training and immediate posttest and 2) delayed posttest one week after the treatment. Both treatment and posttests were conducted individually to protect participants' confidentiality. Each participant signed an informed consent form, which described the purpose of the study. Participants were randomly categorized into four experimental groups (one control group and three treatment groups) according to the order that they came in to the room. They were notified of the group they belonged to after they took the delayed posttest. Participants who completed the first session (*hiragana* memorization and immediate posttest) were entered in a raffle for a $5 Subway gift certificate. Participants who completed both sessions (memorization and immediate posttest & delayed posttest) were entered in a raffle for another $5 Subway gift certificate.

In every experimental group, participants memorized and recalled 10 *hiragana* in total. The researcher pronounced each *hiragana* and/or English sentence out loud, and participants were asked to repeat after the researcher.

Control group: Participants were shown each *hiragana* syllabary. The researcher pronounced each *hiragana*, and participants repeated it. The researcher demonstrated the stroke of the *hiragana*.

Group 1: Participants were shown each *hiragana* syllabary and an image associated with the shape of *hiragana* (see appendix A for the detailed picture). The researcher pronounced each *hiragana*, and participants repeated it, but no explanation of the image was given to encourage participants to generate association between the shape of the *hiragana* and the image. The researcher demonstrated the stroke of the *hiragana*.

Group 2: Participants were shown each *hiragana*, an image associated with the shape of *hiragana*, and an English sentence (see Appendix A for detailed sentences) associated both with the image and the pronunciation of the *hiragana*. The researcher pronounced each *hiragana*, and participants repeated it. The researcher demonstrated the stroke of the *hiragana*.

Group 3: Participants were shown each *hiragana* and an English sentence associated with the pronunciation of *hiragana*. The researcher pronounced each *hiragana*, and participants repeated it. The researcher demonstrated the stroke of the *hiragana*.

Immediate Posttest. After the treatment, participants took an immediate posttest. The posttest was intended to examine whether the participants could recall *hiragana* immediately after they received the treatment. The posttest sheet consisted of multiple choice items. The researcher read the directions out loud and then asked participants to answer 10 questions. Participants first listened to the researcher pronounce each *hiragana* and then selected corresponding answers.

Delayed Posttest. One week after the treatment, participants took a delayed posttest individually in the printer room where the experiment took place. The delayed posttest was administered with the same testing strategy used in the immediate posttest, but the order of the multiple choice items was shuffled. The researcher examined possible differences among four treatment groups. The number of correct answers was used as a dependent variable. The data were collected and then coded confidentially.

Materials. In the treatment, the researcher employed instruction materials from the book *Kana Can Be Easy* (Ogawa, 1992). The book is used in various Japanese language classrooms throughout the United States. It introduces pictorial mnemonics, in which the shapes of the *hiragana* syllabaries are associated with different images, and the pronunciations of *hiragana* are associated with English words and sentences (See Appendix A for detailed examples). Before participants memorized *hiragana,* the explanation of the specific instruction of the immediate posttest was provided. When presenting *hiragana* syllabaries, the researcher employed the automated PowerPoint presentation slides because the original book did not allow the researcher to have only image or only English sentence on a page for one *hiragana*. Moreover, PowerPoint slides made it more convenient to time and demonstrate the stroke for each *hiragana*. Each slide consisted of one *hiragana*, and an image, an English sentence, or both, depending on the group. Slides were automated to move to the next slide after 30 seconds.

Hypotheses

Based on previous research, the researcher hypothesized the followings. **Hypothesis I**: Students who are provided with visual aids (Group 1) will memorize and recall Japanese *hiragana* better than those who are not. **Hypothesis II**: Students who are provided with both audio and visual aids (Group 2) will memorize and recall *hiragana* significantly better than those who are not, and students in this group will have the highest recall score. **Hypothesis III**: Students who are provided with audio aids (Group 3) will memorize and recall Japanese *hiragana* significantly better than those who are not.

Hypotheses I, II, and III are expected to be consistent with the results obtained by previous literature. In addition, to compare the effectiveness of oral and visual aids, the following was hypothesized. **Hypothesis IV**: Students who are provided with visual aids will remember Japanese *hiragana* better than those who are provided with audio aids.

Results

To test the hypotheses, the analysis of variance (one-way ANOVA) was conducted to analyze both immediate and delayed posttest scores. Multiple-comparison tests were conducted using Turky's post hoc tests. For all analyses, the alpha level was set at 0.05. Table 4 describes the mean scores and standard deviation for the immediate and delayed posttests. The data suggested that there was no significance. N=24, F (3, 20) = .842 (p>0.05). Although statistically not significant, mean scores from each group were in line with hypotheses I, II, and III.

For the immediate posttest, the Control group had the lowest mean score (M=5.83), and Groups 1, 2, and 3 had higher mean scores than did the control group (M=7.33, 7.66, and 7.16).

Of all groups, Group 2 had the highest mean score. Mean differences from control groups were 1.5, 1.83, and 1.33, respectively. For the delayed posttest, Group 1 had the lowest mean score (M=3), and Group 2 had the highest mean score (M=5.16). The mean score for Control group was 4.33 and 4.4 for Group 3.

To investigate further the effectiveness of each instruction on individual *hiragana,* the Chi-Square test was conducted for the immediate posttest. Of 10 *hiragana*, 2 suggested statistical significance. For the *hiragana* わ (*wa)*, $\chi^2(3) = 9.90$ (p<0.05). The study's findings suggested that the instruction used for Group 1 (*hiragana* + image) was most effective among all groups for memorizing the *hiragana* わ (*wa*). For the *hiragana* い (*i*), $\chi^2(3) = 11.89$ (p<0.01). The results indicated that different instructions used in Groups 1, 2, and 3 were all effective for memorizing *hiragana* い (*i*). For other *hiragana* syllabaries, the study findings suggested that different instructions did not have any statistical significance. In other words, different types of instructions did not affect students' ability to memorize other *hiragana*.

Discussion

Although no statistical significance was found, the mean scores from each group marginally confirmed hypotheses I, II, and III. Students in Group 1 (*hiragana* + image) had higher mean scores than students in the Control group. Students in Group 2 (*hiragana* + image + English sentence) had the highest posttest scores among students in all groups. Students in Group 3 (*hiragana* + English sentence) had higher mean scores than students in the Control group. Hypothesis IV was also marginally confirmed. Students in Groups 1 and 2 had higher mean scores than students in Group 3, which suggested that visual aids used in Groups 1 and 2 were more effective memorization tools for *hiragana* than were the audio aids in Group 3.

The Chi-Square test was conducted to investigate which instruction was most effective in memorization of individual *hiragana*. Analysis indicated that for specific *hiragana*, instruction based on visual aids was most suitable, yet for others, any type of instruction was effective. In particular, the analysis of the results for *hiragana* わ (*wa*) and い (*i*) were statistically significant. In the case of *hiragana* わ (*wa*), compared with other groups, Group 1 had higher mean scores in memorizing and recalling *hiragana*, which suggested that visual aids used in Group 1 were most helpful. The effectiveness of visual aids resulted from the fact that participants had to self-generalize the association between the *hiragana* and an image associated with it (Kuo & Hooper, 2004). Participants were told by the researcher to generate their own association between *hiragana* and an image. As a result, participants' lexical memory was strengthened, which resulted in more effective recalling. The effectiveness of self-generation was consistent with the study by Kuo et al. (2002). For the *hiragana* い (*i*), the data indicated that any type of instruction was effective. More specifically, when participants were shown visual, audio, or both aids (Group 1, 2, and 3), they scored significantly higher in posttests than those who were not shown those aids (Control group). Consequently, this result suggested that for *hiragana* い (*i*), any type of instruction was effective.

Based on the mean scores, the researcher analyzed how each *hiragana* was memorized (See Table 5). The mean scores suggested that for the four groups, those *hiragana* that were

simpler, less visually challenging, and had fewer strokes were recalled better. For example, い (*i*), し (*shi*), and の (*no*) had higher mean scores. Compared to other *hiragana* shown, such as な (*na*) and は (*ha*), the former *hiragana* have fewer strokes. Consequently, because they were not visually challenging, their shapers would be easier for participants to store their shapes in the lexical memory. These results indicated that depending on which *hiragana* is being taught, instructors of Japanese language need to modify the way they teach, so that students can learn *hiragana* in the most effective way.

Individual differences

Although hypotheses II (students who are provided with both audio and visual aids will memorize *hiragana* will memorize *hiragana* better than who are not) and IV (students who are provided with visual aids will memorize *hiragana* better than those who are provided with audio aids) in the present study were marginally confirmed based on the mean scores, the mean difference of the four groups was very small. This lack of statistical significance might have resulted from individual differences in language learning strategies. Although many studies, including DCT, have suggested that visual aids are one of the more effective ways of learning a foreign language, Vekiri (2002) argued that for some students, learning with visual aids "may be less efficient and even challenging" (p. 304). He indicated that students who have low visuospatial ability might have difficulty extracting the information from the graphics shown. In addition, to help those students who may have difficulty in learning with visual aids, Vekiri suggested that those aids should be accompanied by sufficient explanations. In the present study, for Group 1 (*hiragana* + visual image), the researcher did not explain how each image was connected to each *hiragana*. Therefore, although the researcher encouraged participants to associate *hiragana* with an image, this suggestion might not have been sufficient for some participants.

Moreover, contrary to the existing theories and all four hypotheses, Group 2 (*hiragana* + image + English sentence) did not claim statistical significance. This may be due to the excessive amount of information given to participants. Especially for the users of alphabetical languages, *hiragana* syllabaries might have been visually unfamiliar to them that they had to pay excessive attention to what was presented. Although images and English sentences were given to aid students in memorizing *hiragana*, they instead might have distracted the learners from effectively processing the information and memorizing *hiragana*. Veriki (2002) claimed that visual images are effective learning tools "only when they allow readers to interpret and integrate information with minimum cognitive processing" (p. 261). Therefore, not only visual aids, but also audio aids can inhibit students from effectively learning if those students find the aids distracting.

Although some researchers suggested that self-generated mnemonics have stronger long-term effects on memorization (Wang, Thomas, & Quellete 1992; Wang & Thomas, 1996), analysis of the present study did not claim statistical significance to confirm their results. In the present study, participants in Group 1 (*hiragana* + image) had to generate their own association between the *hiragana* and the image provided; however, of all groups, Group 1 had the lowest score in delayed posttest. Group 2 (*hiragana* + image + English sentence) and Group 3 (*hiragana* + English sentence) had the highest mean score. This research finding suggested that to obtain

long-term effects of *hiragana* memorization, audio aids might be more helpful than visual aids.

Limitations

Although various implications were possible from the present study, some factors contributed to the lack of statistical significance. One major limitation was sample size. The results of the present study were based on 24 participants, which was not a well-represented population of general population. Due to the small sample size, only 6 students were in each experimental group, which made the present study even harder to claim statistical significance. In addition, the demographics of the university might have contributed to the small sample size as well. Due to high number of Japanese speaking students at the university, although some students had never taken Japanese language classes, they already had familiarity with the Japanese language. In other cases, some students had prior experience in learning non-alphabetical languages, such as Chinese and Korean. Chinese and Korean, like Japanese, also contains highly orthographic style of writing. Therefore, although some students did not have any Japanese language experience, contact with other languages with similar orthographical structure contributed to improved memorization and scoring in the posttests.

Experimental error also might have contributed to the lack of statistical significance in the present study. To be consistent with the pictorial mnemonics and the English sentence, the researcher used a font that was similar to the one employed in the book *Kana Can Be Easy* for the *hiragana* memorization training. However, the *hiragana* font on the posttest sheets appeared to be slightly different from the one that was shown to the participants. For example, in the training, participants were shown *hiragana* な (*na*). However, on the posttests, they were shown な (*na*), a slightly different version from the first one. In the first version of this *hiragana*, the right-hand side of the lines are separated. However, those lines are connected in the latter version. Because of this error in the experiment, participants might have been confused. Although the difference seems insignificant to the native speaker of Japanese, it can be very different to those who are not familiar with orthographical characters.

Although these limitations might have contributed to the lack of statistical significance in the present study on the role of visual and audio aids in *hiragana* learning,, they offer implications for future studies. Based on the findings that prior language experiences in orthographical languages might be a confounding variable and might have affected the degree of *hiragana* memorization, future studies should identify students' language experiences and limit students to those with no experience in non-alphabetical languages. In addition, future research should utilize a larger sample size. Although small in size, the study found that visual aids better help students learn Japanese *hiragana* than no aids or audio aids. Therefore, with more participants, future studies will be able to obtain statistical significance.

In the present study, the slight difference in the font was overlooked because the researcher was a native speaker and was not aware of how these seemingly insignificant differences could affect the experiments. Although the degree to which the experimental error contributed to the results was not confirmed, it is worth noting that researchers studying instruction of orthographical

languages should always be aware that different styles of characters can influence the lexical memory of language learners. This is because researchers who are native speakers of the language they are investigating might assume students' learning processes to be the same as theirs. Thus, researchers of future studies should manipulate participants' language backgrounds, and pay very close attention to the materials that use specific characters shown and differences between them.

Educational implications

Paivio and Clerk (1991) stated that Dual coding theory and associated learning strategies associated, such as keyword mnemonics technique, have educational implications. They argued that keyword and other imagery elements in learning are important especially both in first and second language learning. Because of its relevance in new vocabulary learning, they suggested its importance to be integrated into a classroom environment. Although the present study did not claim the statistical significance in the role of imagery, the results suggested the potential use of these strategies in foreign language learning. Moreover, based on the results from the present study, the use of the book *Kana Can be Easy* was shown to be effective. Based on the confusion caused in font difference in the present study, some images and English sentences should be modified to improve the quality of the learning material. Authors should include the images and English sentence that are more concrete so that learners can effectively create mental image when memorizing the *hiragana*.

Consistent with the DCT and keyword mnemonic strategy, all four hypotheses were marginally confirmed, although not statistically significant. The lack of significance resulted from the limitations, including small sample size and experimental error. However, the present study offers insight into future studies. Future foreign language instructors should always be aware of the language background of their students. Furthermore, understanding the role of visual and audio aids will help educators develop effective theory-based instruction for students.

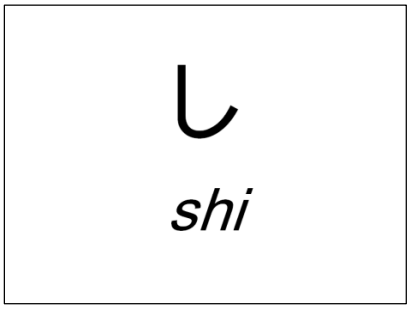
Appendix A

Group categorization

Control: *hiragana*
Group 1: *hiragana* + Image (Visual only)
Group 2: *hiragana* + Image + English sentence (Visual + Audio)
Group 3: *hiragana* + English sentence (Audio only)

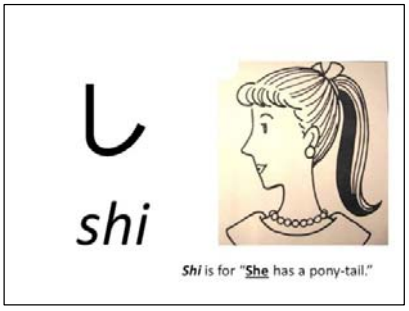
Sample materials for the treatment

Control Group (*hiragana* only)

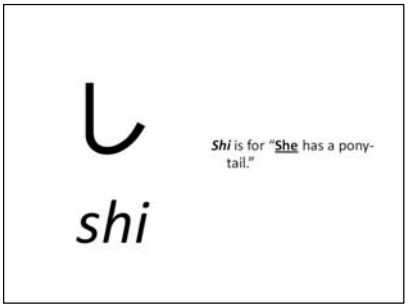


Group1 (*hiragana* + image)

Group2 (*hiragana* + image + English sentence)



Group 3 (*hiragana* + English sentence)



Appendix B

Mnemonic clues (English sentences)

English sentences that were used in the experiment (bold italicized words represent *hiragana* words, and bold underlined words/letters represent the oral clue associated with the *hiragana* pronunciation.)

Shi is for "**She** has a pony-tail."

Wa is a s**wa**n behind a stake.

Na is someone **kno**cking at the door.

I is two **ee**ls.

So is a zigzag **sew**ing stitch.

No is a **no** entry sign.

Ha is a **ho**ckey player sitting on a bench.

Nu is a **new** tricycle.

Se is to **say** "I love you!" on your boyfriend's lap.

Fu is Mt. **Fu**ji with a path down the middle.

Table 1

Demographic Information of Participants

		N	%
Sex			
	Female	16	66.6
	Male	8	33.3
Academic Level			
	Freshmen	9	37.5
	Sophomore	8	33
	Junior	5	20
	Senior	2	8

Table 2

Age

18	19	20	21	22	23	24
2	5	7	6	2	1	1

Table 3

Native Languages

English	16
Chinese	2
Korean	2
Spanish	2
Portuguese	2
Malay	1
Hindu	1
Urdu	1

Note. The sum of the number of the languages does not match with *N* because some participants indicated more than 2 languages as their native languages.

Table 4

Mean scores and Standard Deviation of each group for immediate and delayed posttest

		N	*M*		*SD*	
			Immediate	Delayed	Immediate	Delayed
Group						
	Control	6	5.83	4.33	2.639444	3.141
	Group 1	6	7.33	3.00	1.75119	1.000
	Group 2	6	7.66	5.16	1.861899	3.188
	Group 3	6	7.16	4.40	2.228602	2.449

Table 5

Mean scores for each *hiragana*

Group	1-わ	2-し	3-い	4-ぬ	5-せ	6-な	7-は	8-ふ	9-そ	10-の
Control	4	5	1	5	2	2	3	6	3	4
Group 1	6	4	5	2	5	3	4	6	3	6
Group 2	1	6	6	4	6	3	4	6	6	4
Group 3	2	6	5	5	4	2	5	5	3	6
Total Mean	3.3	5.3	4.3	4	4.3	2.5	4	5.8	3.8	3.33

Table 6

Results from the Chi-square test

Hiragana わ		Answers	
		0	1
Group	Control	2	4
	Group 1	0	6
	Group 2	5	1
	Group 3	4	2
Total		11	13

Hiragana い		Answers	
		0	1
Group	Control	5	1
	Group 1	1	5
	Group 2	0	6
	Group 3	1	5
Total		7	17

Note. The number 0 indicates that participants had a wrong answer. The number 1 indicates that participants had a correct answer.

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