USE OF CHINESE CHARACTERS AND DRAWING AS AIDS IN TEACHING YOUNG CHILDREN TO READ ENGLISH

By

SUH ER WONG

Bachelor of Arts

Nanyang University

Singapore

1979

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
May, 1986

USE OF CHINESE CHARACTERS AND DRAWING AS AIDS IN TEACHING YOUNG CHILDREN TO READ ENGLISH

Thesis Approved:

John C McCullers
Thesis Adviser

Mona Lane

Frances Stromberg

Paul Y. Lin

Norman D Durham
Dean of the Graduate College

ACKNOWLEDGMENT

I wish to express my sincere gratitude to all the people who assisted me in this study and during my stay at Oklahoma State University. I am especially indebted to my major advisor, Dr. John C. McCullers, for his invaluable guidance and assistance throughout this study. I am also grateful to other committee members, Dr. Frances Stromberg and Miss Mona Lane, for their moral support, and helpful guidance. Especially, Miss Mona Lane contributed many hours of time and effort in sharing her knowledge of the research issues related to the present project. The general linguistic contributions of Dr. Paul Lin, as Chinese language specialist and fourth member of the committee are also gratefully acknowledged.

Special mention must be made of the personal involvement of three other people for patient assistance and cooperation in collecting the data. They are Galye Broberg, Carla Goble and Anne Bomba.

I wish to thank the teachers of Oklahoma State University Child Development Laboratories, Stillwater YMCA, and The First Presbyterian Preschool for their assistance and cooperation, as well as all the children and their parents who helped to make the study possible.

I am also thankful for the unforgetable friendship, encouragement, and help of my friends, Carolyn Allen, Steven Lee and brothers and sisters of the Stillwater Chinese Bible Study Group, especially Chi-Chung Chang, Siew Joo Lim, Yuh-Ling Chen and Chai Lim.

Finally my parents, Mr. and Mrs. Sah Quan Wong, and parents-in-law, Mr.and Mrs. Kee Hing Yeo, and in particular, my husband, deserve my deepest appreciation and gratitude for their patience, constant support, sacrifices, moral encouragement and understanding. Their love provided me with a source of encouragement, energy and pleasure during the many long hours involved in this project.

This thesis is affectionately dedicated to my husband, Yek Hwee Yeo, and to my son, Justin Zuo Jin Yeo, who was my constant companion throughtout the project until his birthday. He was born near the conclusion of the study.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Use of Chinese Characters and Drawing as Aids in Teaching Young Children to Read English

Suh E. Wong

and

John C. McCullers

Oklahoma State University

This article is based on the Master's thesis research of the first author, conducted under the direction of the second author. Funds in support of the research were provided to the second author by the College of Home Economics, Oklahoma State University. The authors wish to thank Mona Lane, Acting Director, Oklahoma State University Child Development Laboratory, Annette Downs, Director of the Stillwater YMCA, and Holly Hartman, Director of The First Presbyterian Preschool, Stillwater, Oklahoma, for assistance and cooperation in obtaining subjects. The authors also wish to thank Gayle Broberg, Carla Goble and Anne Bomba for assistance in collecting the data.

Finally, the authors extend their appreciation to the other committee members, Frances Stromberg, Mona Lane, and Paul Lin for their contributions to this project.

Abstract

This experiment was conducted to determine if Chinese characters and drawing could help English-speaking preschool children learn to read English words. The subjects were 60 children whose average age was 4.6 years assigned to one of the three groups. One group ("Chinese") learned seven modern Chinese characters, one (Drawing) drew pictures representing these seven words, and the third group (Control) did neither. All three groups were taught the English words corresponding to the Chinese characters/ drawings of the first two groups. The Chinese group children learned to read the Chinese words faster than the corresponding English words. The Chinese group learned to read the English words better than either the Drawing or Control groups. The Drawing group learned better than the Control group but not significantly so. The findings suggest that Chinese characters could be used to aid preschool children in learning to read English.

Use of Chinese Characters and Drawing as Aids in Teaching Young Children to Read English

Considerable attention has been given to children's art as a way to understand and enhance the child's cognitive development. For example, Kellogg (1969) has stated that the "opportunity to scribble freely has meaning for two critical operations of intelligence: reading and writing"(p. 262). Writing and reading are specifically related to graphic representation. The aim of this study was to further explore the relationship between drawing and graphic representation on the one hand and writing on the other. In particular, the intent was to examine the possiblity of using Chinese characters as a mediator between drawing pictures and reading English words, given that the Chinese character has both a pictographic/ideographic element in common with graphic representation and an abstract, symbolic element in common with the written English word.

Graphic Representation

Graphic symbols are communicated via visual, representational forms of expression whereas verbal thinking is communicated orally. Thus, verbal symbols are less tangible than graphic symbols. The development of graphic and verbal skills has been studied by many researchers, but there is disagreement as to which is more fundamental in the order of development. Jameson (1968) considers the educational significance of the drawing and painting of

young children as an important starting point for educational skills--reading, writing and spoken communcitaiton. In line with Jameson, Kane (1982) suggests that drawing should precede writing in the development progression. However, Brittain (1979) has found an interesting parallel in the production of graphic forms between drawing and writing. Graves (1979), investigating processes of written composition, suggested drawing may serve as a form of prewriting. In agreement with Kellogg (1969), he also sees drawing and handwriting to be related processes for young children. Grinnell and Burris (1983) found evidence of the importance of drawing as a precursor to composition by helping children think about what they want to write, conveying information that is too difficult to put into words, and providing a format for revision. Clay (1977), in research with New Zealand children on the externalization of written language, concluded that creative drawing motivates written language.

Creative drawing also appears to be a significant factor in the development of verbal skills. A recent experimental study conducted by Zepeda-de-Kane (1978) indicated that kindergarten children can verbalize to significantly greater degrees and utter more complex, more elaborate language when they draw pictures before telling a story about a field trip they had taken than similar children who are merely shown pictures of the field trip. Thus, there is growing evidence that children's creative

drawing and other forms of pictorializing seem to serve essential conceptualizing needs in the writing process (Emig, 1977). Based on such research and reasoning, it appears reasonable to expect a connection between drawing and reading.

The child who has developed the ability to create art gestalts should learn to read quickly and well. According to Kellogg (1967), scribbling and drawing help to develop the child's ability to perceive abstract gestalts, an ability that is necessary for learning to read. She found that children who had been allowed to experiment with and produce abstract esthetic forms actually developed the mental set required for learning symbolic language. Kellogg also noted that scribbling and drawing provide the groundwork for improving children's reading and writing.

Consistent with Kellogg, Brittain (1979), in a long-term study of young children's art, found that children who do a lot of drawing show greater reading readiness than children who do not draw very much. He concluded that children use drawings as a means to formulate their thoughts and ideas internally. Their marks on paper serve as shorthand notations of an event, and in some cases are seen by the child as resembling or symbolizing something in his environment. In this sense, the child reads his pictures, using his own words and his own experiences as references.

Drawing therefore appears to be related to the underlying cognitive process necessary to acquiring the

basic skills for reading. However, learning to read is a complex process, and Brittain pointed out that a youngster must not only be "ready," but also be eager to discover what the symbols mean and try to translate the written word into meaningful information. Words are not isolated abstract forms to be memorized but are rather indicators of experience that need a reference point in the child's life.

Therefore, allowing a child to make his own discoveries of form and shape, i.e., self-identification with symbols could provide a very good educational foundation for an effective reading program. Nevertheless, much of the work that has been done to date has concentrated on the mechanics of reading, and little study has been given to the developmental mechanisms that may underlie the reading process. This issue provided another impetus for the present study.

Development and Evolutionary Transitions from Drawing to Writing

Scribbling is an early form of drawing, and children's drawing evolves from scribbling to pictorial work. In order to have a precise overview of children's art, Kellogg (1969) developed an elaborate system of classifying children's early drawings. She collected thousands of children's drawings from nursery school children and analyzed them in terms of the basic form and line. She observed 20 basic scribbling components that evolved into children's drawings. Such elementary line formations could be found in every

later drawing, pattern, shape, design, pictorial or language symbol. Thus, according to Kellogg, the child, in learning to read, must perceive line formations that are like the ones the child has made spontaneously.

Kellogg and O'Dell (1967) and Kellogg (1969) also implies that prehistoric art followed this same evolutionary pattern and that the art of prehistoric man included the abstract and early pictorial motifs commonly found in children's art today. Moreover, many drawings done in other countries have the familiar look of a universal children's art. And these children's art motifs in archaic, primitive, traditional and modern art indicate that they could have occurred in all places and all historical periods. From her collections, Kellogg (1967, 1969) also noted that drawings are significant because they document the progression from pictographic to alphabetic symbols. Perhaps the art of young children everywhere is identical in that it comes from the same (brain) developmental beginnings and uses the same shapes found in primitive art.

Cuneiform, hieroglyphic, and other forms of writing originated in picturemaking. Contemporary alphabet symbols developed from pictorial symbols and this pictographic progression of drawing to script may reflect an evolutionary process that children recreate and follow on their own individual development. One illustration used in Kellogg's book (1969) showed the symbols that an African chief designed as written letters in a first attempt to create an

alphabet for his language. His final choice of letters included 140 symbols, many of which can also be found in children's art.

Primitive Chinese characters provide some of the earliest written symbols available to us, and, interestingly enough, they originated in picturemaking. The hieroglyphic characters of Chinese were derived from the shape of concrete objects and have been simplified to their present ideographic forms, i.e., the ancient Chinese pictograph for "Mountain" (a) underwent modifications (e.g., "b") over the years, eventually arriving at the current form of the word ("c"):

(a) (b) (c)

Although the current form of Chinese words (ideograms) are not pictographic, they have a more direct connection with pictorial symbolic meaning than do written words in English (Wang, 1973; Wieger, 1927/1965). As Park and Arbuckle (1977) have suggested, ideograms may at times be an abstract but vital intermediary step (that contains an underlying dimension of information content) between pictures and purely symbolic, written words as in English. These considerations encouraged us to ask whether the use of Chinese characters could help young English-speaking children learn to read English.

Chinese as a Possible Mediator between Drawing and Reading

Chinese characters have some elements of pictures and

also some elements of the pure symbol, and so might serve as a bridge between pictures and abstract words. If this is true, it should be possible to teach children to read Chinese characters more easily than abstract English words, and learning to read Chinese might help the children to learn to read English.

Although it may appear far-fetched to teach Chinese characters in order to learn to read English, there is a logical connection or link between the two. Although the Chinese character "人" and the English word "man" have no obvious connection, it is possible that the Chinese character has an pictographic link to the picture of a man. The character "人" is also a highly symbolic, written representation like English. So, it is possible that if the child can learn to deal with abstract symbols in Chinese, s/he might be able to deal with them more easily in English.

Research conducted by Rozin, Poritsky and Sotsky (1971), supports the possibility of such a learning bridge using Chinese characters and English words. Rozin and his fellow researchers used 30 different Chinese characters to teach American children who had clear reading disabilities to read English material. The success of their program, according to them, could be attributed to the novelty of the Chinese orthography and to the fact that Chinese characters map into speech at the level of words rather than of phonemes. They also proposed that reading disability could be accounted for in terms of the highly abstract outline of

phonemes (the critical unit of speech in alphabetic systems).

Another interesting finding is that in Japan, where written scripts consist of Kana (phonetic letters) and Kanji (ideographs which originally were borrowed from Chinese but read differently), there has been a rarity of reading disability reported for Japanese children (less than 1%). The level of reading disability is much higher in Western countries (e.g., 15% in the U.S.A., as estimated by Gibson & Levin, 1975), where the mechanism of reading is based on combinations of 26 Roman letters (Makita, 1968). Makita implied that the specificity of the symbols used in the language is the most potent contributing factor in the formation of reading disability.

Parallel to Makita's report, Tarnopol and Tarnopol (1976) estimated that fewer than 1% of Taiwanese school children have reading disability. One study investigating the effect of ideogram and alphabet scripts on memory in "Biscriptual" Korean subjects has reported that words presented in ideographic script were remembered better than words presented in alphabetic script, on both recognition and free recall (Park & Arbuckle, 1977). Several studies have investigated how the different types of written systems activate different processing strategies and have yielded parallel findings to Park and Arbuckle.

Biederman and Tsao (1979) found that the magnitude of the Stroop-interference effect is much greater in the

Chinese version with Chinese subjects than in the English version with American subjects. They suspected that there may be some fundamental differences in the perceptual demands of reading Chinese and English. Hatta (1977); Sasanuma, Itoh, Mori and Kobayashi (1977) have found that for normal subjects a right visual field (RVF) superiority is generally found for Kana words and a left visual field (LVF) superiority is generally found for Kanji.

Sasanuma, Itoh, Kobayashi and Mori (1980) suggested that logographic writing systems demand a greater dependence on visual strategies than do phonetic-based writing systems, which tend to depend more on phonological strategies. The left hemisphere (RVF) is more efficient in phonological processing of Kana characters, while the right hemisphere (LVF) is more efficient in visual processing of Kanji characters. Recent work (Chen & Juola, 1982) has also suggested that alphabetic and logographic writing systems apparently activate different coding and memory mechanisms such that logographic characters produce significantly more visual information in memory, whereas alphabetic words result in a more integrated code involving visual, phonological, and semantic information.

The Present Study

Based on the amount of research literature available that shows the visual recall of ideographic characters is superior to alphabetic characters, it was deemed possible to test the hypothesis that learning Chinese characters should

facilitate young children's learning to recognize English words. Further, it would appear that if children are taught the evolution of the Chinese character from pictures to ideogram, they should find it easier to learn the current, more symbolic (ideographic) forms of the Chinese character.

Method

Subjects

The subjects were normal, English-speaking preschool children in Stillwater, Oklahoma, enrolled in programs at Oklahoma State University, The First Presbyterian Preschool, and the YMCA. A total of 78 subjects participated initially in the study, but to achieve adequate matching, the final sample consisted of 60 white subjects (30 males and 30 females) with a mean age of 4 years, 6 months (Range=4 years, 0 months to 5 years, 0 months). These 60 subjects were assigned in equal numbers to one of three groups (10 males and 10 females each) matched on age, sex, and peabody Picture Vocabulary Test (PPVT) IQ scores (mean PPVT IQ = 109.58, range = 87 - 150). None of the subjects had any initial knowedge of Chinese. Each group was assigned to a different experimental condition at random.

Materials/Stimuli

Line Drawings and Chinese Characters. The stimuli were 14 line drawings of common objects familiar to children of this age (except perhaps the goat and rice), as shown by pilot testing. These 14 objects were compiled, and their names were written in English and in Chinese. These items

were chosen because they have pictographic components in the Chinese characters and are familiar, unambiguous words in both languages.

As revealed by a pilot study (See Appendix A), words with similar perceptual images when taught together, produced discrimination problems for the children. Thus, the 14 Chinese characters were intentionally divided into two 7-word sets to eliminate this problem. Moreover, the pilot study also showed that children of this age could not cope with 14 words at a time, but were able to learn seven words without fatigue or loss of attention. The use of the 7-word sets of characters was considered appropriate so that the results of learning would not be attributed to one particular set of words.

The 14 Chinese words were not randomly divided into two 7-word sets. Rather, the two sets were chosen on the basis of perceptual similarity, so as to make the two 7-word sets (i.e., Forms A and B) as closely equivalent as possible, both perceptually and in terms of level of difficulty in the two languages (See Figure 1, in Appendix E), and to minimize interference within a set.

Single Card: Chinese. The line drawings and Chinese words were drawn and written individually in black ink on 8cm by 8cm plastic-coated, yellow cards. The Chinese words had one character corresponding to one syllable. Mean pen strokes per character were 6.00 (ranging from 2 to 12 penstrokes). The visual evolutionary sequence of each

character was comprised within a two- or three-card series. A total of 58 cards were used to explain the evolution of the 14 Chinese word-picture connections (see Appendix E, Figure 2).

Single Card : English. The English words were also written in black ink on the same type of cards, in lower case letters (3/4" Helvetica Permanent Presto Stik Vinyl plastic letters; see Figure 4 in Appendix E). English words varied from three to eight letters (mean = 4.29 letters), and from one to three syllables. English words had no pictorial evolution, so there were a total of 28 cards for 14 English words and 14 corresponding line drawings. The 8cm by 8cm cards of the same type of cards were also printed for the 14 English words, with a Futura Demi Bold 24 point (1/4") lettering set (See Figure 4, in Appendix E). This was for use in playing the matching game (See Figure 5, in Appendix E) described below.

Boards: Matching Game, Methods 1 and 2. Other task materials were several matching-game boards. A set of 14 pictures that were identical to those on the single cards, and two additional pictures were used to make up a 34cm by 34cm colorful picture board. Similar boards were also made for English words and for Chinese words. Thus, the matching game used three 16-item square boards: (a) a picture board, (b) a board with English words, and (c) a board with Chinese words (See Figure 5, 6 , 7 and Table 9 in Appendix E).

The three boards were used for recognition testing

purposes. Each child was required to play the matching game in two ways. Method 1 required children to match the words (English or Chinese) to corresponding pictures, whereas Method 2 required children to match the pictures to corresponding words. The Method 1, which was considered to be easier than Method 2, was presented to the children first. However, Method 2 was used to determine whether children could pass a more stringent test of learning.

Design

The research design consisted of three separate sessions; a pretest session, a treatment session, and a reading session.

Pretest Session. All subjects were presented three preliminary tasks: (a) the Peabody Picture Vocabulary Test; (b) a list of 25 English words that included the 14 key words to be used in the study; and (c) 14 pictures corresponding to the 14 key words plus two extra pictures to make up a 16-picture (34 * 34cm) square picture board. These materials were used to obtain initial data on the child's verbal I.Q. and to make sure that all subjects could identify the objects by picture but could not yet read the corresponding English words for the object prior to task engagement.

Treatment Session. During the treatment session, which occurred approximately two weeks after the pretest session, the three groups of children (Chinese, Drawing, and Control) performed as follows:

a. Chinese Group: In this group, a total of 20 children was taught Chinese. Half of the subjects in this group (5 females and 5 males) were taught the Form A and half the Form B set of seven Chinese ideographs using a teaching method that involved showing the visual, historical evolution of each Chinese character from ancient picture or pictograph to the modern, present-day character.

b. Drawing Group: Children in this group did not learn Chinese characters but instead drew pictures. One set of seven ideographs was verbalized to one-half of the subjects (5 females and 5 males) and other set to the remaining subjects. The subjects responded to each word by drawing an appropriate picture.

c. Control Group: Children in this group did not learn Chinese characters or draw pictures, but continued with their regular preschool activities during the Treatment session.

Reading Session. This session occured 3 to 5 days after the Treatment session. All three groups of children were shown one set of seven pictures, and taught the corresponding English words one at the time by the "look and say" system. The subjects were required to read the words and play the matching game in the same way described for the Chinese group.

Procedure

Each subject participated individually in a private room. Subjects were allowed to practice labeling and

matching the pictures used in the experiment during the pretest session prior to the actual task. In the actual task subjects were introduced to the materials and the tasks were explained to them. The Chinese group was presented the seven items from either Form A or B Chinese word set. The items were shown one at a time and the child was taught the evolutionary sequence of the Chinese words sequentially rather than simultaneously. For example, the cards for a given word were placed side by side (See Figure 2, Appendix E) and the parts of the pictograph that carried over to the later forms were pointed out. Thus, the child was helped to "see" the pictograph in the current form of the Chinese characters. The child was required to read the Chinese words in English. A multiple trial testing method was used in which seven ideographs were presented once and then all ideographs were tested by a recognition procedure (Methods 1 and 2). The child was tested (Method 1) by being asked to place the ideograph card on the corresponding 16-item picture board and, vice versa (Method 2), to place the picture on the appropriate ideograph.

The learning criterion was one perfect trial (i.e. all seven ideographs recognized and matched correctly). If the child failed to match any of the seven characters and pictures correctly s/he was given another training trial and recognition test on the game board. This procedure continued, as long as the child was willing to keep trying, until either the learning criterion or a maximum of 7 trials

was reached. Encouragement was provided to keep the child interested in the task.

Testing with Method 2 (picture-word matching) occurred immediately after the Method 1 (word-picture matching) test. The subjects were asked to match the seven pictures corresponding to the seven learned Chinese words one at a time. Correctness or incorrectness of responeses were indicated and recorded by the experimenter, and errors were corrected immediately by the child.

Members of the Drawing group were asked to draw a picture for each of the seven words. Information about the object represented by the words was provided to the subject to help them grasp the object's visual appearance, if the child had no idea how to draw the object.

During the reading session, all 60 children were taught to read the seven English words corresponding to Form A or B by the "look and say" method. The teaching and testing procedures were the same as used in learning Chinese by the Chinese group. Each time the subject finished each task s/he was rewarded by star stickers and verbal approval.

Results

The results are presented gererally in the same sequence as that of the experimental design. That is, the results of the Pretest Session will be presented first, the Treatment Session results next, followed by Reading Session results.

Most of the data were analyzed via the Statistical

Analysis System (SAS) computer program. The information on different measures and different experimental conditions and raw data for each subject are presented in Appendices D and F respectively.

Prestest Session

All 60 children participated in this session. Mean Peabody Picture Vocabulary Test (PPVT) scores and standard deviations were computed for the three groups and these are presented in Table 1. The overall mean PPVT score for all

---

Insert Table 1 About Here

---

three groups combined was 109.58 (range = 87 - 150). Analysis of PPVT IQ scores revealed that there was no significant difference initially between the three groups $F(2, 57) = .0009$, $p > .25$.

The results of the pretest on the words and pictures revealed that all the children met the criterion for being included in the study in that they could not read any of the 14 key words but could identify the corresponding objects in the pictures.

Treatment Session

a. Chinese Group: The Children took about 5 to 7 minutes to learn the 7 Chinese characters, and 10 to 15 minutes to complete the two matching games.

The results of learning Chinese on Method 1 scores from the matching game was measured in terms of numbers of trials

required to reach criterion. Of the 20 children (all learners), 7 and 8 children learned all 7 words in first and second trial respectively. An analysis of mean of numbers of trials to reach criterion showed that children took anaverage of 2 trials to learn all 7 words (M = 2, SD = .973).

b. Drawing Group: Because of the purpose of the present study, there was no intent to analyze the actual drawings obtained from this group.

c. Control Group: During the treament session, children continued with their regular preschool activities, therefore no data were obtained from this group.

Reading Session

Within-Group Comparision: Chinese vs. English. Performance was assesed in terms of four measures. There were: (a) numbers of learners (subjects who reach the criterion of one perfect trial); (b) proportion of correct response to the base of total opportunities to make correct response (PROP); (c) total numbers of trials required to reach criterion (TRI); (d) maximum percent of correct responses achieved (CORR).

A comparision of learning the two languages was analyzed based on Method 1 scores from the matching game. A Chi-square analysis indicated that the number of learners were significantly different for two languages, $\chi^2(1, N = 40) = 5.714$, $p < .025$, and that there were more learners with Chinese than with English words.

To determine whether learning Chinese was easier or faster than learning English, the proportions of correct words responses of learners were subjected to a Wilcoxon Rank Sum Test (non-parametric equivalent of the t-test). The results (T = 2.14, p<.02) showed that Chinese learning resulted in a higher proportion of correct words.

An analysis of the mean of numbers of trials to reach criterion also revealed that children took fewer trials (M = 2, SD = .973) to learn Chinese characters than English words (M = 4.27, SD = 2.12) for Method 1, $t(33) = -4.237$, p<.005.

Analyses of variance were also computed on CORR and PROP scores to determine the effects of learning the two languages as a function of four variables: Form, Sex, Method and Language. The analyses of variance are presented in Table 2.

Insert Table 2 About Here

The analyses showed that Sex was statistically significant for both measures (CORR: $F(1, 79) = 4.58$, p< .036; PROP: $F(1, 79) = 5.85$, p<.018), the sex difference was due to females having higher mean scores. The mean scores are presented in Table 3. The CORR analysis showed

---

Insert Table 3 About Here

---

that the main effects for Form, $F(1, 79) = 2.80$, p<.099, and

the Form x Sex interactions were nonsignificant for both measures. Form was significant for the measure PROP, $F(1, 79) = 5.05$, $p<.028$., the difference mainly being due to Form A having higher mean scores (See Table 3).

Method as nested within Form and Sex showed significant differences for the measure CORR due to Method 1 (words to pictures) yielding higher means than Method 2. There was no significant Method nesting for measure PROP. (See Table 7, Appendix G).

For the most part, Language as nested within Form, Sex and Method proved to be the most significant effect for both measures CORR, $F(1, 79) = 3.01$, $p<.006$, and PROP, $F(1, 79) = 3.28$, $p<.005$. (See Table 2 for other effects).

Between-Groups Comparision of English Performance. Of the original 60 children, one was not included in the data analysis due to experimenter error, and one, who refused to continue participation, was replaced with a comparable subject. As a result, a total of 59 children, 29 girls and 30 boys, were included in the final sample for the purpose of data analysis.

Equal numbers of each sex were initially planned for each form and each group. However, an incorrect form was presented to one child in the Drawing group, which caused the numbers of each sex or form to be unequal (See Appendix D). Therefore, due to unequal number of observations in the cells, the SAS general linear model (GLM) was computed instead of analysis of variance to analyze overall English

performance among the Groups. Within the model, Type III, rather than Type I, Sums of Squares values were used throughout (See p. 70, Appendix G for example).

The general linear model analysis was computed for two measures of learning to read, i.e, CORR and PROP, and the results are presented in Table 4. The main effects of Group

---

Insert Table 4 About Here

---

were highly significant, $F(2, 117) = 5.48$, $P<.006$, and $F(2, 117) = 4.74$, $P<.011$, for CORR and PROP respectively. Group means and Fisher's least-significant-difference test results are presented in Table 5.

Insert Table 5 About Here

The Group means showed that the English performance of the subjects in Chinese group was better than that of subjects in either the Control group or the Drawing group, but the difference was significant only between the Chinese and Control groups. The Drawing group had a higher mean score than the Control group; however, the difference was not statistically significant. The effects of Sex were significant for PROP but not so for CORR. The several two-way interactions were also highly significant, as may be seen in Table 4. The Chinese Group (1) and the Control Group (3) females had higher scores than the males. In the

Drawing Group (2), the Sex difference was reversed. A similar pattern held for Form. The Form x Sex interaction was due to the fact that, for Form B, the girls outperformed the boys (See Table 8, Appendix G).

Memory for Chinese vs. English Words. Recall of words was also measured, although it was not the main interest of the study. The results lend additional significance to this study and seem to bear out the fact that Chinese does have a facilitating effect on learning to read English.

Children who learned all the seven words were retested on Chinese and/or English after 3 to 4 weeks had elapsed after termination of the experiment. Data are presented in Table 6. There were 20 learners in the Chinese group (all

---

Insert Table 6 About Here

---

subjects). These children were able to recall Chinese from a maximum of 7 characters to a minimum of 4 characters. As may be seen in Table 6, the recall of Chinese characters was better than the recall of English words.

Discussion

The results obtained in this study, as predicted, confirmed that the learning of the two languages was essentially different. Learning the Chinese words was easier and faster than learning the corresponding English words. The present results support Wang's (1973) argument:

> A written Chinese character has a more direct

> connection with its meaning than a written word in English does. The sequence of letters spelling "horse" has meaning only through the mediation of the sounds they represent. The shape of letters has no relation to the concept "horse".....To a Chinese the character for "horse" means horse with no mediation through the sound mǎ. The image is so vivid that one canalmost sense an abstract figure galloping across the page: 馬 . (pp.55-56)

In other words, a total visual perception of a symbol is primarily connected with its meaning in reading the character (Makita, 1968). However, this is not the case in English. Chen and Juola (1982) also confirmed that visual representation plays a significant role in perception and memory for Chinese logographs, and depends more on purely visual processes.

Another study by Park and Arbuckle (1977) also suggested that ideograms share with pictures the properties and processing characteristics that are relevant to the picture superiority effect, because they found that words presented in ideographic script were remembered better than words presented in alphabetic script. This is consistent with our data showing that children not only learned Chinese faster and more easily than English, they also were able to remember the written Chinese words better than the corresponding English ones.

The present data support the researchers' suggestion

that learning Chinese may facilitate learning to read English, and that ideograms may indeed occupy an intermediate position between pictures and alphabetically written words. The present results, thus, are consistent with a similar experimental concept used in the Rozin et al., (1971) study. Their study showed that children can easily learn to read English represented by Chinese characters. Children with reading disability/difficulty were used as subjects in their study, while children of normal ability but not yet reading were used in the present experiment. In both studies, the learning of Chinese characters effect had a significant facilitation effect on learning to read English.

It is not clear why the Drawing group should have performed at a level intermediate to the Chinese and Control groups, and not significantly different from either. One possible interpretation may be that learning Chinese and drawing both have the same advantage of a picture superiority effect that could help to facilitate learning to read English. However, drawing alone cannot provide the children with any abstract symbol for a word. There is a suggestion, nevertheless, that children who are allowed to draw objects representing the words they are going to learn might be able to learn to read these English words better. With a longer and more intense involvement in drawing, and perhaps a larger subject sample, the difference between Drawing and Control groups might be significantly different

in favor of the Drawing group.

The recall data indicated that most of the children in the Chinese group remembered the English words better than children in the other two groups. However, the children in the Drawing and Control groups performed at about the same level, consistent with the foregoing interpretation.

Implication and Conclusion

The present study showed that Chinese characters are easier to learn than English words presumably because of their pictographic nature, and that Chinese characters can help English-speaking children learn to read English. It is possible that the facilitation in learning due to Chinese may be related to right and left brain hemisphere development and function. For example, several studies Sasanuma et al., (1977, 1980), Biederman and Tsao (1979), and Hatta (1977) suggest that the hieroglyphic characters of Kanji (Chinese) are processed in the left visual field (right hemisphere) and English words more in right visual field (left hemisphere). It is possible that the stimulation of both portions of the brain while teaching children to read might enhance cognitive development and function. Use of Chinese character to teach children to read English could stimulate both hemispheres of the brain and engage them in a balanced, integrated manner. Also, it is possible that young children could learn reading material more easily and at a younger age when it is presented as a right-hemisphere rather than a left-hemisphere task.

At any rate, the present study would seem to have some important practical implications. Similar types of activity might be used in the future to enhance the reading ability of preschool children or to help older children who have reading problems. Makita's (1968) report of a low rate of reading disability in Japanese children and the report by Rozin et al., (1971) using 30 Chinese characters to teach reading disability children to read English would support this view.

In conclusion, the present findings support the idea that Chinese characters can be used as an intermediary between pictures and purely symbolic written words. The data support the hypothesis that learning Chinese characters facilitate young, English-speaking children's capacity to learn to read English words. However, the data only partially supported the view that drawing activity would facilitate learning to read English.

References

Biederman, I., & Tsao, Y. C. (1979). On processing Chinese ideographs and English words: Some implications from Stroop-test results. Cognitive Psychology, 11, 125-132.

Brittain, W. L. (1979). Creativity, art, and the young child. New York: Macmillan.

Chen, H-C., Juola, J. F. (1982). Dimension of lexical coding in Chinese and English. Memory and Cognition, 10, 216-224.

Clay, M. M. (1977). Exploring with a pencil. Theory into Practice, 16, 334-341

Emig, J. (1977). Commentary: Learning to write. Language Arts, 54, 739-740.

Gibson, E. J., & Levin, H. (1975). The psychology of reading. Cambridge, MA: M.I.T. Press.

Graves, D. H. (1979). Let children show us how to help them write. Visible Language, 13, 1-7.

Grinnell, P. C. & Burris, N. A. (1983). Drawing and writing: The emerging graphic communication process. Topica in learning & learning disabilities, 3, 21-32.

Hatta, T. (1977). Recognition of Japenese kanji in the left and right visual fields. Neuropsychologia, 15, 685-688.

Jameson, K. (1968). Art and the young child. New York: The Viking Press.

Kane, F. (1982). Thinking, drawing-writing, reading. Childhood Education, 58, 292-297.

Kellogg, R. (1967). Understanding children's art. Psychology Today, 1, 16-25.

Kellogg, R. (1969). Analyzing children's art. Palo Alto, CA: National Press Books.

Kellogg, R., & (with) O'Dell, S. (1967). The psychology of children's art. A Psychology Today Book. New York: CRM-Random House.

Makita, K. (1968). The rarity of reading disability in Japanese children. Journal of Orthopsychiatry, 38, 599-615.

Park, S. & Arbuckle, T. Y. (1977). Ideograms versus alphabets: Effects of script on memory in "Biscriptual" Korean subjects. Journal of Experimental Psychology: Human Learning and Memory, 3, 631-642.

Rozin, P., Poritsky, S., & Sotsky, R. (1971). American children with reading problems can easily learn to read English represented by Chinese characters. Science, 171, 1264-1267.

Sasanuma, S., Itoh, M., Mori, K., & Kobayashi, Y. (1977). Tachistoscopic recognition of kana and kanji words. Neuropsychologia, 15, 547-553.

Sasanuma, S., Itoh, M., Kobayashi, Y., & Mori, K. (1980). The nature of the task-stimulus interaction in the tachistoscopic recognition of kana and kanji words. Brain and language, 9, 298-306.

Tarnopol L., & Tarnopol, M. (1976). Reading and learning

problems worldwide. In L. Tarnopol & M. Tarnopol (Eds.), Reading disabilities: An international perspective. Baltimore, MD: University Park Press.

Wang, W. S-Y. (1973). The Chinese language. Scientific American, 228, 50-63.

Wieger, L. (1965). Chinese characters (2nd ed.). (L. Davrout, Trans.). New York: Dover. (originally published 1927).

Zepeda-de-kane, F. (1978). The stimulus effect of graphic representation on the oral composition of kindergarten children as related to sex, race and socioeconomic status (Doctoral disseration, University of Florida).

Table 1

Mean Peabody Vocabulary Test Scores (PPVT)

	PPVT Scores								
	Girls			Boys			Overall		
Groups	n	M	SD	n	M	SD	n	M	SD
Chinese	10	112.1	14.00	10	107.5	19.11	20	109.8	16.48
Drawing	10	111.5	14.98	10	107.4	16.90	20	109.5	15.68
Control	10	111.9	14.10	10	107.1	14.42	20	109.5	14.10
Totals	30	111.3	13.86	30	107.3	16.33	60	109.6	15.19

Table 2

Analyses of Variance for CORR and PROP

DEPENDENT VARIABLE: CORR

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F
MODEL	15	7643.80000000	509.58666667	2.80	0.0022
ERROR	64	11638.00000000	181.84375000	R-SQUARE	
CORRECTED TOTAL	79	19281.80000000		0.396426	

SOURCE	DF	ANOVA SS	F VALUE	PR > F
FORM	1	510.05000000	2.80	0.0989
SEX	1	832.05000000	4.58	0.0363
FORM*SEX	1	0.00000000	0.00	1.0000
METH(FORM*SEX)	4	1919.30000000	2.64	0.0418
LANG(FORM*SEX*METH)	8	4382.40000000	3.01	0.0062

DEPENDENT VARIABLE: PROP

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F
MODEL	15	1.16529875	0.07768658	2.70	0.0030
ERROR	64	1.84120000	0.02876875	R-SQUARE	
CORRECTED TOTAL	79	3.00649875		0.387593	

SOURCE	DF	ANOVA SS	F VALUE	PR > F
FORM	1	0.14535125	5.05	0.0280
SEX	1	0.16836125	5.85	0.0184
FORM*SEX	1	0.01275125	0.44	0.5080
METH(FORM*SEX)	4	0.08366500	0.73	0.5767
LANG(FORM*SEX*METH)	8	0.75517000	3.28	0.0034

Table 3

t-Tests (Fisher's Least-Significant-Difference Test) for Significant Effects Sex and Form Measure by CORR and PROP

Measure: CORR		
Sex	M	Grouping*
F[a]	96.775	A
M[a]	90.325	B
Measure: PROP		
Sex	M	Grouping*
F[a]	0.822	A
M[a]	0.730	B
Measure: PROP		
Form	M	Grouping*
A[a]	0.819	A
B[a]	0.734	B

* Means with the same letter are not significantly different, $p<.05$

a $n=40$

Table 4

Significant Effects from the General Linear Model Analyses in the CORR and PROP

DEPENDENT VARIABLE: CORR

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F
MODEL	23	33588.20988701	1460.35695161	2.67	0.0005
ERROR	94	51460.88333333	547.45620567	R-SQUARE	
CORRECTED TOTAL	117	85049.09322034		0.394927	

SOURCE	DF	TYPE III SS	F VALUE	PR > F
GRP	2	6005.46706741	5.48	0.0056
SEX	1	2141.43519144	3.91	0.0509
GRP*SEX	2	7732.83722770	7.06	0.0014
FORM*SEX	1	2686.18519144	4.91	0.0292
GRP*FORM	2	5497.48013769	5.02	0.0085

DEPENDENT VARIABLE: PROP

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F
MODEL	23	2.19851192	0.09558747	2.10	0.0067
ERROR	94	4.27235333	0.04545057	R-SQUARE	
CORRECTED TOTAL	117	6.47086525		0.339755	

SOURCE	DF	TYPE III SS	F VALUE	PR > F
GRP	2	0.43049248	4.74	0.0110
SEX	1	0.34450273	7.58	0.0071
GRP*SEX	2	0.35463068	3.90	0.0236
FORM*SEX	1	0.39070327	8.60	0.0042

Table 5

t-Tests (Fisher's Least-Significant-Difference Test) of Three Groups Measure by CORR and PROP

Measure: CORR

Group	*M*	Grouping*
Chinese[a]	88.18	A
Drawing[b]	78.13	A B
Control[a]	71.03	B

Measure: PROP

Group	*M*	Grouping*
Chinese[a]	0.69	A
Drawing[b]	0.62	A B
Control[a]	0.54	B

* Means with the same letter are not significantly different, $p<.05$

a $n=40$

b $n=38$

Table 6

Number of Correct Words Recalled by Learners*

Groups	Chinese		Drawing	Control
Langauges	Chinese (n = 20)	English (n = 15)	English (n = 10)	English (n = 9)
Number of Words Recalled	Number of Learners*			
7	6	1	1	0
6	3	0	0	0
5	8	1	0	1
4	3	3	1	2
3	0	2	1	0
2	0	3	1	2
1	0	4	3	2
0	0	1	3	2

* Learners were defined as subjects who reached criterion (i.e., all seven words learned). Total number of learners is presented above in parentheses.

APPENDIX A

PILOT STUDY

A pilot study was undertaken before the main reserach was conducted in an attempt (a) to determine whether or not the 14 selected Chinese characters were of appropriate difficulty for the children; (b) to determine how many words to use in the learning task; (c) to evaluate the children's performance in recognizing Chinese Words; and (d) to formulate a final design for the study.

The 14 Chinese characters selected (see Figure 1, Appendix E) were moderately to highly pictographic. These characters consisted of simple to difficult words in terms of their numbers of pen strokes and their structure. A total of 58 cards were prepared to depict the historical evolution of the 14 Chinese characters from ancient pictograph to the present day character (See Figure 2, Appendix E).

In the pilot study, there were eight children (2 Chinese and 6 Americans) with an age range from 3.5 to 5 years. Before these children engaged in the learning task, they were tested to make sure they could not read th e 14 key words in English (or Chinese), but could identify the corresponding picture. Initially, an attempt was to teach all 14 characters to each child; however, some children became fatigued and inattentive at 6, 8, or 10 characters and refused to go on. So the rest of the children were taught only 6 to 10 characters.

The children were individually taught the Chinese characters following the same procedures as outlined in the methodology. For the recognition test the child was asked

to read each character in English or match the words to corresponding picture on the matching game board.

The results, in brief, showed that most of the children, regardless of age, sex or race, took about 1 to 3 trials to learn the Chinese words, and approximately 15 minutes to complete the learning and testing task.

Of the 14 characters, some had rather similar perceptual images, in terms of numbers of pen strokes and structure. When those words were taught together, the children usually made some errors of discrimination. For example, "horse" is written in Chinese as  , and "bird" as  . The children often confused these two words. When children learned the characters without seeing a similar character, they tended to learn all characters in 1 or 2 trials. Therefore in the actual study, perceptually similar characters were placed in different sets, and children learned only one set.

For curiosity, memory for Chinese characters were also tested over different periods of time from 30 minutes to a week after initial learning. Most of the children could remember all of the Chinese words over the longest test period studied.

Based on the above results, the variables, analysis, and experimental design of the actual study were formulated accordingly.

APPENDIX B

LETTERS TO PARENTS AND SCHOOLS

Oklahoma State University

DEPARTMENT OF FAMILY RELATIONS
AND CHILD DEVELOPMENT

STILLWATER, OKLAHOMA 74078
241 HOME ECONOMICS WEST
(405) 624-5057

November 7, 1985

Dear Parents,

We are presently conducting research on factors related to children's reading. Previous research has shown that drawing can help children to read.

This project will involve teaching Chinese pictographic characters to some of the children, and asking other children to draw pictures for us. This is to see whether or not these activities will faciliate learning to read English words, and how quickly children can learn to read Chinese characters as compared to the corresponding English words. A word-picture matching game will also be presented to each child.

Children find these activities to be interesting and enjoyable, and in no way stressful or harmful. The project has been approved by the Department of Family Relations and Child Development. The task will take approximately 20 minutes and data will be collected during the regular hours of your child's nursery program. If you would like any further information about this project please feel free to call me at this number 377-7247. I would be happy to answer any questions you may have.

The general results of the research will be showed with you at the conclusion of the study. Individual performance and the child's identity will not be revealed execpt to provide feedback to the child's own parents. Your assistance in this research project would be greatly appreciated. Without your cooperation this research will not be possible. Please complete the attached form below and return to the teacher by November 15, 1985. Thank you.

Sincerely,

Dr. John C. McCullers
Faculty Supervisor

Suh Er Wong
Graduate Assistant

PARENT CONSENT FORM

My child_____,

_____ has my permission to participate in the above research.

_____ may not participate in the above research.

_____
Parent or Guardian Signature

Date:_____

CENTENNIAL DECADE 1980 • 1990

Oklahoma State University

DEPARTMENT OF FAMILY RELATIONS
AND CHILD DEVELOPMENT

STILLWATER, OKLAHOMA 74078
241 HOME ECONOMICS WEST
(405) 624-5057

November 5, 1985

Mrs. Holly Hartman, Director
Presbyterian Preschool
524 South Duncan
Stillwater, OK 74074

Dear Mrs. Hartman,

This is to introduce Ms. Suh Er Wong, my Graduate Research Assistant. We are presently conducting research on factors related to children's reading, and hope to be able to work with your preschool children on this project. This is Ms. Wong's master thesis research and has been approved by the Department of Family Relations and Child Development at OSU.

Some investigators have shown that drawing can help children learn to read. This project will involve teaching Chinese pictographic characters to some of the children, and asking other children to draw pictures for us. The question is whether or not these activities will faciliate learning to read English words, and how quickly children can learn to read Chinese characters as compared to the corresponding English words. Each child will be taught and tested individually. A word-picture matching game will be presented to each child. Children find these activities to be interesting and enjoyable, and in no way stressful or harmful. The task will take about 20 mintues of the child's time. We wish to work with four-year-olds that can identify objects by picture but cannot yet read the words for the objects.

Ms. Wong will contact you to arrange a meeting with you to answer any questions you may have. I would be happy to come along too, if you feel that you need to talk to me. We would be ready to begin whenever it is convenient for you. If you would like any further information about the project, please feel free to call Ms. Wong at 377-7247, or call me here at the FRCD department at OSU, 624-5061.

We shall be happy to share the outcome of the study with you at the conclusion of the study. Without your help and support this research will not be possible. Thank you for your cooperation.

Sincerely,

John C. McCullers

John C. McCullers, Ph.D.
Professor of Family Relations
and Child Development
Professor of Psychology

CENTENNIAL DECADE
1980 • 1990

jj
cc: Ms. Wong

Oklahoma State University

DEPARTMENT OF FAMILY RELATIONS
AND CHILD DEVELOPMENT

STILLWATER, OKLAHOMA 74078
241 HOME ECONOMICS WEST
(405) 624-5057

May 2, 1986

Dear parents,

I am writing to let you know that our research project has been completed and to thank you and your child for your cooperation.

As we know, reading difficulty is a serious problem in the U.S.A The study of factors related to children's reading might help us better understand this problem.

This research was my master's thesis research. The possibility of using Chinese characters to aid young children in learning to recognize and read English words was investigated. The speculation was that the Chinese character has both a pictographic/ideographic element in common with graphic representation and an abstract, symbolic element in common with the written English word. We thought that children should learn Chinese characters more easily and faster than printed English words, and that Chinese characters might facilitate children's learning to read English.

We found that the children did learn to read the Chinese characters faster than the corresponding English words, and that the children who learned the Chinese characters also learned to read English words better.

Again I thank you and your child for your help to make this research possible.

Sincerely,

Dr. John C. McCullers
Faculty Supervisor

Suh Er Wong
Graduate Assistant

CENTENNIAL DECADE
1980 • 1990

Oklahoma State University

DEPARTMENT OF FAMILY RELATIONS
AND CHILD DEVELOPMENT

STILLWATER, OKLAHOMA 74078
241 HOME ECONOMICS WEST
(405) 624-5057

May 7, 1986

Mrs. Holly Martman, Director
Presbyterian Preschool
524 South Duncan
Stillwater, OK 74074

Dear Mrs. Hartman,

I am writing to let you know that our research project has been completed and to thank you for your cooperation.

As we know, reading difficulty is a serious problem in the U.S.A. The study of factors related to children's reading might help us better understand this problem.

This research was my master's thesis research. The possibility of using Chinese characters to aid young children in learning to recognize and read English words was investigated. The speculation was that the Chinese character has both a pictographic/ideographic element in common with graphic representation and an abstract, symbolic element in common with the written English word. We thought that children should learn Chinese characters more easily and faster than printed English words, and that Chinese characters might facilitate children's learning to read English.

We found that the children did learn to read the Chinese characters faster than the corresponding English words, and that the children who learned the Chinese characters also learned to read English words better.

Again I thank you and the teachers for your help to make this research possible.

Sincerely,

Dr. John C. McCullers
Faculty Supervisor

Suh Er Wong
Graduate Assistant

CENTENNIAL DECADE
1980 • 1990

APPENDIX C

INDIVIDUAL TEST RECORD SHEET

INDIVIDUAL TEST RECORD -- Form B

NAME _____ SEX: M F AGE:___

SCHOOL _____ EXAMINER _____ DATE _____

7 Chinese characters:

No. of trial	B1: 7 words 16 pictures							B : 7 pictures 16 words						
A-4 人 man														
B-4 子 baby														
C-4 木 tree														
D-4 羊 goat														
E-4 目 eye														
F-4 象 elephant														
G-5 馬 horse														
	Total:___trials ___errors							Total:___trials ___errors						

Code number of other 7 Chinese characters:

1 大 big 2 山 mountain 3 米 rice 4 牛 cow 5 耳 ear 6 魚 fish

7 鳥 bird 8 豬 Pig 9 貓 Cat

7 corresponding English words:

No. of trial	B : 7 words 16 pictures							B : 7 pictures 16 words						
A man														
B baby														
C tree														
D goat														
E eye														
F elephant														
G horse														
	Total:___trials ___errors							Toatl:___trials ___errors						

APPENDIX D

RESEARCH DESIGN AND OUTLINE OF VARIABLES

SAS

					CORR		PROP	
					N	MEAN	N	MEAN
GRP	FORM	SEX	METH	LANG				
1	A	F	1	1	5.00	100.00	5.00	0.93
				2	5.00	100.00	5.00	0.78
			2	1	5.00	100.00	5.00	0.90
				2	5.00	97.20	5.00	0.79
		M	1	1	5.00	100.00	5.00	0.90
				2	5.00	97.20	5.00	0.76
			2	1	5.00	94.20	5.00	0.81
				2	5.00	80.00	5.00	0.68
	B	F	1	1	5.00	100.00	5.00	0.94
				2	5.00	88.60	5.00	0.67
			2	1	5.00	100.00	5.00	0.82
				2	5.00	88.40	5.00	0.74
		M	1	1	5.00	100.00	5.00	0.83
				2	5.00	91.40	5.00	0.61
			2	1	5.00	97.20	5.00	0.79
				2	5.00	62.60	5.00	0.47
2	A	F	1	2	5.00	65.60	5.00	0.56
			2	2	5.00	45.60	5.00	0.40
		M	1	2	5.00	94.20	5.00	0.69
			2	2	5.00	77.20	5.00	0.67
	B	F	1	2	4.00	89.25	4.00	0.79
			2	2	4.00	89.25	4.00	0.70
		M	1	2	5.00	85.60	5.00	0.65
					5.00	82.80	5.00	0.56
3	A	F	1	2	6.00	92.83	6.00	0.71
			2	2	6.00	81.00	6.00	0.58
		M	1	2	5.00	79.80	5.00	0.55
			2	2	5.00	60.00	5.00	0.52
	B	F	1	2	4.00	85.75	4.00	0.69
			2	2	4.00	78.50	4.00	0.66
		M	1	2	5.00	54.20	5.00	0.35
			2	2	5.00	34.20	5.00	0.27

GRP 1=Chinese Group; GRP 2=Drawing Group;
GRP 3=Control Group
METH 1=Word-Picture Matching Board; METH 2=Picture-Word Matching Board
LANG 1=Chinese; LANG 2=English

APPENDIX E

RESEARCH MATERIALS

Form A:

大 山 米 牛 耳 魚 鳥

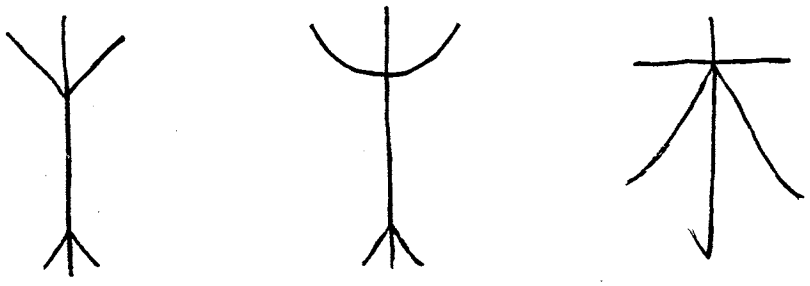
big mountain rice cow ear fish bird

Form B:

人 子 木 羊 目 象 馬

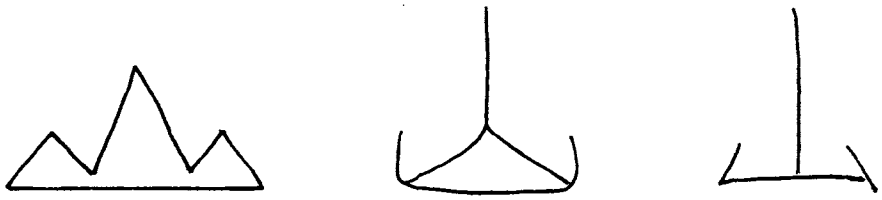
man baby tree goat eye elephant horse

Figure 1. Two Forms of Seven Chinese Characters and Corresponding English Words.



Tree - The first two pictures represent the trunk of a tree with roots and branches. The modern character still retains the outline of its original form.

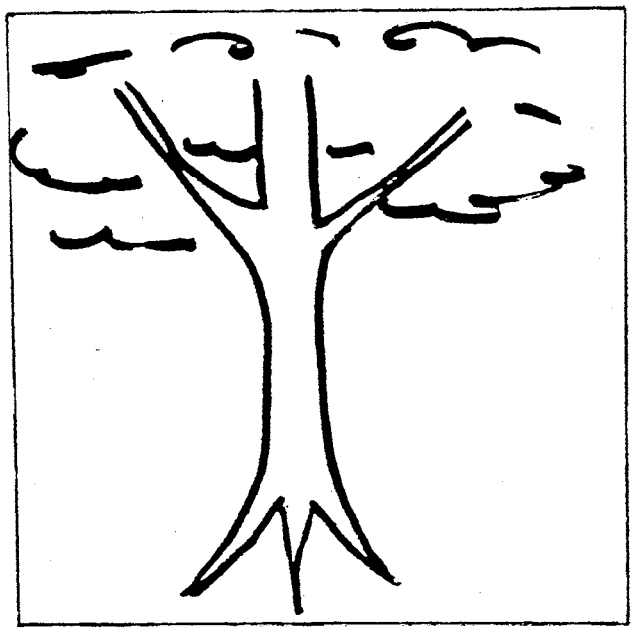
Birds - Originally, this character was the graphic representation of a common bird. The modern character still retains much of its original form.

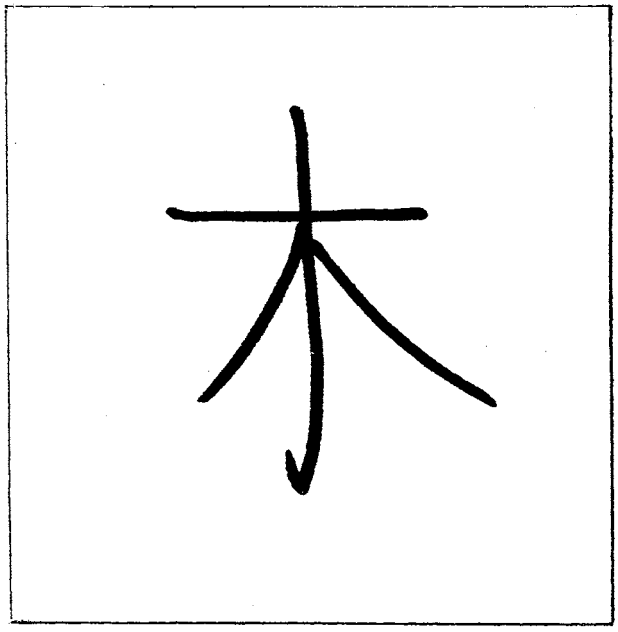


Mountain - An ancient pictograph of a group of three mountains. The modern character still retains elements of the original form.

Note: Adapted drawing from The Straits Times Collection (1980). Fun with Chinese Characters. vol. 1. Singapore, Federal Publications.

Figure 2. A Few Examples of Evolution of Hieroglyphic Chinese Characters.

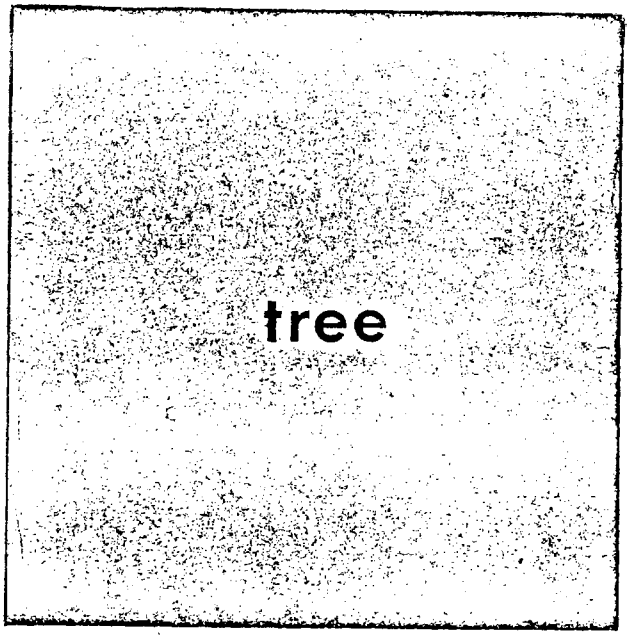




tree

Note: The card was the actual size used in the study.

Figure 3. Sample of Single Card for Line Drawing and Chinese.



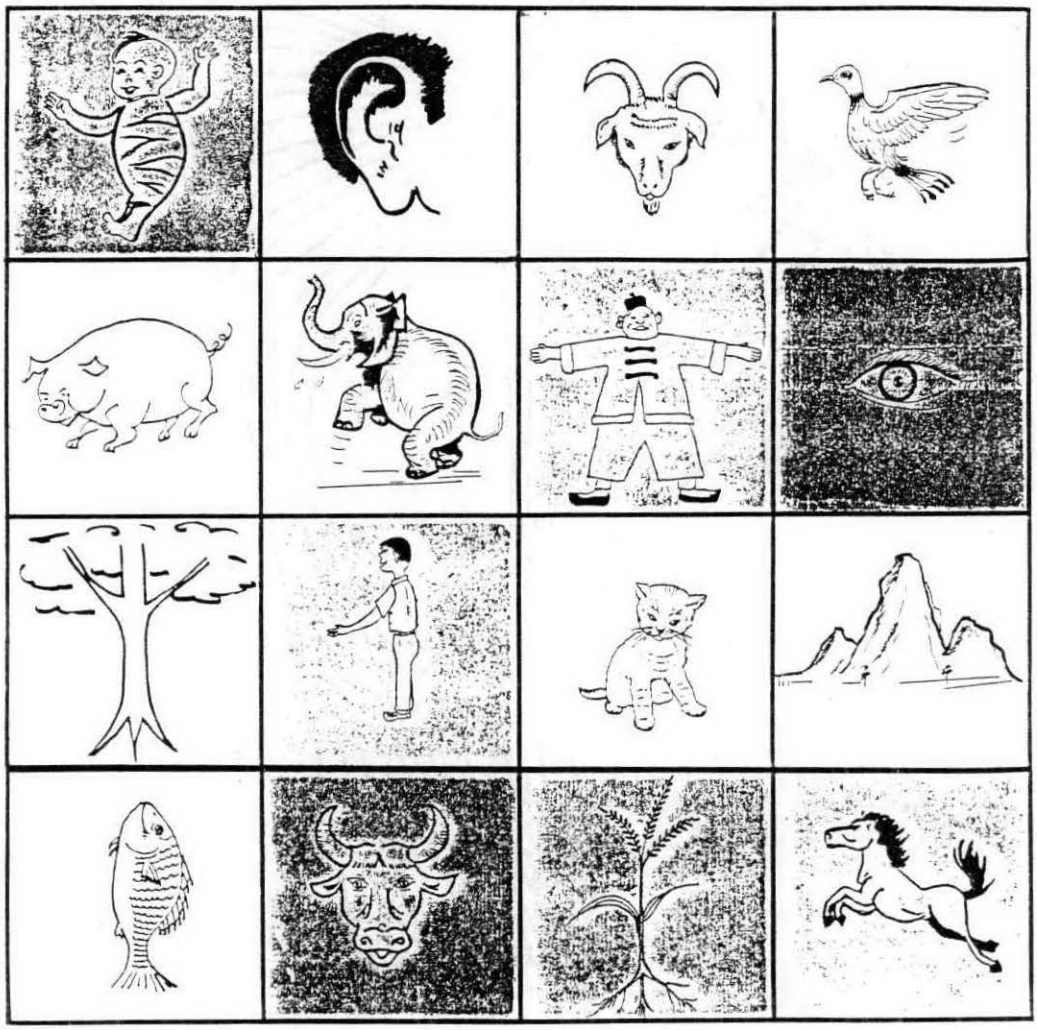
Note: The card was the actual size used in the study.

Figure 4. Sample of Single Card for English.

Table 9

Colors Used on the Three Game Boards

	Figure 5 : left to right
row 1:	Cherry, Light Green, Cafe, Pink
2:	Light Blue, Pink, Orchid, Cherry
3:	Light Green, Orchid, Light Green, Cafe
4:	Pink, Cherry, Salmon, Orchid
	Figure 6 : left to right
row 1:	Orchid, Salmon, Light Green, Pink
2:	Cafe, Pink, Light Blue, Orchid
3:	Cherry, Orchid, Light Green, Cherry
4:	Light Blue, Cherry, Salmon, Cafe
	Figure 7 : left to right
row 1:	Cherry, Cafe, Light Green, Cherry
2:	Light Blue, Canary, Orchid, Cafe
3:	Canary, Salmon, Cherry, Light Blue
4:	Salmon, Light Green, Pink, Orchid



Note: Actual size of the board - 34CM X 34CM

Figure 5. Sample of Pictures Board.

Figure 6. Sample of Chinese Characters Board.

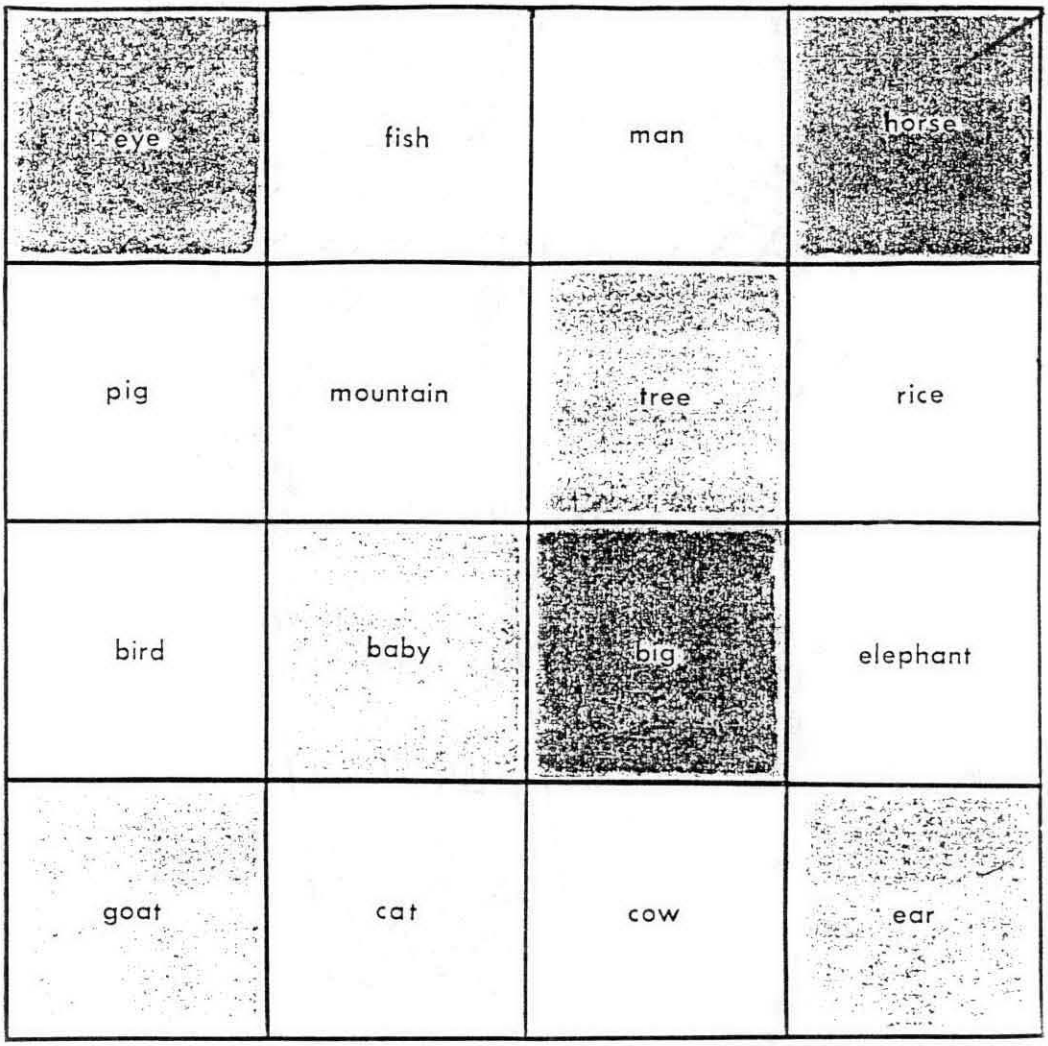


Figure 7. Sample of English Words Board.

APPENDIX F

RAW DATA FOR EACH SUBJECT

VARIABLE CODE AND MEASUREMENT KEY

Code	Variable Name	Key
SBJ	Subject Number	
SEX	Sex of Subject	F=Female, M=Male
STD	Peabody Picture Vocabulary Test (PPVT) scores	
FORM	Two Forms of 14 Words	A=Form A, B=Form B
GRP	Experimental Condition	1=Chinese Group 2=Drawing Group 3=Control Group
LEARN	Number of Learners (subjects who reach the criterion of one perfect trial)	1=Learner 0=Nonlearner
TRI	Total Numbers of Trials (required to reach criterion)	
CORR	Maximum Percent of Correct Responses Achieved	
PROP	Proportion of Correct Response (to the base of total opportunities to make correct response)	
METH	Methods of Matching Games	1=Method 1 (word-picture matching) 2=Method 2 (picture-word matching)
LANG	Languages	1=Chinese 2=English

TREATMENTS SESSION RAW DATA*

SAS

OBS	SBJ	SEX	STD	FORM	GRP	LEARN	TRI	CORR	PROP	METH	LANG
1	1	M	150	A	1	1	1	100	1.00	1	1
2	1	M	150	A	1	1	2	100	0.93	2	1
3	1	M	150	A	1	1	1	100	1.00	1	2
4	1	M	150	A	1	1	3	100	0.76	2	2
5	2	M	120	A	1	1	2	100	0.93	1	1
6	2	M	120	A	1	0	2	71	0.71	2	1
7	2	M	120	A	1	0	3	86	0.67	1	2
8	2	M	120	A	1	0	1	57	0.57	2	2
9	3	M	107	A	1	1	2	100	0.71	1	1
10	3	M	107	A	1	1	3	100	0.67	2	1
11	3	M	107	A	1	1	4	100	0.64	1	2
12	3	M	107	A	1	0	1	57	0.57	2	2
13	4	M	112	A	1	1	2	100	0.93	1	1
14	4	M	112	A	1	1	3	100	0.86	2	1
15	4	M	112	A	1	1	5	100	0.66	1	2
16	4	M	112	A	1	1	2	100	0.86	2	2
17	5	M	84	A	1	1	2	100	0.93	1	1
18	5	M	84	A	1	1	2	100	0.86	2	1
19	5	M	84	A	1	1	3	100	0.81	1	2
20	5	M	84	A	1	0	2	86	0.64	2	2
21	6	F	138	A	1	1	1	100	1.00	1	1
22	6	F	138	A	1	1	2	100	0.93	2	1
23	6	F	138	A	1	1	1	100	1.00	1	2
24	6	F	138	A	1	1	1	100	1.00	2	2
25	7	F	101	A	1	1	1	100	1.00	1	1
26	7	F	101	A	1	1	2	100	0.93	2	1
27	7	F	101	A	1	1	4	100	0.86	1	2
28	7	F	101	A	1	1	1	100	1.00	2	2
29	8	F	111	A	1	1	2	100	0.86	1	1
30	8	F	111	A	1	1	1	100	1.00	2	1
31	8	F	111	A	1	1	5	100	0.71	1	2
32	8	F	111	A	1	0	5	86	0.49	2	2
33	9	F	126	A	1	1	1	100	1.00	1	1
34	9	F	126	A	1	1	2	100	0.79	2	1
35	9	F	126	A	1	1	6	100	0.74	1	2
36	9	F	126	A	1	1	4	100	0.75	2	2
37	10	F	107	A	1	1	3	100	0.81	1	1
38	10	F	107	A	1	1	3	100	0.86	2	1
39	10	F	107	A	1	1	6	100	0.60	1	2
40	10	F	107	A	1	1	5	100	0.71	2	2
41	11	M	120	B	1	1	2	100	0.93	1	1
42	11	M	120	B	1	1	2	100	0.79	2	1
43	11	M	120	B	1	0	3	86	0.71	1	2
44	11	M	120	B	1	1	2	100	0.71	2	2
45	12	M	92	B	1	1	4	100	0.71	1	1
46	12	M	92	B	1	1	2	100	0.86	2	1
47	12	M	92	B	1	0	4	71	0.21	1	2
48	12	M	92	B	1	0	1	0	0.00	2	2
49	13	M	89	B	1	1	3	100	0.76	1	1
50	13	M	89	B	1	0	2	86	0.57	2	1
51	13	M	89	B	1	1	5	100	0.74	1	2
52	13	M	89	B	1	0	2	71	0.50	2	2
53	14	M	99	B	1	1	4	100	0.82	1	1
54	14	M	99	B	1	1	2	100	0.93	2	1

TREATMENT SESSION RAW DATA* - CONTINUED

SAS

OBS	SBJ	SEX	STD	FORM	GRP	LEARN	TRI	CORR	PROP	METH	LANG
55	14	M	99	B	1	1	7	100	0.67	1	2
56	14	M	99	B	1	0	3	71	0.62	2	2
57	15	M	99	B	1	1	2	100	0.93	1	1
58	15	M	99	B	1	1	2	100	0.79	2	1
59	15	M	99	B	1	1	8	100	0.73	1	2
60	15	M	99	B	1	0	3	71	0.52	2	2
61	16	F	128	B	1	1	1	100	1.00	1	1
62	16	F	128	B	1	1	2	100	0.86	2	1
63	16	F	128	B	1	1	1	100	1.00	1	2
64	16	F	128	B	1	1	1	100	1.00	2	2
65	17	F	111	B	1	1	3	100	0.86	1	1
66	17	F	111	B	1	1	2	100	0.93	2	1
67	17	F	111	B	1	0	3	57	0.29	1	2
68	17	F	111	B	1	0	2	71	0.50	2	2
69	18	F	99	B	1	1	2	100	0.86	1	1
70	18	F	99	B	1	1	2	100	0.93	2	1
71	18	F	99	B	1	0	3	86	0.62	1	2
72	18	F	99	B	1	0	3	71	0.52	2	2
73	19	F	96	B	1	1	1	100	1.00	1	1
74	19	F	96	B	1	1	2	100	0.50	2	1
75	19	F	96	B	1	1	4	100	0.69	1	2
76	19	F	96	B	1	1	5	100	0.74	2	2
77	20	F	104	B	1	1	1	100	1.00	1	1
78	20	F	104	B	1	1	2	100	0.86	2	1
79	20	F	104	B	1	1	4	100	0.75	1	2
80	20	F	104	B	1	1	2	100	0.93	2	2

*Chinese Group Only

READING SESSION RAW DATA*

SAS

OBS	SBJ	SEX	STD	FORM	GRP	LEARN	TRI	CORR	PROP	METH	LANG
1	1	M	150	A	1	1	1	100	1.00	1	2
2	1	M	150	A	1	1	3	100	0.76	2	2
3	2	M	120	A	1	0	3	86	0.67	1	2
4	2	M	120	A	1	0	1	57	0.57	2	2
5	3	M	107	A	1	1	4	100	0.64	1	2
6	3	M	107	A	1	0	1	57	0.57	2	2
7	4	M	112	A	1	1	5	100	0.66	1	2
8	4	M	112	A	1	1	2	100	0.86	2	2
9	5	M	84	A	1	1	3	100	0.81	1	2
10	5	M	84	A	1	0	2	86	0.64	2	2
11	6	F	138	A	1	1	1	100	1.00	1	2
12	6	F	138	A	1	1	1	100	1.00	2	2
13	7	F	101	A	1	1	4	100	0.86	1	2
14	7	F	101	A	1	1	1	100	1.00	2	2
15	8	F	111	A	1	1	5	100	0.71	1	2
16	8	F	111	A	1	0	5	86	0.49	2	2
17	9	F	126	A	1	1	6	100	0.74	1	2
18	9	F	126	A	1	1	4	100	0.75	2	2
19	10	F	107	A	1	1	6	100	0.60	1	2
20	10	F	107	A	1	1	5	100	0.71	2	2
21	11	M	120	B	1	0	3	86	0.71	1	2
22	11	M	120	B	1	1	2	100	0.71	2	2
23	12	M	92	B	1	0	4	71	0.21	1	2
24	12	M	92	B	1	0	1	0	0.00	2	2
25	13	M	89	B	1	1	5	100	0.74	1	2
26	13	M	89	B	1	0	2	71	0.50	2	2
27	14	M	99	B	1	1	7	100	0.67	1	2
28	14	M	99	B	1	0	3	71	0.62	2	2
29	15	M	99	B	1	1	8	100	0.73	1	2
30	15	M	99	B	1	0	3	71	0.52	2	2
31	16	F	128	B	1	1	1	100	1.00	1	2
32	16	F	128	B	1	1	1	100	1.00	2	2
33	17	F	111	B	1	0	3	57	0.29	1	2
34	17	F	111	B	1	0	2	71	0.50	2	2
35	18	F	99	B	1	0	3	86	0.62	1	2
36	18	F	99	B	1	0	3	71	0.52	2	2
37	19	F	96	B	1	1	4	100	0.69	1	2
38	19	F	96	B	1	1	5	100	0.74	2	2
39	20	F	104	B	1	1	4	100	0.75	1	2
40	20	F	104	B	1	1	2	100	0.93	2	2
41	21	M	133	A	2	1	5	100	0.69	1	2
42	21	M	133	A	2	1	2	100	0.86	2	2
43	22	M	92	A	2	0	3	71	0.57	1	2
44	22	M	92	A	2	0	1	29	0.29	2	2
45	23	M	82	A	2	1	7	100	0.71	1	2
46	23	M	82	A	2	1	5	100	0.80	2	2
47	24	M	98	A	2	1	4	100	0.79	1	2
48	24	M	98	A	2	0	3	86	0.71	2	2
49	25	M	115	A	2	1	4	100	0.71	1	2
50	25	M	115	A	2	0	2	71	0.71	2	2
51	26	F	139	A	2	1	3	100	0.86	1	2
52	26	F	139	A	2	0	5	86	0.74	2	2
53	27	F	112	A	2	0	3	57	0.57	1	2
54	27	F	112	A	2	0	2	14	0.14	2	2

READING SESSION RAW DATA* - CONTINUED

SAS

OBS	SBJ	SEX	STD	FORM	GRP	LEARN	TRI	CORR	PROP	METH	LANG
55	28	F	110	A	2	1	3	100	0.86	1	2
56	28	F	110	A	2	0	2	57	0.57	2	2
57	29	F	96	A	2	0	8	57	0.45	1	2
58	29	F	96	A	2	0	3	71	0.57	2	2
59	30	F	95	A	2	0	3	14	0.05	1	2
60	30	F	95	A	2	0	1	0	0.00	2	2
61	31	M	104	B	2	0	7	71	0.55	1	2
62	31	M	104	B	2	0	2	71	0.43	2	2
63	32	M	120	B	2	1	3	100	0.76	1	2
64	32	M	120	B	2	1	3	100	0.71	2	2
65	33	M	116	B	2	0	2	71	0.57	1	2
66	33	M	116	B	2	0	2	57	0.36	2	2
67	34	M	106	B	2	0	5	86	0.71	1	2
68	34	M	106	B	2	1	3	100	0.67	2	2
69	35	M	88	B	2	1	4	100	0.64	1	2
70	35	M	88	B	2	0	3	86	0.62	2	2
71	36	F	129	B	2	1	1	100	1.00	1	2
72	36	F	129	B	2	1	1	100	1.00	2	2
73	37	F	107	B	2	0	4	86	0.61	1	2
74	37	F	107	B	2	0	3	71	0.43	2	2
75	38	F	104	B	2	0	7	71	0.55	1	2
76	38	F	104	B	2	0	4	86	0.50	2	2
77	39	F	125	B	2	1	1	100	1.00	1	2
78	39	F	125	B	2	1	2	100	0.86	2	2
79	40	M	104	A	3	1	5	100	0.69	1	2
80	40	M	104	A	3	1	3	100	0.81	2	2
81	41	M	120	A	3	0	7	71	0.49	1	2
82	41	M	120	A	3	0	2	29	0.21	2	2
83	42	M	105	A	3	0	4	57	0.39	1	2
84	42	M	105	A	3	0	2	71	0.57	2	2
85	43	M	93	A	3	0	6	71	0.52	1	2
86	43	M	93	A	3	0	1	57	0.57	2	2
87	44	M	91	A	3	1	8	100	0.64	1	2
88	44	M	91	A	3	0	1	43	0.43	2	2
89	45	F	132	A	3	1	3	100	0.91	1	2
90	45	F	132	A	3	1	3	100	0.71	2	2
91	46	F	124	A	3	1	7	100	0.82	1	2
92	46	F	124	A	3	1	3	100	0.71	2	2
93	47	F	109	A	3	1	2	100	0.71	1	2
94	47	F	109	A	3	1	2	100	0.71	2	2
95	48	F	108	A	3	0	9	86	0.54	1	2
96	48	F	108	A	3	0	2	43	0.29	2	2
97	49	F	105	A	3	1	6	100	0.74	1	2
98	49	F	105	A	3	1	4	100	0.68	2	2
99	50	F	102	A	3	0	3	71	0.57	1	2
100	50	F	102	A	3	0	2	43	0.36	2	2
101	51	M	125	B	3	0	4	71	0.46	1	2
102	51	M	125	B	3	0	1	14	0.14	2	2
103	52	M	115	B	3	0	3	57	0.38	1	2
104	52	M	115	B	3	0	3	86	0.48	2	2
105	53	M	115	B	3	0	4	57	0.43	1	2
106	53	M	115	B	3	0	1	14	0.14	2	2
107	54	M	95	B	3	0	4	29	0.11	1	2
108	54	M	95	B	3	0	2	43	0.43	2	2
109	55	M	88	B	3	0	5	57	0.37	1	2
110	55	M	88	B	3	0	1	14	0.14	2	2
111	56	F	130	B	3	1	4	100	0.71	1	2
112	56	F	130	B	3	1	3	100	0.81	2	2
113	57	F	121	B	3	1	5	100	0.69	1	2
114	57	F	121	B	3	1	2	100	0.79	2	2
115	58	F	91	B	3	0	2	43	0.43	1	2
116	58	F	91	B	3	0	1	14	0.14	2	2
117	59	F	97	B	3	1	2	100	0.93	1	2
118	59	F	97	B	3	1	3	100	0.91	2	2

*All Children

APPENDIX G

SELECTED STATISTICAL ANALYSES

Table 7

Mean Nested Effects for Variables, Method, Form, Sex, and Language Measure by CORR and PROP

SAS

ANALYSIS OF VARIANCE PROCEDURE

MEANS

METH	FORM	SEX	N	CORR	PROP
1	A	F	10	100.0000000	0.85800000
2	A	F	10	98.6000000	0.84600000
1	A	M	10	98.6000000	0.82800000
2	A	M	10	87.1000000	0.74300000
1	B	F	10	94.3000000	0.80700000
2	B	F	10	94.2000000	0.77700000
1	B	M	10	95.7000000	0.72100000
2	B	M	10	79.9000000	0.62900000

LANG	FORM	SEX	METH	N	CORR	PROP
1	A	F	1	5	100.0000000	0.93400000
2	A	F	1	5	100.0000000	0.78200000
1	A	F	2	5	100.0000000	0.90200000
2	A	F	2	5	97.2000000	0.79000000
1	A	M	1	5	100.0000000	0.90000000
2	A	M	1	5	97.2000000	0.75600000
1	A	M	2	5	94.2000000	0.80600000
2	A	M	2	5	80.0000000	0.68000000
1	B	F	1	5	100.0000000	0.94400000
2	B	F	1	5	88.6000000	0.67000000
1	B	F	2	5	100.0000000	0.81600000
2	B	F	2	5	88.4000000	0.73800000
1	B	M	1	5	100.0000000	0.83000000
2	B	M	1	5	91.4000000	0.61200000
1	B	M	2	5	97.2000000	0.78800000
2	B	M	2	5	62.6000000	0.47000000

Table 8

Mean Two-Way Interactions Measure by CORR and PROP

SAS

GENERAL LINEAR MODELS PROCEDURE

MEANS

GRP	SEX	N	CORR	PROP
1	F	20	93.5500000	0.74500000
1	M	20	82.8000000	0.62950000
2	F	18	70.5555556	0.59777778
2	M	20	84.9500000	0.64300000
3	F	20	85.0000000	0.65800000
3	M	20	57.0500000	0.42000000

FORM	SEX	N	CORR	PROP
A	F	32	80.7812500	0.63812500
A	M	30	81.4000000	0.64466667
B	F	26	86.7692308	0.70769231
B	M	30	68.4666667	0.48366667

GRP	FORM	N	CORR	PROP
1	A	20	93.6000000	0.75200000
1	B	20	82.7500000	0.62250000
2	A	20	70.6500000	0.58250000
2	B	18	86.4444444	0.66500000
3	A	22	79.1818182	0.59409091
3	B	18	61.0555556	0.47166667

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: CORR

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	15	7643.80000000	509.58666667	2.80	0.0022	0.396426	14.4147
ERROR	64	11638.00000000	181.84375000		ROOT MSE		CORR MEAN
CORRECTED TOTAL	79	19281.80000000			13.48494531		93.55000000

SOURCE	DF	ANOVA SS	F VALUE	PR > F
FORM	1	510.05000000	2.80	0.0989
SEX	1	832.05000000	4.58	0.0363
FORM*SEX	1	0.00000000	0.00	1.0000
METH(FORM*SEX)	4	1919.30000000	2.64	0.0418
LANG(FORM*SEX*METH)	8	4382.40000000	3.01	0.0062

SAS 14:46 WEDNESDAY, APRIL 23, 1986 33

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: PROP

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	15	1.16529875	0.07768658	2.70	0.0030	0.387593	21.8539
ERROR	64	1.84120000	0.02876875		ROOT MSE		PROP MEAN
CORRECTED TOTAL	79	3.00649875			0.16961353		0.77612500

SOURCE	DF	ANOVA SS	F VALUE	PR > F
FORM	1	0.14535125	5.05	0.0280
SEX	1	0.16836125	5.85	0.0184
FORM*SEX	1	0.01275125	0.44	0.5080
METH(FORM*SEX)	4	0.08366500	0.73	0.5767
LANG(FORM*SEX*METH)	8	0.75517000	3.28	0.0034

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: CORR

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	23	33588.20988701	1460.35695161	2.67	0.0005	0.394927	29.5699
ERROR	94	51460.88333333	547.45620567		ROOT MSE		CORR MEAN
CORRECTED TOTAL	117	85049.09322034			23.39778207		79.12711864

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
GRP	2	5938.00111508	5.42	0.0059	2	6005.46706741	5.48	0.0056
FORM	1	651.33081248	1.19	0.2782	1	325.67708333	0.59	0.4425
SEX	1	2016.20608095	3.68	0.0580	1	2141.43519144	3.91	0.0509
GRP*SEX	2	8738.73716471	7.98	0.0006	2	7732.83722770	7.06	0.0014
FORM*SEX	1	2439.47472938	4.46	0.0374	1	2686.18519144	4.91	0.0292
GRP*FORM	2	5336.06682780	4.87	0.0097	2	5497.48013769	5.02	0.0085
GRP*FORM*SEX	2	1388.08482326	1.27	0.2862	2	1388.08482326	1.27	0.2862
METH(GRP*FORM*SEX)	12	7080.30833333	1.08	0.3877	12	7080.30833333	1.08	0.3877

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: PROP

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	23	2.19851192	0.09558747	2.10	0.0067	0.339755	34.6176
ERROR	94	4.27235333	0.04545057		ROOT MSE		PROP MEAN
CORRECTED TOTAL	117	6.47086525			0.21319139		0.61584746

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
GRP	2	0.44140249	4.86	0.0098	2	0.43049248	4.74	0.0110
FORM	1	0.10135187	2.23	0.1387	1	0.05991354	1.32	0.2538
SEX	1	0.30964504	6.81	0.0105	1	0.34450273	7.58	0.0071
GRP*SEX	2	0.38631296	4.25	0.0171	2	0.35463068	3.90	0.0236
FORM*SEX	1	0.36806444	8.10	0.0054	1	0.39070327	8.60	0.0042
GRP*FORM	2	0.26188490	2.88	0.0610	2	0.26995299	2.97	0.0562
GRP*FORM*SEX	2	0.07799689	0.86	0.4273	2	0.07799689	0.86	0.4273
METH(GRP*FORM*SEX)	12	0.25185333	0.46	0.9320	12	0.25185333	0.46	0.9320

SAS

GENERAL LINEAR MODELS PROCEDURE

T TESTS (LSD) FOR VARIABLE: STD
NOTE: THIS TEST CONTROLS THE TYPE I COMPARISONWISE ERROR RATE,
NOT THE EXPERIMENTWISE ERROR RATE

ALPHA=0.05 DF=112 MSE=223.903
CRITICAL VALUE OF T=1.98137
LEAST SIGNIFICANT DIFFERENCE=6.6874

WARNING: CELL SIZES ARE NOT EQUAL.
HARMONIC MEAN OF CELL SIZES=39.3103

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

T	GROUPING	MEAN	N	GRP
	A	109.650	40	1
	A			
	A	109.000	38	2
	A			
	A	108.500	40	3

VITA

Suh Er Wong

Candidate for the Degree of

Master of Science

Thesis: USE OF CHINESES CHARACTERS AND DRAWING AS AIDS IN TEACHING YOUNG CHILDREN TO READ ENGLISH

Major Field: Family Relations and Child Development

Biographical:

Personal Data: Born in Republic of Singapore, May 16, 1956, the daughter of Mr. and Mrs. Sah Quan Wong. Married to Yek Hwee Yeo on May 22, 1982.

Education: Graduated from San Yu High School, Singapore, in November, 1975; received Bachelor of Arts degree in Economics and Mass Communication from Nanyang University, Singapore, in August, 1979; completed requirements for the Master of Science degree at Oklahoma State University, Stillwater, Oklahoma, in May, 1986.

Professional Experience: Graduate Research Assistant, Oklahoma State University, 1986; Member Omicron Nu Honorary Society.