

Do Second-Language Learners of Japanese Process Kanji in the Same Way as Japanese Children?

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When confronted with a kanji, do second-language learners of Japanese and Japanese children employ similar strategies in reading and memorizing it?

At the basis of the experiment was the generally accepted finding that semantic and articulatory information becomes available at different rates for pictures and words. Categorization of an object or word is a task that requires access to semantic information; naming requires access to articulatory information. Thus, the rate of kanji access meaning and pronunciation was tested in comparison with the rate at which photographs access verbal and semantic codes.

It was found that when Japanese children read kanji they access the phonetic code prior to the semantic code. Alphabet-habituated, second-language learners of Japanese at the beginner and advanced levels of mastering kanji have equal access to the verbal and semantic information in reading kanji; the second-language learners at the intermediate level process the phonetic code prior to the semantic. However, in a questionnaire concerning kanji, the second-language learners of Japanese found the semantic aspect of kanji to be far more important than the pronunciation of the particular character. Linguistic and psychological realities do not always match.

It was concluded that it is not the nature of the kanji but rather the familiarity with the script that determines the cognitive strategies employed in reading a word. Suggestions were made about the teaching of Japanese script to second-language learners.

INTRODUCTION

Cognitive psychologists have long been interested in how variations in the format of visual stimulation result in changes in information-processing strategies.

Many current cognitive models suggest that information about a stimulus is represented in the form of a lexicon or internal dictionary. The lexical entry for a given

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item contains information about such aspects of the stimulus as its meaning (semantic code), its name or pronunciation (articulatory name code), its spelling (graphemic code), and so on. Not all information that is stored in a given lexical entry becomes available simultaneously; some forms of information become available more rapidly than others.

Printed words and pictures are both forms of graphic symbology, yet they differ considerably in ease of comprehension. The difference in difficulty of understanding pictures and words may result from the differential ease of accessing these forms of information in the lexicon by the two forms of representation. The time for accessing at least two types of lexical information—meaning and articulatory name code—is different for pictures and words. Pictures make contact with the semantic code very rapidly but more extensive processing is required to access the name code. In contrast, words may be pronounced very quickly, but accessing the semantic code proceeds more slowly (Cattell, 1886; Dhawan and Pellegrino, 1977; Nelson, Reed, and McEvoy, 1977; Paivio, 1975). Data from decision latency, memory, naming latency, and picture-word interference tasks all suggest that articulatory and semantic information becomes available at different rates for pictures and for words (Smith and Magee, 1980).

A number of studies have shown that phonetic recoding (i.e., the visual code transformed into a speech code) occurs with kanji (Tzeng et al., 1977; Erikson, Mattingly, and Turvey, 1973; Mac, 1976; Yik, 1978; Taylor, 1980; Steinberg and Yamada, 1978).

In opposition to these findings, Saito (1981: 273) found in a simple reading experiment, that "in the silent reading of kanji the direct processing from visual (graphemic) codes to meaning (semantic codes) is possible, whereas in kana the relation of graphemic codes to meaning is mediated by the phonemic system." Hatano, Kuhara, and Akiyama (1981) found that in the processing of kanji, meaning may be derived without phonological recoding. Further evidence to support this view is found in the Stroop interference experiments (Shimamura, 1979; Shimamura and Hunt, 1978; Morikawa, 1981; and Biederman, 1980) where the recognition of logographs were found to have more in common with the processing of pictures than with the recognition of alphabetic scripts. Japanese script impairment in brain damage provides further evidence for the kanji and picture-processing analogy (Sasanuma and Fujimura, 1971; Sasanuma, 1975, 1980; Yamadori, 1975; Morton and Sasanuma, 1984).

To date, research on reading kanji has concentrated on the fluent reader. Flaherty (1990) suggests that it may not be the type of script per se, but rather the level of familiarity with that script which is a major factor in how it is processed. The important distinction between the child approaching reading for the first time and the second-language learner must be made. "Learning to write his first language he has to master the great abstraction involved in representing the sounds of a language by marks on paper. Learning to write a second language he already knows that marks on paper can represent sound" (Lado, 1957, 106). Children learn a writing system as a code for language but not for concepts. Spoken language is the primary code, written language thus is a code for a code. "The relative ease or difficulty of the beginner reader's task will be influenced to a large extent by the features of the symbols he has to

deal with, as well as by the nature of their relation to the spoken language" (Feitelson, 1972: 18).

The question being addressed in the present paper is as follows: Will alphabet-habituated, second-language learners of Japanese and Japanese children process the phonetic and semantic aspects of kanji in a similar fashion? This issue was examined by measuring the rate at which they read and categorized photographs and words.

Although pictures can be understood more rapidly than words, printed words can be named more rapidly than their corresponding pictorial representations (Fraisse, 1960; Potter and Faulconer, 1975; in contrast, see Theios and Freedman, 1984). Faster word naming may result from the fact that a word can be named via the application of well-learned grapheme-phoneme correspondence rules, even when the word's meaning is not known. One can "read" almost any unfamiliar language, for instance, given knowledge of the grapheme-to-phoneme correspondence rules. In contrast, some minimal amount of semantic analysis appears to be necessary to name a picture. Intuitively, until a picture's referent is determined, it seems unlikely that an accurate verbal label can be generated. At the basis of the experiment is the generally accepted finding that it takes longer to categorize a word than to name a word and less time to categorize an object represented in a picture¹ than to name that object.

Studies of the time required to name or categorize pictures and words have indicated that words can be named more rapidly than pictures but that pictures can be categorized more rapidly than words (Smith and Magee, 1980). The task of deciding whether an item is a member of a particular category or not requires semantic analysis.

Previous investigators have used terms such as "name" (Smith and Magee, 1980), "phonemic task" (Chen and Juola, 1982), "read aloud" (Iwata et al., 1981) and "read orally" (Hayashi et al., 1985) for the task of emitting the verbal label of a target item. Such terms as "categorizing" and "category generation" (Smith and Magee, 1980), "semantic task" (Chen and Juola, 1982), "comprehension" (Iwata et al., 1981) and "reading comprehension" (Hayashi et al., 1985) have been used for a task requiring semantic analysis of a target item. In the present experiment, "naming" and "reading" will be used to refer to the task of uttering a word, be it a simple written word or a word identifying an image in a photograph. The term "categorization" will be used to refer to the task of deciding whether an item is a member of a particular category or not, and "category generation" to the task of verbalizing the particular category to which the item belongs, the target item being a written word or a photographic image.

Method

Subjects: Japanese children and second-language learners of Japanese were selected.

¹ Photographs were used in the present study as a common baseline against which to compare words written in three different scripts, in much the same way as Shimamura (1984) used arrows to compare kana and kanji. Photographs were employed instead of line drawings (used by Smith and Magee, 1980) because in a crosscultural study such as this, line drawings may give rise to some of the confusion encountered by Hudson (1960, 1967) and Davidoff (1975) in crosscultural perceptual studies.

Ninety-six Japanese children participated in the study. One-third of this sample were age eight ("beginners"), one-third age ten ("intermediate"), and one-third age twelve ("advanced"). All were students at Ryukyu University Primary School, Okinawa.

Seventy-one foreign students also participated in the study; 24 of them were at the beginner level, 23 at the intermediate level, and 24 at the advanced level of reading kanji. Of these subjects, 37 were English native speakers, 14 Spanish, 7 Indonesian, 8 Portuguese and 5 Philippine native Tagalog speakers. Thus, all were alphabet-habituated readers. The subjects were foreign exchange students at the following institutions: Ryukyu University, Okinawa International Center, Okinawa International University, Maryland University, and Okinawa Language Center. A number of missionaries also participated. All subjects had normal or corrected to normal vision in both eyes.

A kanji test, based on the Japanese-language program at Ryukyu University, Maryland University, and Okinawa Language Center was designed to test the subjects' level of reading kanji. Each subject was asked to write the pronunciation (romanized (*romaji*) and in hiragana or katakana) and the meaning (in Japanese or the subjects' native language) of 42 kanji. Of the 42 characters, 14 kanji were considered to be at the beginner, 14 at the intermediate, and 14 at the advanced level. They were arranged in a random order. Only if the subject could give at least one pronunciation and one meaning of a particular kanji, was he or she considered to know that character. A subject who knew 7 or more of the advanced kanji was placed in the advanced group. Knowing 7 or more of the intermediate kanji placed the subject in the intermediate group. Those who knew less than 7 of the intermediate kanji were considered beginners. Every subject who participated in the experiment was required to know at least the 14 beginner-level kanji, as all of these kanji appeared in the experiment. The test was administered to each subject at least two days prior to the experiment, as the characters to be used in the experiment appeared in the kanji test. The kanji test was written in the native language of the subject. A copy of the kanji test that was administered to English speakers appears in Appendix A.

A questionnaire concerning kanji was completed by each subject in his or her own native language. While not being crucial to the present experiment, the results of the questionnaire seemed to highlight interesting questions concerning foreigners' views on kanji and its study, and certain points might at some time be useful in considering teaching methods. This same questionnaire was also completed by fifty Japanese adults. A copy of the questionnaire (English version) appears in Appendix B, the results in Appendices C (second-language learners) and D (Japanese adults).

All the subjects claimed to have normal color vision and could produce the appropriate names for the colors used in the experiment.

Apparatus: A slide projector linked to a tachistoscope was used to display the slides on which the stimuli were presented. A speaker linked to the tachistoscope gave a one-second warning tone (500 Hz) prior to each stimulus presentation.

A six-digit millisecond counter in the tachistoscope commenced timing with onset of the stimulus and stopped upon activation of a voice key. The volume of the voice key was changed according to the individual subject's voice level.

Stimulus Materials: The same set of stimuli was used for all levels, beginning, inter-

mediate, and advanced, of subjects. Two types of stimulus materials were prepared: a set of photographs and a set of words, each word naming an object presented in one of the photographs. The set of photographs and words each contained fifteen items: five from each of the three categories of animal, body part, and color.

The words were all high-frequency words from a basic list of 6,000 Japanese words (National Language Research Institute, 1984).² All were written horizontally³ and in the most familiar script employed in daily usage.⁴

The stimulus slides were of two types: color photographs and words printed in black ink on a clear background. Both word and photograph stimuli were presented on slides. All stimuli were placed at the center of the slide. The image of the object presented in the photographs measured approximately fifteen centimeters square with the subject sitting 1.2 meters from the screen in all cases.

Design: The design was identical for beginning-, intermediate-, and advanced-level subjects. Two sets of twelve stimuli were compiled, one of photographs and the other of words. Two target lists were prepared by subdividing the set of 24 items into 2 non-overlapping groups of 12: Target A and Target B. In each target list, 6 stimuli were photographs and 6 were words. The subject was required to name half the stimuli (3 photographs, 3 words) and to categorize the other half (3 photographs, 3 words). Half the subjects first named and then categorized the stimuli, and the other half first categorized and then named the stimuli.

Procedure: All explanations and instructions were given verbally by a native Japanese speaker. Prior to the experiment, subjects were given a practice session of twelve stimuli. These sample items were not used in the experiment. Each subject was tested individually in a session lasting approximately fifteen minutes.

The subject sat before the screen and held the voice key to his or her throat. Response times were automatically recorded. The subject was initially asked to either name or categorize words and photographs (depending on which group was assigned to). Half of the subjects first named and then categorized the stimuli. The other half first categorized and then named the stimuli. In the naming task, the subject either read the word or named the object represented in the photograph. In the categorization task, the subject was asked to say to which category the stimulus belonged. Both naming and categorization response times were recorded with a voice key. The subject was reminded to respond as accurately and as rapidly as possible. Each stimulus was preceded by a one-second warning tone (500 Hz). The stimulus card appeared

² Japanese children are required by the Ministry of Education to learn a set number of designated kanji each year in school. All stimulus words used should have been mastered by the second grade (age eight years).

³ For Japanese readers, it makes no difference whether words are written horizontally or vertically (Flaherty, 1990).

⁴ As these stimuli were presented to both Japanese children and second-language learners of Japanese, all words were written in the *kaisho/gyōsho* script. This script was found to be the most prototypical by both Japanese and Americans who know Japanese (Langman and Saito, 1984).

for two seconds. There was an interval of one second between the display of the stimulus and the warning tone for the following stimulus. Both accuracy and latency of response were recorded.

Results

Japanese children, ages eight, ten, and twelve, access the phonetic code prior to the semantic code in reading kanji (see Fig. 1 and Table 1).

The twelve year olds categorized photographs (p) faster than they named them ($F(1, 46)=13.47, p<.001$). There was no difference in the speed at which the photographs were named and categorized by the eight year olds ($F(1, 46)=1.57, NS$) and ten year olds ($F(1, 46)=0.02, NS$).

All three age groups read kanji significantly faster than they categorized them (age eight: $F(1, 46)=17.06, p<.001$; age ten: $F(1, 46)=26.34, p<.0001$; age twelve: $F(1, 46)=19.67, p<.0001$).

There was no difference in the speed at which the twelve year olds categorized photographs and kanji ($F(1, 46)=3.66, NS$). However, the eight and ten year olds categorized photographs significantly faster than they categorized kanji (eight year olds: $F(1, 46)=6.66, p<.01$; ten year olds: $F(1, 46)=4.77, p<.05$). The eight and ten year olds, in accessing the phonetic information prior to the semantic in reading kanji, are perhaps coming to terms with the many and appropriate readings of kanji and do not yet appreciate the possible semantic inference possible with kanji (Hatano et al., 1981).

All three age groups read kanji significantly faster than they named the objects in the photographs (eight year olds: $F(1, 46)=12.20, p<.001$; ten year olds: $F(1, 46)=6.26,$

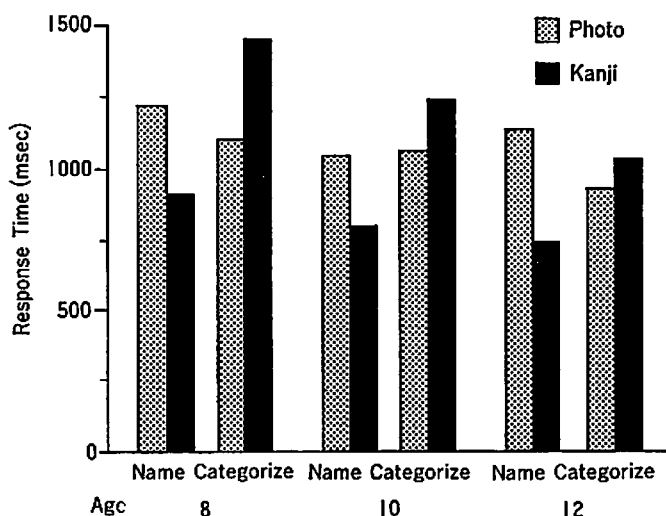


Fig. 1 Mean Times (msec) Taken by Japanese Subjects (eight-, ten- and twelve-year-olds), to Name and Categorize Objects Represented in Photographs and Kanji

Table 1 Mean Response Times (MRT) in Milliseconds and Standard Deviations (SD) to Name and Categorize Photographs and Words by Subjects Ages Eight, Ten, and Twelve

Age	Name		Categorize	
	MRT	SD	MRT	SD
Photographs				
Eight	1221	384	1101	268
Ten	1044	400	1058	251
Twelve	1132	243	923	135
Kanji				
Eight	507	216	1452	609
Ten	794	281	1237	316
Twelve	736	228	1025	223

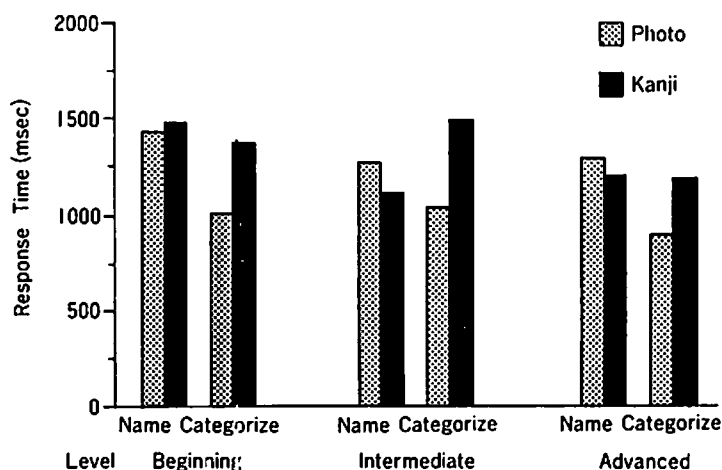


Fig. 2 Mean Time (msec) Taken by Non-Native Japanese Subjects at Beginning, Intermediate, and Advanced Levels, to Name and Categorize Objects Represented in Photographs and Kanji

$p < .01$; twelve year olds: $F(1, 46) = 33.77$, $p < .0001$).

The eight year olds were slower than the ten and twelve year olds in naming and categorizing photographs and kanji ($F(2, 285) = 4.90$, $p < .01$). This is hardly surprising. The eight year olds grew more tired in the course of the experiment than the ten and twelve year olds, and were also less motivated.

Alphabet-habituated, second-language learners of Japanese, at the early stage of mastering kanji and at the advanced stage, read and categorized the kanji at comparable rates, thus revealing an equal appreciation of both the semantic and phonetic aspects of the characters; at the intermediate stage, the phonetic aspect took precedence over the semantic (see Fig. 2 and Table 2).

Table 2 Mean Response Times (MRT) in Milliseconds and Standard Deviations (SD) to Name and Categorize Photographs and Words by Beginning-, Intermediate-, and Advanced-Level Subjects

Level	Name		Categorize	
	MRT	SD	MRT	SD
Photographs				
Beginning	1419	464	1004	255
Intermediate	1270	536	1051	273
Advanced	1310	444	910	176
Kanji				
Beginning	1481	522	1369	364
Intermediate	1123	336	1505	357
Advanced	1219	403	1207	242

Objects represented in photographs were categorized faster than they were named by beginning- ($F(1, 46)=14.71, p<.001$), intermediate- ($F(1, 44)=3.04, NS$), and advanced-level subjects ($F(1, 46)=16.92, p<.001$).

Words were read significantly faster than they were categorized by the intermediate group ($F(1, 44)=13.94, p<.001$). The beginners read the words at much the same rate as they categorized them ($F(1, 46)=0.74, NS$) as did the advanced subjects ($F(1, 46)=0.01, NS$).

The beginners, who learned the Japanese pronunciation for a particular word at the same time as learning its kanji, accessed the semantic and articulatory information of the kanji at similar speeds. The intermediate subjects, encountering the *on* and *kun* readings of the kanji that were familiar to them, accessed the phonetic code of the kanji prior to the semantic.⁶ The advanced subjects, with much experience in applying the appropriate reading to a kanji in a particular compound and in using the visual aspect of a kanji to access the meaning of previously unknown kanji compounds (see Hatano et al., 1981), accessed the semantic and phonetic codes of kanji at comparable speeds.

The beginners as well as intermediate and advanced subjects categorized the photographs significantly faster than they categorized the words (beginners: $F(1, 46)=16.18, p<.001$; intermediate: $F(1, 44)=23.40, p<.0001$; advanced: $F(1, 46)=23.63, p<.0001$).

Questionnaire Concerning Kanji

In a questionnaire concerning kanji (Appendix B), the alphabet-habituated, second-language learners of Japanese stress the importance of the semantic aspect of kanji and

⁶ It would be enlightening to compare second-language learners at varying levels of proficiency of Japanese kanji reading (with multiple readings) with second-language learners of parallel levels of proficiency in reading Chinese (with single readings) to highlight the influence, if any, of *on* and *kun* readings in learning to read kanji.

view the phonetic information as hardly important at all. Fifty-five percent of the beginners, 35 percent of the intermediate, and 60 percent of the advanced students see kanji as "a pictorial representation of a concept." None of the beginners, 13 percent of the intermediate, and 10 percent of the advanced students see kanji as "phonetic script, like the English alphabet." However, the test results indicate that both the semantic and phonetic codes are equally accessed in the reading of and memory for kanji by the foreign students. In fact, at the intermediate stage of mastering kanji, the phonetic information becomes available prior to the semantic in reading kanji.

The linguistic classification of kanji (the foreign students' view of kanji) coexists with a psychological finding concerning the reading of and memory for kanji (experimental results).⁷ This is a case of mistaking how something happens with what happens. The German reader, I am sure, does not break down *haltestelle* into its component parts "stop for a bus." Likewise, we do not see "suburb" as "sub-urban," unless of course we are explaining the meaning of the word to a non-English speaker. That which happens when we explain the word's meaning and component parts is not the same as that which happens when we read the word.

Such a mismatch between linguistic interpretation and psychological reality concerning kanji did not occur with the native Japanese speakers. Results of a questionnaire (Appendix C) administered to adult Japanese, reveal that 55 percent see kanji as "having a pictorial aspect" and 45 percent see kanji as being "like the English alphabet, phonetic symbols."

Discussion

It would seem that non-native speakers at the beginning and advanced stages of learning to read Japanese as a second language do not approach kanji in the same way as do Japanese children. The children access the phonetic code prior to the semantic while non-Japanese subjects accessed both the semantic and the phonetic at comparable rates. It must be remembered that Japanese children already know the word for dog prior to his learning the kanji for dog. More often than not, the second language learner will be learning the kanji and pronunciation (*on* and *kun*) for dog simultaneously.

Some Practical Recommendations for Teaching Kanji

In learning to write Chinese, the alphabet habituated person simply has to start afresh. (Lado, 1957: 108)

This thesis is not concerned with the pedagogy of the teaching of reading across cultures (Gray, 1960; Downing, 1973). The present findings indicate that Japanese children access the phonetic code prior to the semantic in reading kanji. Japanese adults can access either the phonetic or semantic codes according to the experimental require-

⁷ A questionnaire completed by the second-language learners of Japanese (Appendix D) reveals that while 50 percent believe kanji to be a "pictorial representation of a concept" and that the most effective way of learning kanji is by reading (35 percent) and writing kanji (33 percent), the most popular book to learn Japanese (Appendix F) was in romaji.

ments and particular kanji employed. The visual aspect was found to be important in memorizing Japanese. With these findings and related research in mind, some practical recommendations for the teaching of kanji to the second language learner may be made.

1. Romaji and a hiragana transition phase unnecessary in learning to read

Whether to use Roman script to teach Japanese to alphabet-habituated students is of profound importance for teachers of Japanese. Despite all good intentions, Romanization is likely to become a crutch that some learners will find difficult to throw away when the time comes. Experience shows that for many learners Romanization continues to be the primary mode of visualizing Japanese sounds; it has a virtually permanent, deleterious effect on their reading and certainly their writing fluency (Harries, 1989)

Would we think it strange, even misguided, for a Japanese scholar to devise a complex system of diacritics so that English pronunciation could be noted down with accuracy and taught using *kana*? There is better reason for this than for the other way round, because English spelling is so irregular and unreliable as a system for recording the sounds of English, whereas *kana* is on the whole a reasonably accurate reflection of the spoken sounds of Japanese. Yet we would surely regard such an undertaking as bizarre. As a means of learning Japanese, Romanization should be regarded in the same light.

Steinberg and Yamada (1978) suggest that the teaching of reading of Japanese on a word basis is more effective than on a syllable basis. Furthermore, "if a whole word teaching approach is adopted, then no transition phase where everything is written in hiragana (the usual Japanese teaching practice) is necessary. Such a phase is wasteful, since a majority of the words that are shown in hiragana will never again be seen in that form, once the transition phase is terminated. It would be much better for children to be exposed to words right from the start, regardless of whether they are written in hiragana, katakana, or kanji. All that is necessary is that children be taught words that are meaningful to them (Steinberg and Yamada, 1978: 21)." Steinberg is supported in this view by Oka et al. (1979).

The variable of meaningfulness is vastly more important for the learning of kanji, hiragana, and katakana than is perceptual complexity (the shape of the character, number of strokes, etc.). Steinberg and Oka (1978), Ishii (1961) and Steinberg (1981) found that individual kanji are easier to learn than individual hiragana and katakana. For example, 雪 (*yuki*, snow) is easier to learn than the individual hiragana (ゆ and き) and katakana (ユ and キ).

In teaching alphabet-habituated students to read Japanese through Romanization, hiragana, or katakana, one is doing the student a disfavor by encouraging his already strong phonetic awareness at the loss of the nonlinguistic, visual aspect that kanji offers and which, it would seem, is important to memorizing Japanese (Experiment 5). The limitations of teaching kanji vis-à-vis the phonological route alone was reported by Wang (1981) and Heisig (1989).

The one advantage of learning the kana system first lies not in ease of learning but in allowing the identification of new words. If the new word is written in kana and one knows the kana system, then one may be able to utter and identify that word. This is not possible if the new word is written in kanji; Apart from guessing, the only way one can identify it is by being told what the word is. One need not conclude, however, that new kanji compounds should not be presented to the learner because of the problem of new words. The simple expedient of adding *furigana*⁸ may be used to give the student the opportunity to learn new kanji compounds.

2. Write characters in space

Kūsho (空書) is used to teach Chinese characters to Japanese and Chinese children. (*Kūsho* is what Sasaki (1987) refers to as "writing in space.") This graphomotor coding strategy is encouraged by teachers and involves presenting characters as a sequence of strokes which the children must copy and memorize. This finger writing, according to Sasaki (1987: 146), has two functions: "First providing motor- or action-based representation and second, aiding a conscious mental process by an external action." "Acquisition of kanji contrasts with that of other orthographies, insofar as it makes an additional demand on a nonlinguistic component. The outcome of having to master both kana and kanji is that, for the beginning reader in Japan, both phonetic and graphomotor memory abilities associate with early reading success (Kao et al., 1986: 165).

The Japanese and Chinese encourage the early learner to appreciate the "remarkable graphic-design quality of the Chinese character (Nakatani, 1982)." Indeed, Kao et al. (1986) found in an exploratory study of EEG activities accompanying Chinese calligraphic writing and English that the latter displayed higher left-hemisphere activity, while the former had higher right-hemisphere activity. They attribute this finding to the sequential requirement of English and the visual aspect and early kinesthetic movement of *kūsho* with the Chinese character.

3. Use the radical in teaching Chinese characters

The compound symbols of Chinese writing can all be analysed into 214 constituents ('radicals'). (Bloomfield, 1933: 286)

In an intense program of teaching Chinese characters in China, Wang (1981) found that the learner needs to shift, as soon as possible, from a wholistic approach of learning individual Chinese characters to an analytic strategy of using radicals to learn and remember the increasing number of characters. Heisig (1989) reports a similar finding with Japanese learning kanji.

Indeed, the results of the questionnaires administered to both fluent Japanese readers (Appendix C) and second-language learners of Japanese (Appendix D) show how Japanese adults, foreigners at an advanced level of mastering kanji and, to a lesser degree, foreigners at an intermediate level appreciate the use of radicals in learning to read Japanese. Perhaps the reason that only 5 percent of the beginners saw the radical

⁸ *Furigana* are the hiragana representation of the kanji pronunciation (for example: 雨).

as useful was because they had such a basic level of kanji knowledge that many of the characters they were still learning were radicals themselves (for example, 月 and 口).

4. Graphic connection to the meaning of the kanji

You must put aside your fear of Chinese characters. Don't think of them as words in a foreign language, but as pictures or symbols of objects and ideas, and you'll soon find them wonderfully accessible (Ito, 1988: 41).

The idea of memorizing kanji by illustrating the symbolic logic of the Chinese character has been much covered in the literature (Dykstra, 1985; Ito, 1988; Walsh, 1979; Flaherty, 1985). Heisig's (1989) advice is to allow kanji to "surprise you, inspire you, enlighten you, resist you and seduce you" by the active use of the "imaginative memory."

Perhaps with the recommendations outlined above, the teacher of kanji may help the alphabet-habituated person to organize this "totally arbitrary collection of multiple sounding scribbles" by means other than "simply brainracking memorization to the point of tears" (observations on kanji and its study made by one foreign student subject). The experimental verification of these recommendations awaits further research.

BIBLIOGRAPHY

- Bagley, C. S. Iwawaki and L. Young. 1983. Japanese children: Group oriented but not field dependent? In *Multicultural education*, ed. C. Bagley and G. Verma. Aldershot: Gower Publishing Co.
- Biederman, I. 1980. Cited in O. J. L. Tzeng and H. Singer. 1981. *Perception of print: Reading research in experimental psychology*. Hillsdale, N. J.: Lawrence Erlbaum Assocs.
- Bloomfield, L. 1933. *Language*. New York: Holt, Rinehart and Winston.
- Cattell, J. M. 1886. The time it takes to see and name objects. *Mind* 11: 63-65.
- Chen, H-C. and J. F. Juola. 1982. Dimensions of lexical coding in Chinese and English. *Memory and Cognition* 10(3): 216-24.
- Davidoff, J. B. 1975. *Differences in visual perception: The individual eye*. London: Crosby Lockwood Staples.
- Dhawan, M. and J. W. Pellegrino. 1977. Acoustic and semantic interference effects in words and pictures. *Memory and Cognition* 5: 340-46.
- Downing, J., ed. 1973. *Comparative reading*. New York: MacMillan.
- Dykstra, A. 1985. *The kanji ABC*. Los Altos, California: W. Kaufmann.
- Erikson, D., I. G. Mattingly and M. T. Turvey. 1973. Phonetic activity in reading: An experiment with kanji. *Haskins Laboratories Status Report on Speech Research* 33: 137-56.
- Feitelson, D. 1972. Learning to read. In *UNESCO handbook for reading*. Paris: UNESCO.
- Flaherty, M. 1985. Reading Chinese. *Chinese Culture* (Summer): 7-10.
- . 1990. Reading of and memory for Chinese, English and Japanese scripts. Ph.D. diss., University College, Dublin.
- Fraisse, P. 1960. Recognition time measured by verbal reaction to figures and words. *Perceptual and Motor Skills* 11: 204.
- Gray, W. S. 1960. Reading. In *Encyclopedia of educational research*, 3d ed., ed. C. W. Harris. New York: Macmillan.

- Harries, P. 1989. Matter and method in Japanese language teaching. *Japan Forum* 1(1): 113-18.
- Hatano, G., K. Kuhara and M. Akiyama. 1981. Kanji help readers of Japanese infer the meaning of unfamiliar words. *Quarterly Newsletter of Laboratory of Comparative Human Cognition* 3, no. 2: 30-33.
- Hayashi, M. M., H. K. Ulatowska and S. Sasanuma. 1985. Subcortical aphasia with deep dyslexia: A case study of a Japanese patient. *Brain and Language* 25: 293-313.
- Heisig, J. W. 1989. *Remembering the kanji*, 3d ed. Tokyo: Japan Publication Trading Company.
- Hudson, W. 1960. Pictorial depth perception in sub-cultural groups in Africa. *Journal of Social Psychology* 52: 183.
- . 1967. The study of the problem of pictorial perception among unacculturated groups. *International Journal of Psychology* 2: 90.
- Ishii, I. 1961. *How I teach kanji in the classroom*. Tokyo: Reimei Shobō.
- Ito, K. 1988. What happens when you cross a Chinese character with a Mercedes-Benz? *Upper and Lower Case. The International Journal of Typography* 15(3): 40-45.
- Iwata, M., M. Sugishita and Y. Tookura. 1981. The Japanese writing system and functional hemispheric specialization. *Proceedings of the 12th World Congress of Neurology*. Kyoto, Japan.
- Kao, H. S. R., D. T. L. Shek, A. W. L. Chau and S. P. W. Law. 1986. An exploratory study of EEG activities accompanying Chinese calligraphic writing. In *Linguistics, psychology, and the Chinese language*, ed. Centre of Asian Studies. University of Hong Kong.
- Lado, R. 1957. *Linguistics across cultures*, ed. H. S. R. Kao and R. Hoosain. Ann Arbor: University of Michigan Press.
- Lieberman, I., A. M. Liberman, J. Mattingly and D. Shankweiler. 1980. Orthography and the beginning reader. In *Orthography, reading and dyslexia*, ed. J. Kavanagh and R. Venezky. Baltimore: University Park Press.
- Lynn, R. 1987. The intelligence of the Mongoloids: A psychometric, evolutionary and neurological theory. *Personality and Individual Differences* 8(6): 813-44.
- Lynn, R., S. L. Hampson and S. Iwawaki. 1987. Abstract reasoning and spatial abilities in American, British and Japanese adolescents. *Mankind Quarterly*.
- Mae, C. C. 1976. Even Chinese ideograms are phonologically encoded in STM! Paper presented at First Annual Boston University Conference on Language Development, Boston.
- Morikawa, Y. 1981. Stroop phenomenon in the Japanese language. *Perceptual and Motor Skills* 53: 67-77.
- Morton, J. and S. Sasanuma. 1984. Lexical access in Japanese. In *Orthographies and reading: Perspectives from cognitive psychology, neuropsychology and linguistics*, ed. L. Henderson, London: Lawrence Erlbaum Associates.
- National Language Research Institute. 1984. *A study of the fundamental vocabulary for Japanese language teaching*. Tokyo: Shūeisha.
- Nelson, D. L., V. Reed and C. L. McEvoy. 1977. Learning to order pictures and words: A model of sensory and semantic encoding. *Journal of Experimental Psychology: Human Learning and Memory* 3: 485-97.
- Oka, N., J. Mori and S. Kakigi. 1979. Learning of reading kanji and kana moji in young children. *Japanese Journal of Psychology* 50 (1): 49-52.
- Paivio, A. 1975. Perceptual comparisons through the mind's eye. *Memory and Cognition* 3: 635-47.

- Potter, M. C. and B. A. Faulconer. 1975. Time to understand pictures and words. *Nature* 253: 437-38.
- Saito, H. 1981. Use of graphemic and phonemic encoding in reading kanji and kana. *The Japanese Journal of Psychology* 52(5): 266-73.
- Salkind, N. J., H. Kojima and T. Zelniker. 1978. Cognitive tempo in American, Japanese and Israeli children. *Child Development* 49: 1014-24.
- Sasaki, M. 1987. Why do Japanese write characters in space? *International Journal of Behavioral Development* 10(2): 135-49.
- . 1975. Kana and kanji processing in Japanese aphasics. *Brain and Language* 2: 369-83.
- Sasanuma, S. 1980. Acquired dyslexia in Japanese: Clinical features and underlying mechanisms. In *Deep Dyslexia*, ed. M. Coltheart, K. Patterson, and J. C. Marshall. London: Routledge & Kegan Paul.
- Sasanuma, S. and O. Fujimura. 1971. Selective impairment of phonetic and non-phonetic transcription of words in Japanese aphasic patients: Kana vs. kanji in visual recognition and writing. *Cortex* 7: 1-18.
- Shimamura, A. P. 1987. Word comprehension and naming: An analysis of English and Japanese orthographies. *American Journal of Psychology* 100(1): 15-40.
- . 1984. Comprehending logographic and phonetic symbols in Japanese and English-speaking individuals. Ph. D. diss., Univ. of Washington.
- . 1979. The processing of ideographic and phonemic symbols: A Japanese version of Stroop phenomenon. Ms., Univ. of Washington.
- Shimamura, A. P. and E. Hunt. 1978. Stroop interference test with kanji and kana scripts. Ms. Univ. of Washington.
- Smith, M. C. and L. E. Magee. 1980. Tracing the Time Course of Picture-Word Processing. *Journal of Experimental Psychology: General* 109: 373-92.
- Steinberg, D. D. 1981. Learning to read kana and kanji by young children. *The Japanese Journal of Psychology* 52(5): 309-12.
- Steinberg, D. D. and N. Oka. 1978. Learning to read kanji is easier than learning individual kana. *The Japanese Journal of Psychology* 49(1): 15-21.
- Steinberg, D. D. and J. Yamada. 1978. Are whole word kanji easier to learn than syllable kana? *Reading Research Quarterly* 1: 88-99.
- Stevenson, H. W., J. W. Stigler, S. Lee, G. W. Luckier, S. Kitamura, and C. Hsu. 1982. Cognitive performance of Japanese, Chinese and American children. *Child Development* 56: 718-34.
- Taylor, I. 1980. The Korean writing system. In *Processing of visible language*, Vol. 2, ed. P. A. Kollers, M. Wrolstad, and H. Bouma. New York: Plenum Press.
- Theois, J. and K. Freedman. 1984. The widely reported "advantage" of pictures over words is due to the widespread use of large pictures and small words. Paper presented at the 25th Annual Meeting of the Psychonomics Society, San Antonio, Texas.
- Tzeng, O. J. L., D. L. Hung, and W. S. Y. Wang. 1977. Speech recoding in reading Chinese characters. *Journal of Experimental Psychology: Human Learning and Memory* 3, no. 6: 621-30.
- Vellutino, F. 1977. Alternative conceptualizations of dyslexia: Evidence in support of a verbal deficit hypothesis. *Harvard Educational Review* 47: 334-54.
- Walsh, L. 1979. *Read Japanese today*. Tokyo and Rutland, Vt.: Charles E. Tuttle.
- Wang, W. S-Y. 1981. Language structure and optimal orthography. In *Perception of print*,

- ed. O.J.L. Tzeng and H. Singer. Hillsdale, N. J.: Erlbaum, Lawrence, Assocs.
 Yamadori, A. 1975. Ideogram reading in alexia. *Brain* 98::231-38.
 Yik, W. F. 1978. The effect of visual and acoustic similarity on short-term memory for Chinese words. *Quarterly Journal of Experimental Psychology* 30: 487-94.

Appendix A

Kanji Test Administered to Second-Language Learners of Japanese (English Version)

これは、漢字テストです。次の漢字の読みと意味を、下のカッコの中に書いて下さい。また漢字の読みは、ひらがな、カタカナまたはローマ字書き、漢字の意味は日本語か、あなたの母国語で書いて下さい。

This is a kanji test. Please write the pronunciation and meaning of the kanji characters which you know in the spaces provided.

The pronunciation is to be written in hiragana, katakana, or romaji; the meaning in Japanese or your native language.

kanji 漢字	pronunciation 読み	meaning 意味	kanji 漢字	pronunciation 読み	meaning 意味
1. 河	() ()	()	22. 口	() ()	()
2. 馬	() ()	()	23. 血	() ()	()
3. 技	() ()	()	24. 壳	() ()	()
4. 都	() ()	()	25. 低	() ()	()
5. 性	() ()	()	26. 青	() ()	()
6. 液	() ()	()	27. 目	() ()	()
7. 赤	() ()	()	28. 神	() ()	()
8. 緑	() ()	()	29. 油	() ()	()
9. 手	() ()	()	30. 味	() ()	()
10. 白	() ()	()	31. 店	() ()	()
11. 私	() ()	()	32. 牛	() ()	()
12. 肉	() ()	()	33. 齒	() ()	()
13. 夫	() ()	()	34. 島	() ()	()
14. 冷	() ()	()	35. 茶	() ()	()
15. 耳	() ()	()	36. 氷	() ()	()
16. 命	() ()	()	37. 黒	() ()	()
17. 人	() ()	()	38. 船	() ()	()
18. 胃	() ()	()	39. 老	() ()	()
19. 湯	() ()	()	40. 体	() ()	()
20. 坂	() ()	()	41. 足	() ()	()
21. 食	() ()	()	42. 犬	() ()	()

Appendix B**Questionnaire Administered to Second-Language Learners of Japanese (English Version)**

-
1. What country are you from? ()
 2. What is your native language? ()
 3. What languages can you read? ()
 4. Do you see any similarity between kanji and the written form of your native language? (Yes / No)
 5. As a child, did your parents communicate with you in Japanese? (Yes / No)
 6. How long have you been studying kanji?
 - (a) Less than 6 months (b) 6 months to 1 year
 - (c) 1 year to 2 years (d) More than 2 years
 7. How many hours a week do you study kanji in any form? (Please include BOTH private study and class time.)
 - (a) Less than 2 hours (b) 2 to 6 hours
 - (c) 6 to 12 hours (d) More than 12 hours
 8. For what reason are you studying kanji?
 - (a) Personal (b) Career (c) Academic (d) Other
 9. Do you see kanji to be . . .
 - (a) A phonetic script as with English alphabet.
 - (b) A pictorial representation of a concept.
 - (c) Both phonetic and pictorial.
 10. What have you found to be the most effective way of memorizing kanji?
 11. Which textbook / textbooks did you find most useful in studying kanji? Please give title and author, if possible.
-

Questionnaire Administered to Japanese Adults and English Translation

-
1. あなたは漢字をどのようなものとして見ますか。
 - (a) 英語のアルファベットのような音標文字である。
 - (b) 概念を絵で象徴するものである。
 - (c) (a), (b) の両方である。
 2. 漢字を憶えるのに一番良い方法は何だと思えますか。

English Translation

1. How do you view kanji?
 - a. Like English alphabet, a phonetic symbols
 - b. As having a pictorial aspect
 - c. Both (a) and (b)
 2. What do you think is the best way to remember kanji?
-

Appendix C**Results of a Questionnaire Administered to Japanese Adults (English Translation)**

	Percentage
1. How do you see kanji?	
(a) Like English alphabet, as phonetic symbols	45
(b) As having a pictorial aspect	55
(c) Both (a) and (b)	1
2. What do you think is the best way to remember kanji?	
(a) By reading books	30
(b) By writing the kanji over and over again	36
(c) By studying the history of kanji and meanings of radicals	26
(d) By memorizing the kanji as a whole pattern, an image	4
(e) By using kanji in any way in daily life	3
(f) By being highly motivated	1

Appendix D**Results of a Questionnaire Administered to Second-Language Learners of Japanese**

	Percentage			
	Beg	Int	Adv	Total
1. How do you see kanji?				
(a) A phonetic script, as with English alphabet	—	13	10	07
(b) A pictorial representation of a concept	55	35	60	50
(c) Both phonetic and pictorial	45	52	30	40
2. What have you found to be the most effective way of memorizing kanji?				
(a) By reading books	50	32	23	35
(b) By writing the kanji over and over again	15	40	43	33
(c) By studying the history of kanji and meanings of radicals	5	16	24	15
(d) By memorizing the kanji as a whole pattern, an image	30	—	—	10
(e) By using kanji in any way in daily life	—	12	10	07

Appendix E

Textbooks and Dictionaries Recommended by Experiment Participants

Textbooks		*Use of romaji/ kana/kanji	All readings of a kanji	Examples of kanji compounds	Some history of kanji
Authors					
<i>Japanese Language</i> (1986)					
Jordan, E. H. & Chaplin, H.	1	romaji	no	no	no
<i>Learn Japanese</i> (1985)					
Young, J. & Nakajima-Okano, K.	2	kana / kanji	no	yes	yes
<i>Japanese</i> (1984)					
Hibbett, H. & Itasaka, G.	3	kana / kanji	no	no	no
<i>Modern Japanese</i> (1977)					
Mizutani, O. & Mizutani, N.	4	kana / kanji	no	yes	no
<i>Nihongo</i> (1970)					
Naganuma, M.	4	kana / kanji	no	yes	no
<i>Nihongo no Kiso</i> (1976)					
Kaigai Gijutsu Kenshū Kyōkai	4	kana / kanji	no	yes	no
<i>Nihongo Journal</i>	4	kana / kanji	no	yes	yes
Kanji dictionaries		*Use of romaji/ kana/kanji	All readings of a kanji	Examples of kanji compounds	Some history of kanji
Authors / Editors					
<i>Chinese-Japanese Character Cards: New Series 1, 2, 3</i> (1971)					
Naganuma, N.	1	kana / kanji	no	no	no
<i>Essential Kanji</i> (1973)					
O'Neill, P. G.	1	kana / kanji	yes	yes	no
<i>A Guide to Reading and Writing Japanese</i> (1984)					
Sakade, F.	1	kana / kanji	yes	yes	no
<i>Today's Japanese Kanji</i> (1980)					
Brannen, N. S.	2	kana / kanji	no	no	no
<i>The Kanji ABC</i> (1985)					
Dykstra, A.	2	kana / kanji	yes	yes	yes
<i>The Modern Reader's Japanese- English Character Dictionary</i>					
Nelson, A. N.	2	kana / kanji	yes	yes	no
<i>Kanji and Kana</i> (1981)					
Hadamitzky, W. & Spahn, M.	3	kana / kanji	yes	yes	no
<i>Remembering the Kanji</i> (1984)					
Heisig, J. W.	3	kana / kanji	yes	yes	yes
<i>Read Japanese Today</i> (1979)					
Walsh, K.	3	romaji	yes	yes	yes

* Most highly recommended = 1.