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Utilizing Cognitive Illustration as a Kanji Memorization Strategy in Kanji Learning

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ABSTRACT

The study reports on the effect of 'Cognitive Illustration' in Kanji learning in the JFL setting. Cognitive illustration is not a formal concept that can be found regularly in Kanji teaching and learning methods. It is purposely used in this study to describe 'kinds of imagery that students have when they see or hear a Kanji character and its meaning by referring to its formation process, including pictographs (*shoukei moji*), simple ideographs (*shiji moji*), compound ideographs (*kai-i moji*), and phonetic-ideographic characters (*keisei moji*)'. Involving twenty-eight students taking a Kanji course, namely fifteen students participated in the experimental class and thirteen students participated in the control class, this experimental research observes the effect of cognitive illustration on students who learn hundreds and fifteen Kanji of Japanese Language Proficiency Test (JLPT) N5 or basic level. The results show that students in the experimental class perform better in Kanji memorization than those in the control groups. It can be seen from the *t*-test results with the *t*-score value obtained (11,38) which is much higher than the *t*-table, both at the 5% (2,06) and 1% (2,78) significance levels. In relation to Kanji learning, there are some factors that contribute to the enhancement of Kanji learning, including varying Kanji learning strategies, thorough guided instruction, and ordering Kanji strategies.

KEYWORDS

Cognitive Illustration; Cognitive Theory; Japanese as Foreign Language (JFL); Kanji; Memorization Strategy.

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INTRODUCTION

The study is concerned with 'cognitive illustration' in Kanji learning. In this study, the term 'cognitive illustration' refers to 'a kind of imagery students have when they see or hear a Kanji character and its meaning which involves its formation process, including pictographs (*shoukei moji*), simple ideographs (*shiji moji*), compound ideographs (*kai-i moji*), and phonetic-ideographic characters (*keisei moji*). Therefore, the term 'cognitive illustration' is used only within the scope of this study. Further, the study puts an emphasis on the effect of cognitive illustration on the students' understanding of the Kanji they learned, investigating to what extent the imagery process contributes to students' understanding of Kanji learning. The study is conducted because in Japanese language learning, Kanji is one of the most essential scripts to learn (Yuki, 2009). It is not only one of the characters used most frequently in modern text in Japanese (Inoue, Georgiou, & Parrila, 2022; Mori, 2003), but also, one of the most determining factors for Japanese language

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learners to measure their success in Japanese language learning, particularly in reading competence and written interaction (Leong & Tamaoka, 1998; Toyoda, 1998; Mori, 2003; Tollini, 2020; Fitriani & Ginanjar, 2022; Fukuda, 2023).

Even so, most researchers have noted that learning Kanji is arduous (Toyoda, 1998; Usuki, 2000; Gamage, 2003a, 2003b; Richmond, 2005; Yuki, 2009; Asaoka, 2010; Rose, 2010; Mori, 2003; Huan, 2019; Nanahashi, 2022; Tomiyasu, 2022; Lensun, Aror, & Sompotan, 2023). The complexities lie in several issues. First, there is a large number of different types of Kanji characters that Japanese language students need to learn. The increasing number of Kanji scripts to memorize along with their higher levels make them daunted to learn (Asaoka, 2010; Fitriani, Sutedi, & Danasasmita, 2021). Second, multiple readings of a single character of a Kanji demotivate students when learning this type of script (Asaoka, 2010), indicating that one Kanji script conveys many different meanings which are likely to add to the burden of students (Lensun, Aror, & Sompotan, 2023). Third, visual similarity and physical complexity have discouraged students from learning the script (Yuki, 2009). Fourth, the differences in typology between Kanji and alphabets are also another cause of students' difficulty (Gamage, 2003a; Fukuda, 2024). Japanese learners, particularly in foreign language settings, find they are unable to learn because they have no prior knowledge to assist them in memorizing unfamiliar orthography (Nesbitt, 2009). Finally, learning Kanji is complex because the study involves the understanding of not only the meaning but also the order of writing, how to read, how to combine Kanji *(jukugo),* how to form (*naritachi*), and *bushu* (Fitriani & Ginanjar, 2022) aligning with the approach of Kanji education; to know (*shiteru*), to understand (*wakaru*) and to be able to (*dekiru*) (Tollini, 2020).

All of these Kanji-related problems as mentioned in the earlier paragraph have also taken place in the present research setting. Learners are required to master 2136 Kanji characters used in daily life (*Jouyou* Kanji), despite the fact that in Indonesian Japanese language education, particularly in the bachelor degree programs, students are only taught 1000 *Jouyou* Kanji scripts (Sutedi, 2006). As Kanji learning poses many problems, relevant studies, particularly in the settings of Japanese as a second and foreign language learning, are conducted in order to minimize or even solve the problem. Most prevalent studies are focused on approaches, methods, strategies, and techniques in Kanji teaching and learning. The most noted findings among others are rote-learning strategies, semantic-phonetic compounds, context-based strategies, association methods, metacognitive strategies, and cognitive approaches.

Rote learning strategies involve repeated writing (Naka & Naoi, 1995; Naka, 1998), tracking, copying (Onose, 1987, 1988) and learning of formulaic chunks (Myles et al., 1998) in Huan (2019), assisting the beginning learner of Japanese Kanji to overcome frustration when attempting to master the multi-faceted, multi-item writing system and to build and strengthen neural pathways to the Procedural memory, a memory system that is implicated in automatic performance of habit or unconscious learning (Nesbitt, 2009). This strategy is the most widely used and has been proven to be effective, especially for students at the beginning level (Shimizu & Green, 2002; Gamage, 2003b; Yuki, 2009; Paxton & Svetenant, 2014). The strategy assists students not only in remembering Kanji but also in developing their ability to write Kanji with the correct proportions despite the fact that it is not particularly effective in improving retention (Paxton & Svetenant, 2014).

Apart from the rote learning strategy, the Semantic-Phonetic Compound is another method in Kanji learning that encompasses semantic radical contributing to the meaning and the phonetic component that contributes to the approximate pronunciation (Shu & Anderson, 1995; Feldman & Siok, 1999) in Huan (2019). In this case, familiar components of a new kanji character or word can be recognized by students by using built-in kanji knowledge of semantic radicals, phonetic components, and their functions (Yamashita & Maru,2000; Kubota & Toyoda, 2001; Mori, 2012; Kondo-Brown, 2006; Mori et al., 2007; Rose, 2017) in Huan (2019).

Context-based strategies refer to Kanji learning based on contextual information to learn novel words to help students find out the word class of the kanji word in a given context (Mori, 2003). It means Kanji is not learned in isolation because context provides broad information assisting students to find out the meaning of Kanji suited to the context. It is very useful since the Japanese language has a larger number of homonyms (Paxton & Svetenant, 2014). The basis for this approach is to consider Kanji as a 'vocabulary' not as a 'character' and is generally employed in the

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teaching of Kanji at the intermediate level (Paxton & Svetenant, 2014). The emphasis of context-based strategy is highly context-dependent reading and meaning of Kanji compounds (Shimizu & Green, 2002).

Further, the association method or Mnemonics refers to a technique to improve memory (Putnam, 2015) by capitalizing on naturally occurring memory processes such as visual imagery, organization, and elaborative encoding (Higbee, 2001; Worthen & Hunt, 2011) in Putnam (2015). Learners would use their personal techniques or mental images, such as visual images, keywords, and phonological alike to target kanji in order to encode kanji characters or words (Huan, 2019). This method has also been applied in several JFL Indonesian settings resulting in effective instructions in Kanji teaching and learning (Rasiban, 2017; Fitriani, Sutedi, & Danasasmita, 2021). Even so, there seems to be little evidence to suggest that mnemonics aid in long-term memory retention (Paxton & Svetenant, 2014). As a learning strategy, mnemonics is useful in helping students remember the structure of the kanji, yet it does not support students in remembering the reading of the kanji (Paxton & Svetenant, 2014). Likewise, Manalo et al., (2004) in Mori & Mori (2011) found that the Mnemonics strategy is likely to have more impact on students' perceptions than students' test performance.

The mnemonic method is different from metacognitive strategies as the latter involves consciously directing one's efforts into the learning task (Gamage, 2003b). It consists of understanding of a given task and kanji learning strategy selection (Huan, 2019) and puts an emphasis on important stages of one's own learning coordination, the progress of monitoring, and the self-directed development of kanji knowledge (Mori, 2012, 2014) in Huan (2019).

The cognitive approach constitutes the mental processes that underlie the processing of new information, such as paying attention to an explanation, interpreting an image, or associating a new concept with pre-existing knowledge. In Kanji learning, it means that students will go through four steps, including (1) the process of word association or process of imagery, (2) the process of long-term memory, (3) the process of reproduction, and (4) the process of obviation (Sakai, 1994,1995) and it is the cognitive system of Kanji teaching method that Sakai (1994, 1995) proposed is the one that is adopted in this study, particularly on the first process; The process of word association or process of imagery.

In this research, students are presented with Kanji illustrations mostly by means of pictographs and are observed whether the illustration shown to them can be recognized and perceived easily. Kanji Illustrations are shown or heard of by means of several strategies depending on the formation process, including pictographs, component analysis, and chunks are what they process cognitively and what constitutes a cognitive illustration. They are also asked whether illustrations presented to them can be recognized and perceived easily by them.

Studies on the use of Sakai's Kanji teaching method (1994, 1995) involving the four processes as aforementioned have been proven effective only in her context as she applied it to Japanese Native students at the level of elementary. It indicates that the effectiveness of this proposed teaching method for teachers as well as learners is yet to be examined, although it is assumed to be well-adapted as a systematic strategy instruction system for teachers of Japanese and Kanji (Gamage, 2003b). Therefore, the adoption of this teaching method in this study is worthwhile investigating, particularly in the Indonesia JFL setting.

LITERATURE REVIEW

There are three main theories that are used as the framework of the study, including Cognitive theory in Kanji Acquisition in the JFL setting, The Four Methods of Sakai's (1994, 1995) Teaching Technique, and Cognitive Illustration. Each is elaborated in the following sections.

Cognitive Theory in Kanji Acquisition Within JFL Setting

Cognitive theory in general assists humans in understanding the nature of human intelligence and how people think (Anderson, 1980 in Paxton & Svetenant, 2014). It provides insight into how humans process, store, and retrieve information (Paxton & Svetenant, 2014). Due to the large scope of cognitive theory and the constraint of the space to elaborate here, the theory illustrated here is cognitive theory in the Kanji acquisition in the JFL setting.

In relation to Kanji acquisition, cognitive theories provide a relevant framework for Kanji

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acquisition, considering the background of the learners and the setting of Japanese learning (Paxton & Svetenant, 2014). The background of the learners illustrates whether students learning Japanese come from a Kanji background (such as Chinese) or a non-Kanji background (other than Chinese). With respect to the setting, Kanji acquisition is also affected by whether students are learning Japanese as a native, as a second language, or as a foreign language. Taking, among others, these two factors into account in the Kanji acquisition will help in finding the best strategies for teaching and learning (Gamage, 2003b; Iwashita, 2009; Paxton & Svetenant, 2014). In other words, a more effective Kanji teaching to non-Kanji background students in a JFL setting will be likely to occur when the way JFL students perceive and process Kanji is understood (Paxton & Svetenant, 2014).

In relation to this, Fukuda et al. (1995) in Usuki (2000) state that students from non-kanji areas perceive kanji from a bottom-up perspective moving from feeling – perception – recognition – association of the meanings. Similarly, Toyoda (1998) also suggests that learners with non-Kanji backgrounds may process Kanji by visual association. In other words, creating images affected the ability to recall conceptually related word lists as well as rhyming word lists (Oliver, Bays, & Zabrucky, 2016).

The cognitive process involves a number of mental processes, including the short-term (STM, also known as immediate, working, or primary memory) and long-term (LTM) memories or the level of processing. In relation to Kanji acquisition, the goal is to retain Kanji in LTM allowing for easy retrieval (Mnguni, 2014; Paxton & Svetenant, 2014). This is because LTM or deeper processing generates more elaborate, longer lasting, and stronger memory traces, in which the meaning is analyzed through related associations, images, and past experiences which are all related to the stimulus (Paxton & Svetenant, 2014). In this case, the depth of perceptual processing is highly influenced by the amount of attention devoted to the stimulus, its compatibility with existing memory structures in the learner's brain, and the amount of processing time available (Paxton & Svetenant, 2014).

In a level of sufficient depth processing or when moving from STM to LTM, the encoding process takes place and its success is highly associated with three factors; organization, meaningfulness, and imagery (Paxton & Svetenant, 2014). It is the encoding process of Kanji that has been the main goal of and expectation from Kanji learning students by implementing learning strategies that accommodate this process of encoding (Mnguni, 2014).

Furthermore, among the three factors associated with the success of encoding in Kanji learning, 'meaningfulness' is the most significant (Paxton & Svetenant, 2014). Therefore, teachers must select characters that are meaningful and introduce them in an effective order, while providing students with helpful information for learning each character (Hammerly, 1985 in Paxton & Svetenant, 2014) and train students to acquire strategies for learning new kanji so they can be active and independent learners (Thompson, 1995; Paxton & Svetenant, 2014).

What seems to be important to note is that during cognitive processing of information, students tend to select information that is easiest to comprehend and manage mentally (Thompson 1995). It indicates that learning unorganized random Kanji is tough (Yamashita & Maru, 2000). The organization is pertinent as we consider how different sequences of kanji affect kanji retention (Paxton & Svetenant, 2014).

Therefore, in Kanji acquisition, there are three stages involved in the cognitive processes including internalization (the process where sense organs, such as the eyes, work with the brain to "absorb" information of Kanji illustration from the world), conceptualization (the process where meaning is made and during which cognitive visual models/ Kanji illustrations are constructed), and externalization (the production of external visual models by way of expressing cognitive mental schema) (Mnguni, 2014).

The Four Methods of Sakai's (1994,1995) Kanji Teaching Technique

The four methods of Sakai's (1994, 1995) Kanji teaching technique constitute a memorizing technique, carried out as one attempt to create a positive Kanji education method (Sakai, 1994). These four teaching techniques are based on a cognitive approach, conducted on Japanese Native Speakers at the elementary level, considering the formation of characters since the beginning level in order to make efficient recognition and writing by paying attention to the memory mechanism. The technique constitutes four steps, including; (1) the process of word association or imagery process; (2) the process of long-term memory (LTM); (3) the

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process of reproduction; and (4) the process of obviation.

The process of word association or imagery process is a step when a teacher presents or shows kanji characters to students through illustrations/ animation/ imagery. This is for remembering the meaning or shape of Kanji (Gamage, 2003b). In Sakai's perspective, the teaching of Kanji formation is done by increasing students' understanding at the recognition level. It is proven that, at least in her case, by doing this, students found no problems when they had to memorize more difficult Kanji formations containing many strokes and their meanings because the illustrations and the guided instruction allowed students to eventually grasp the shape of the character of the image leading to the enhancement of students' Kanji understanding.

The process of long-term memory (LTM) allows Kanji students to memorize the character with just one look and retain it, not easily forget it. The process is done by 'Chanting' which highly depends not only on vision memorization ability but also on auditory sense perception. This stage is where the 'recital' of a sentence with already learned kanji/kana is used as a memory aid. The character of 名 "*na*" (name), for example, is remembered as タロはいぬの名前です "*taro wa inu no namae desu*" (Taro (Katakana syllables constituting the kanji 名 "*na*") is a name for a dog (Gamage, 2003b).

The process of reproduction constitutes radical feedback. It indicates that when students are taught new Kanji characters, they are made to be aware of their previous knowledge of the Kanji character by organizing the radicals expected to improve the results. For instance, the new kanji 空 "*sora*" is introduced along with the previously learned 家 "*ie/uchi*" and 字 "*ji*" which have the 'same top' radical (Gamage, 2003b).

The process of obviation refers to the distinction stage, where students are introduced to new Kanji with possible error writings identified in previous lessons, discernible for students from Kanji and alphabetic backgrounds respectively. 空 "*sora*" for example, is introduced along with 穹 "*sora*" for character-background learners and 究 "*kyuu*" for alphabetic-background learners (Gamage, 2003b).

As mentioned in the introduction section, the focus of this study is only on the imagery process where students are presented with some illustrations/ imagery and are asked to remember the shape and the meaning of a Kanji character. Since it involves the different levels of processing including how these external Kanji illustrations are entered into the cognitive system through the eyes and visualization process which is highly related to the concept of 'cognitive illustration', more information on the imagery process will be elaborated in the following section on Cognitive Illustration.

Cognitive Illustration

Cognitive illustration is not a formal concept that can be found regularly in any kind of paper/ literature review discussing Kanji teaching and learning methods. It is purposely used in this study to describe 'kinds of imagery that students have when they see or hear a Kanji character and its meaning by referring to its formation process, including pictographs (*shoukei moji*), simple ideographs (*shiji moji*), compound ideographs (*kai-i moji*), and phonetic-ideographic characters (*keisei moji*)'.

It takes place in Sakai's imagery process (1994, 1995) as the framework of Kanji teaching used in the study. As outlined in the previous section (see The Four Methods of Sakai's (1994, 1995) Kanji Teaching), this imagery process constitutes an activity in which the teacher presents or shows kanji characters to students through illustrations/ animation/ imagery (Sakai, 1994,1995). The aim is to make students remember the shape and the meaning of Kanji (Gamage, 2003b). In this process, the Kanji illustrations provided in Sakai's model of Kanji teaching (1994, 1995) are those for the beginning level, mostly *Jouyou* Kanji and etymology-based, aligned with Paxton & Svetenant (2014) stating that the most common approach for teaching kanji in mostly Japanese course is to begin by teaching the etymology of the kanji.

This etymology of the Kanji is only practical for kanji coming under the category of pictographs (象形文字 "*shoukeimoji*") and therefore should be taught at the earlier stage of Japanese (Takebe, 1989 and Hatase, 1989 in Paxton & Svetenant, 2014). In other words, pictographs are generally thought to be the best characters to introduce students to first because the number of pictographs is limited and it does not offer a method in general for ordering all of the *Jouyou* Kanji (Paxton & Svetenant, 2014).

It also indicates two things. First, cognitive illustration is not a technique or strategy. It

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constitutes the Kanji visual models, the imagery the students have when they see or hear of the shape and meaning of a Kanji character. Therefore, it employs a broader concept than just pictographs or mnemonics as memory strategies, having a higher flexibility in employing any kind of strategies in the process as long as those aligned with the features of Sakai's imagery process (1994,1995), such as mnemonics, component-based analysis, chunks, rote-learning, and repetition. Further, the strategies to present the Kanji illustration are not limited to one technique, depending on the type of Kanji formation process, pictographs (*shoukei moji*), simple ideographs (*shiji moji*), compound ideographs (*kai-i moji*), and phonetic-ideographic characters (*keisei moji*)', as also stated by Bourke (1996) that the most successful students in kanji recall tasks were the ones who used the highest number and widest strategies variation.

Second, the imagery process puts an emphasis on the showing of Kanji to students and the presentation is done not only by considering the formation process but also the ordering. Hitherto, Kanji characters are most often introduced in the order they appear in the textbook or the order as prescribed by the Japanese Ministry of Education (Paxton & Svetenant, 2014) and thus the teaching will follow how these are presented in the textbook. Even so, some Kanji teaching and learning strategies do not relate to how the Kanji is presented based on the textbook, limiting the effectiveness of the strategies themselves and to some extent, ignoring the cognitive process.

Some strategies can lend themselves to how to order Kanji to make students easily learn, some others need the teacher to figure out how to make Kanji easily retained in students' memory inconsistent with the goal of kanji learning; to retain kanji in our long-term memory so that kanji can be easily retrieved (Paxton & Svetenant, 2014). Therefore, ordering what Kanji comes first to teach or to learn is also pertinent to the success of the Kanji acquisition.

The ordering helps students in the encoding process of information and enables it to perform better, involving factors such as organization, meaningfulness, and imagery that are among the criteria to contribute to the success of Kanji learning (Paxton & Svetenant, 2014). It indicates that within the classroom practices, the teacher must break the task into meaningful and tangible subsets (Findley & Cooper,1983 in Yamashita & Maru, 2000 in Paxton & Svetenant, 2014) by selecting Kanji characters that are meaningful and introduce them in an effective order, from the simplest to the hardest while providing students helpful information for learning each character (Hammerly, 1985 in Paxton & Svetenant, 2014) and by training students to acquire strategies for learning new kanji so they can be active and independent learners (Paxton & Svetenant, 2014).

Organizing Kanji in a systematic order should also produce greater rates of retention because organized information results in better visual information processing and memory (Yamashita & Maru, 2000). Visual, phonological, contextual, stroke number and frequency are among the suggestions for the ordering in the teaching of Kanji (Paxton & Svetenant, 2014).

The ordering has also been inconsistent with the imagery process of Sakai's Kanji teaching method (1994,1995) in which most of the examples of Kanji illustration in her research are often visual, confirming the idea that imagery helps students improve memory (Oliver, Bays, & Zabrucky, 2016) increasing the use of visual models such as pictures, diagrams and animations almost in all fields of education, and Japanese language education is one of them, particularly in Kanji teaching. Therefore, this study involves the ordering and formation process as among the considerations in the imagery process.

The understanding of 'cognitive illustration' constitutes the cognitive process of visualization. If it is applied to Kanji learning, the 'cognitive illustration' is likely to follow the following processes; first, the Kanji illustration enters into the cognitive system through the eyes; then the students attend to some aspects of the Kanji visual models directing them to the construction of a mental pictorial image within working memory; after the subsequent construction of mental images, the students arrange the set of images into a coherent mental representation called a pictorial model, involving the process of selection, organization, and integration of images (Sakai, 1994, 1995; Mayer 2003 in Mnguni, 2014; Rasiban 2017). If it continues to the deeper processing, it produces longer-lasting and stronger memory traces and so when the students analyze for meaning, they may think of other related to associations, images, and past experiences related to the stimulus depending on the amount of attention devoted to the stimulus, its compatibility with existing memory structures in the student's brain, and the amount of processing time available (Paxton & Svetenant, 2014).

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The concept of cognitive illustration is similar to the Learner Visualization Approach by Cueva, Murota, Hayashi, Mitsuhara, Gotoda, and Yano (2010). This approach is based on the concept that when learners view a Kanji, they already tend to mentally divide or deconstruct that Kanji into groups of strokes, but different students will deconstruct the same Kanji in different ways allowing the students to choose their preferred way of dividing a Kanji then guides their study based on that choice (Cueva, Murota, Hayashi, Mitsuhara, Gotoda, & Yano, 2010). Meanwhile, in Cognitive Illustration, the concept of the Learner's Visualization approach is the next step for students when they learn Kanji which formation is more complex or even in the next level (intermediate or advanced) where the Kanji they learned will be ampler and more complex. Therefore, both approaches can complete each other.

METHOD

This experimental research attempts to observe the effect of cognitive illustration on Kanji learning. It is aimed to figure out the kind of imagery/illustration based on its formation process, including pictographs (*shoukei moji*), simple ideographs (*shiji moji*), compound ideographs (*kai-i moji*), and phonetic-ideographic characters (*keisei moji*).

The research was carried out by referring to the first process of the Four teaching processes as Sakai suggested (1994,1995); the process of imagery or word association. In this process, students' cognitive processes the Kanji illustration through showing, recognizing, storing, and understanding (Sakai, 1994, 1995) and so when the students analyze for meaning, they may think of other related associations, images, and past experiences related to the stimulus (Paxton & Svetenant, 2013).

The study was conducted in a Bachelor's degree Japanese language education study program at a public university in West Java, Indonesia. It involved 28 second-semester Japanese language students in total in Kanji class. Therefore, the selection of the subject was purposive sampling, enabling the researcher to intentionally select subjects since they took the course under investigation (Creswell & Clark, 2018).

The class was divided into two groups: 15 students in the experimental class and 13 students in the control class. Both groups of students were taught 115 Kanji characters at the basic level (N5), including the Kanji of numbers, colors, and subjects related to position, human beings, and non-human beings. The topics were taught within seven meetings, each two credit semesters (100 minutes), under different treatments. The experimental group was taught by being presented with Kanji illustrations mostly by means of pictograph, component analysis, and chunking (depending on the Kanji formation process) and observed whether the illustration shown to them can be recognized and perceived easily in terms of shape and meaning. Meanwhile, the control group despite being presented with the same illustration, was asked to further study the same Kanji by using any kind of techniques or strategies they knew without being given similar guidance to those in the experimental class.

In order to find out the effectiveness, three types of data collection techniques were employed; classroom observation, *t*-test, and questionnaire. The classroom observation was carried out on both groups within the period of Kanji teaching. In the experimental class, students were observed the way they reacted to the presentation of the Kanji illustration provided by the lecturer and were involved in the discussion on the imagery they processed. Then, they were asked to practice the way they write and the results of the writing show their imagery process. It cannot be used to the extent that the Kanji can be retained in long-term memory because in order to go into that depth of processing, several stages are needed to go through. Likewise, in the control group, students were also shown the Kanji illustration and explained its formation and meaning. However, they were not involved in the discussion on their imagery process, but were asked to study and practice more on the Kanji by using any kinds of Kanji learning strategies they know or they feel work for them. For this group, the strategies they use without the lecturer's guidance is one of the questions stated in the questionnaire to respond to.

The second data collection technique is the *t*-test. After the teaching was completed, both groups were tested on their Kanji understanding (formation and meaning) and the results were analyzed by using t-test comparative statistics. Finally, a questionnaire asking responses of both experimental and control classes on Kanji's learning was distributed. The results were analyzed by putting the same responses under the same category and were analyzed by referring to the theories and by relating to the previous research.

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RESULTS AND DISCUSSION

This study investigates the effect of cognitive illustration on the students' understanding of the Kanji they learned, investigating to what extent the imagery process contributes to students' understanding of Kanji learning and figuring out students' imagery based on its formation process, including pictographs (*shoukei moji*), simple ideographs (*shiji moji*), compound ideographs (*kai-i moji*), and phonetic-ideographic characters (*keisei moji*). The results show that cognitive illustration has a significant impact on students' Kanji understanding, to the extent that it helps students to better remember the shape and meaning of Kanji through exposure to many strategies to remember the Kanji they learned in the imagery process.

Cognitive Illustration and Kanji Learning

There are 115 Kanji of N5 level taught to students in both groups. Both are exposed to the same Kanji with different treatments. Students in both groups are presented with Kanji illustrations within seven meetings. While the experimental class is exposed to the Kanji illustrations by using many kinds of different strategies depending on the formation process, in the control group, students are exposed to the Kanji illustrations restricted to only certain strategies. There are also the same strategies used in both classes in a situation where possible situation.

The simplest Kanji are taught first in both groups and since the simplest category of Kanji is mostly *shoukeimoji* or pictographs, the Kanji illustrations in both groups are presented by using pictographs. It is aligned with Takebe (1989) in Paxton and Svetenant (2014), stating that in most Japanese courses, using pictographs is very common, particularly in teaching beginners. The results of the presentation vary. First, not all simplest Kanji under the category of *Shoukeimoji* can be recognized and perceived easily by all students in both groups. Kanji, for instance, 一 (*ichi*), 二 (*ni*), 人 (*hito*), 山 (*yama*), 川 (*kawa*), 田 (*ta*), and 口 (*kuchi*) are recognized and perceived easily by all students in both groups (100%). These illustrations are considered easily perceived by both because the visual formation can be relatively easy to trace in their mind, or in other words, it is very easy to see the visual formation of the kanji from its intended form and this is both interesting for students and a useful memory aid. It is also confirmed by Paxton and Svetenant (2014) and Oliver, Bays, and Zabrucky (2016) that imagery is an effective way to increase memory as shown in the example of Kanji illustration as seen in Figure 1.

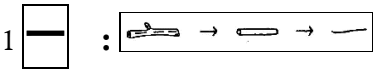

Figure 1: Pictographs of Kanji Number 1.

This Kanji is Kanji number 1, illustrated by one stick of wood. The illustration is adopted from Fusao et al. (2008, 2012) in Istrate (2014). The Kanji illustration above shares the characteristic of being pictographs and it is the best character to introduce to students at the initial stage because of its simple formation and meaning. The imagery shown is similar and logical allowing students to easily understand and remember (Istrate, 2014).

It is in line with Fukuda (2024) stating that Kanji with simple structure must be taught earlier, confirming the idea that organizing Kanji from the easiest to the hardest or in a systematic order tends to produce greater rates of retention because organized information results in better visual information processing and memory (Yamashita & Maru, 2000). Similarly, the idea is confirmed by Thompson (1995) describing that within the perspective of cognitive processing of information, students tend to select information which easiest to comprehend and manage mentally.

With respect to the simplest Kanji, the different treatments carried out in both groups have no relation to students' Kanji understanding respect to those particular Kanji, and it is likely because the nature of the Kanji itself is easy to remember and perceive since there is a high possibility that pictographs only make up a small percentage of kanji and therefore its application is limited to a small percentage of characters and many Kanji have undergone changes over time and frequently, therefore, bear little resemblance to their original form and intended meaning. (Gamage, 2003b; Paxton & Svetenant, 2014).

Therefore, it also makes sense that not all *shoukeimoji* learned in both groups cannot be 100 % easily recognized and perceived due to the reasons as earlier stated; the original meanings of this kanji and its form have both changed over time making its etymology of little use in the task of memorizing kanji for the JFL student (Gamage, 2003b; Paxton & Svetenant, 2014). It also confirms the idea that pictographs/ etymology-based Kanji cannot be

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offered as the only method for ordering and teaching all of the *jouyou* kanji (Gamage, 2003b; Paxton & Svetenant, 2014). Some Kanji such as 小 "*chiisai/ko*" (78,6%), 十 (85,7%), 大 "*ookii/dai*" (92,9%) are among the examples that not all students can recognize and perceive the *shoukeimoji* Kanji easily. No prior experience in learning character-based language adds up to the difficulties for students in learning, even the simplest Kanji, as also stated by Toyoda (1998).

Apart from this, of all 115 Kanji learned by students, there are 10 Kanji illustrations that are considered difficult to recognize and perceive by both groups of students. Those Kanji include 五 "*go*" (50%), 六 "*roku*" (57,1%) 、九 "*kyuu*" (50%) 、金 "*kane*" (57,1%) 、北 "*kita*" (50%) 、青 "*ao*" (35,7%) 、前 "*mae*" (50%) 、校 "*kou*" (50%、今 "*ima*" (57,1%) 、and 来 "*kuru/rai*" (57,1%). With respect to this, only an average of 50% of students from both groups can recognize and perceive these types of Kanji easily, while the rest consider that they need more time to memorize. The difficulties are likely because the Kanji they learn are considered complex. Below is one example of a Kanji illustration considered hard to perceive.

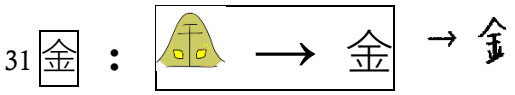

Figure 2: Pictograph of Kanji Gold and Money.

The Kanji in Figure 2 means gold and money. It is derived from a simplified image of a mountain of gold. In the other version, the kanji is written slightly italics. In teaching this type of Kanji, in the experimental class, students are presented with this kanji by grouping the information or chunking so that Kanji that are seemingly complex can be broken into separate components and easily learned (Yamashita & Maru, 2000). Students are exposed more than once and invest much time to practice under the guidance of the teacher. Meanwhile, in the control group, students are taught by presenting the Kanji illustration, however, the strategy used is not by chunking/ grouping information of Kanji but by pictographs, and students are instructed to practice by themselves afterward.

The small percentage of students who understand those Kanji indicates two things. First, students in different groups are treated differently in terms of their strategies of learning. The experimental class is exposed to Kanji illustration more than once. They are guided by the lecturer on how to memorize the Kanji by breaking the its components. It is because Kanji are often comprised of two or more separate components that are frequently radicals or independent standalone kanji and thus the way teaching and learning them will be different from those Pictographs and visually less complex Kanji which is usually made up of one component (Paxton & Svetenant, 2014). It gives students better opportunities to tackle a more complex Kanji leading to a mastery of Japanese proficiency (Yuki, 2009; Hermalin, 2015; Huan, 2019; Danh, 2021; Fukuda, 2024). Meanwhile, in the control group, limited guidance and scaffolding as well as less effective strategy are apparently the causing factors of students' difficulties in memorizing the Kanji. It is related to the second indication that guided instruction and the exposure to the application of many strategies in teaching and learning Kanji will facilitate students to learn Kanji better because they are exposed to many techniques and strategies and they can strategize when memorizing the Kanji based on its characteristics or formation process (Bourke, 1996).

Further, of all 115 Kanji of the N5 level, only one Kanji that students find the most complex to remember. It is Kanji 青. The illustration can be seen in Figure 3.

Figure 3: Compound Ideograph (*Kaiimoji*) of Kanji Blue (https://learnshodo.blogspot.com/2017/07/kanji-study-colors.html).

This Kanji represents blue in Japanese. This compound ideograph is comprised of the Kanji character 生 "*sei*" (life) and 井 "*sei*" (water in a well) (https://learnshodo.blogspot.com/2017/07/kanji-study-colors.html). Only 35,7 % of students in both groups found that the Kanji is logical and can be memorized, or in other words, 64,3 % of students in both groups found that this Kanji is overly complex.

Despite different treatments given to the experimental and control classes, both groups agree that Kanji Blue requires them to memorize more. In the experimental class, students are

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presented with the Kanji illustration and are taught by using the component-based analysis. It is done because the Kanji they learn is part radical, consisting of two components, and has been proven that this strategy helps students, particularly in the JFL setting, retain new Kanji characters better (Kubota & Toyoda, cited in Toyoda, 2011 in Paxton & Svetenant, 2014). Therefore, the students are taught by dividing the Kanji into separate components and then each is analyzed explicitly based on its shape and meaning (Taft & Chung, 1999 in Paxton & Svetenant, 2014). Likewise, the control class also presented Kanji illustration and was taught by using the same strategy, component analysis, however, the exposure to the illustration and the guidance of instruction were not as thorough and explicit as that in the experimental class.

Even so, both groups still find problems in remembering the shape and meaning of Kanji blue. The questionnaire reveals that both groups have the same opinion that the illustration of Kanji blue is not logical to them. It is likely because they have no background knowledge with respect to the Kanji and therefore cannot build upon each other creating a system that helps students understand better the shape and the meaning of Kanji Blue. This is in line with what Toyoda (1998) and Fukuda (2024) said that for JFL learners whose writing systems are very different from Japanese, learning Kanji would be a long and arduous journey because they have no prior knowledge or built-in knowledge of Kanji.

Further, in general, students in both groups can recognize and perceive 115 Kanji of N5 well. They are able to observe and process each illustration cognitively along with the presentation. However, not all Kanji illustrations are considered 'aligned' with their visualization process and it affects their understanding of the shape and meaning of the Kanji they learned. The next section will highlight more on this issue.

Students' Understanding of Kanji

In general, students in both groups have a good understanding of all the Kanji they learn. They are able to observe and process each illustration cognitively at their own pace. Even so, between the two groups, the experimental class shows better results in their test as also shown in the calculation of the *t*-test in Table 1.

Table 1. Results of t-test.

No	Calculation	Experimental Group (X)	Control Group (Y)
1	Sample (N)	15	13
2	Mean (M)	67,13	57,23
3	Standard Deviation (Sd)	1,82	2,48
4	Standard Error Mean (SEM)	0,49	0,72
5	Standard Error of Mean Difference XY (SEMx.y)	0,87	
6	t-score	11,38	
7	t-table *(db: 26)*	2,06 (95%)	2,78 (99%)
8	Interpretation	Significant	Significant

Table 1 explains the results of the *t*-test. It reveals information on the significant difference in mean between the experimental class (67,13) and the control class (57,23). It also indicates that cognitive illustration has a significant effect on the imagery process. It is proven by the t score value (11,38) obtained, which is much higher than the t table, both at the 5% (2,06) and 1% (2,78) significance levels.

It also means that cognitive illustration in the imagery process helps students in the experimental class enhance their understanding of 115 Kanji's shape and meaning of the N5 level. Students in the experimental class have the ability to gain a sense of control over a complex and enormous task related to Kanji illustration presentation, remembering the shape and the meaning because the class is facilitated with many different strategies allowing them to have more exposure and remember better. It is in line with Bourke (1999) stating that the most successful students in kanji recall tasks were the ones who used the highest number and widest variety of strategies.

Further, the role of guided instruction also contributes to the enhancement of Kanji understanding in the experimental class. No matter how competent a student is if there is no assistance from the one who is more expert in Kanji they learn, he or she will face difficulty in developing their Kanji proficiency. This is because guided instruction highly considers the relationship between working and long-term memory in

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conjunction with the cognitive process (Clark, Kirschner, & Sweller, 2012).

Meanwhile, in the control group, the lecturer carries out similarly, in which students are presented with Kanji illustrations but facilitated with limited strategies. They are guided only to a certain extent and are asked to learn individually on the Kanji memorization. The result of the questionnaire reveals that when they memorize the Kanji individually, most apply rote learning and repetition or drilling. It is also confirmed by Shimizu and Green (2002), Gamage (2003a, 2003b), and Nesbitt (2009) that JFL learners from alphabetic backgrounds used repeated writing strategies to memorize kanji words more than learners from Chinese character backgrounds.

Furthermore, the questionnaire reveals that most students in the control group state that remembering new kanji is easier than remembering the Kanji they have learned and it deals with the amount of time they invested in the stimulus, its compatibility with existing memory structures in the learner's brain, and the amount of processing time available (Paxton & Svetenant, 2014). Finally, the organization of Kanji learning also plays an important role in the development of Kanji learning in both groups. Ordering from the simplest Kanji to the most difficult provides a means by which kanji can be given more meaning and therefore serve as a useful kanji learning strategy (Paxton & Svetenant, 2014).

CONCLUSIONS

The study has outlined the effect of cognitive illustration on students' Kanji learning, particularly in remembering the shape and meaning of Kanji characters. The cognitive illustration is not a formal concept and is purposely used in this study to describe 'kinds of imagery that students have when they see or hear a Kanji character and its meaning by referring to its formation process, including pictographs (*shoukei moji*), simple ideographs (*shiji moji*), compound ideographs (*kai-i moji*), and phonetic-ideographic characters (*keisei moji*)'. Involving 28 students taking the Kanji course (15 students in the experimental class and 13 students in the control class), this experimental research observes the effect of cognitive illustration on students who learn 115 Kanji at the N5 level. The results show that students in the experimental class perform better in Kanji memorization than those in the control groups. There are some factors that contribute to the enhancement of Kanji learning, including varying Kanji learning strategies, thorough guided instruction, and ordering Kanji strategies.

This study recommends using a similar approach by involving the whole process of the four teaching methods as Sakai (1994,1995) suggested so that the development of students' Kanji learning can be seen in a comprehensive manner. Further, since the time of teaching is limited and the number of students is small, it is suggested that further researchers have more time to carry out the research and more students to teach so that the study can be seen from many perspectives.

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