COGNITIVE STYLE AND ITS RELATIONSHIP TO PAIRED-ASSOCIATE AND CONCEPT IDENTIFICATION TASK PERFORMANCE OF PRIMARY-AGED INDIAN CHILDREN

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PREFACE

The present study focused on a sample of primary-aged American Indian children attending three public schools in Oklahoma. It was the author's belief that these beginning years of formal schooling are the most critical. It is hoped that this study will provide some new information about a particular cognitive variable which may be related to primary-aged Indian students' performance on two types of instructional tasks.

The author wishes to thank Dr. Paul Warden for his endless guidance and assistance in preparing the present study. The author would also like to thank Dr. Douglas Aichele, Dr. Joseph Pearl, and Dr. Kenneth Sandvold for their assistance in preparing the final manuscript. Finally, the author would like to thank the schools which were involved in the study for their cooperation and assistance.

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CHAPTER I

PRESENTATION OF THE PROBLEM

Introduction

The American Indian has demonstrated extreme difficulty in adjusting to America's educational system. This adjustment problem has been reflected in the poor academic achievement of many American Indian students. Evidence of this poor academic performance has been well documented (Fuchs and Havighurst, 1972; Berry, 1968; and Bryde, 1970). No doubt the reasons are numerous, complex, and probably related to a specific community and its culture (Fuchs and Havighurst, 1972). To account for a portion of this poor school performance, Fuchs and Havighurst (1972) identified the school environment itself as a possible source of conflict.

One aspect of the school environment that deserves analysis is the overall teaching-learning process that supposedly transpires within the classroom. The present study agreed with Hudgins' (1971) view of the instructional process. He defined teaching as the process by which the teacher introduces or undertakes an activity with the intention that the pupils will learn something as a consequence. Thus, teaching occurs when the teacher prescribes tasks (reading, writing, computing, etc.) for students to engage in for the purpose of learning. Two important component parts of this teaching process are identified as the characteristics of the prescribed learning task and learner characteristics or attributes. In essence, the learning task is usually the same for all students, such

as reading a chapter and answering questions. However, the literature has indicated that learner characteristics vary from individual to individual. Basically, individuals differ from one another in many attributes and these differences are known collectively as *individual* differences. The present study was an attempt to define a proposed relationship between a particular learner characteristic and performance on two types of learning tasks.

Theoretical Background

The term attribute-treatment interaction originated from Cronbach (1957) and referred to a type of research that attempted to prove the expectation that differenct learners would perform optimally under conditions differentially designed to accommodate each individual's style of information processing. The term attribute refers to a learner characteristic or individual difference which proves to be empirically useful. The term treatment is analogous to a type of instruction or organization of materials to which the subject is asked to interpret and respond. Finally, the term interaction means that there is unequal contrasting effects by the various treatments on the several subgroups of subjects. Basically, the attribute-treatment interaction research paradigm was designed to answer the question of what types of treatments or instruction will interact with one or more learner characteristics to produce optimal learning performance. In other words, will two or more groups of students differing on a particular learner characteristic profit equally from the same or different types of instruction?

The status of attribute-treatment interaction research is ambiguous (Cronbach and Snow, 1969). Rhetts (1972) stated that experimenters have

sought to design treatments before having established that learners (differentially possessing some task-specific attribute) actually vary significantly in their performance on the given task. Rhetts (1972) further argued that accurate attribute-treatment interaction research should be a two stage process. The first stage should be descriptive in nature and designed to determine whether there is a task performance difference among learners varying on some specific attribute. The second stage should be designed to test whether the performance differences can be eleminated by virtue of some carefully designed treatment or instruction. The present study was concerned with the first stage of the process described by Rhetts (1972). Basically, the study was designed to identify a proposed relationship between a learner characteristic or attribute and performance on two types of instructional tasks. If such a relationship is found, future research must determine what type of treatment or instruction will interact with this attribute to produce the optimal learning situation.

In regard to learner characteristics, psychologists and educators have identified certain cognitive attributes or processes that are related to learning performance and school achievement (Ausubel, 1968; Vinacke, 1974; Ellis, 1972; and Saltz, 1971). More specifically, there seems to be be several visual perceptual attributes which must be present in order for a child to receive maximum beneift from the classroom instructional situation (Smith and Dechant, 1961). Schubert and Torgerson (1968) have argued that disadvantaged children come to school with poorly developed visual perceptual skills. The present study will focus on one particular visual skill, namely the method of organizaing one's external environment. This variable, cognitive style, was selected for study because of the

importance of visual perceptual abilities and the potential relationship it could have with the performance of Indian children on certain types of learning tasks which appear to be indigenous to most classroom situations. The dimension of cognitive style selected for study was the field independent vs. field dependent or analytic vs. global dimension.

In regard to task characteristics, Rhetts (1972) stated that future attribute-treatment interaction research should employ learning tasks that are relevant to the actual classroom situation. It was also stated that the research study should provide a detailed description of the characteristics of the particular tasks employed. The present study will employ paired-associate and concept learning tasks. These two types of learning tasks were chosen because of their relevance to the actual classroom learning situation, their appropriateness to the study of paired-associate and concept learning processes, and an empirical relationship between them and performance on tests of academic achievement (Stevenson, Hale, Klein, and Miller, 1968; Samuels and Anderson, 1973; and Rohwer, 1972).

A review of research concerned with the performance of Indian students on paired-associate and concept learning tasks evidenced little information. While a few studies (Purdy, 1968; and Cole, 1971) concentrated on the rate of performance of Indians on paired-associate learning tasks, no research was found which attempted to relate cognitive attributes, such as cognitive style, to Indian students' performance on paired-associate or concept learning tasks.

In summary, the present study focused on a proposed relationship between a learner attribute and performance on two types of learning tasks that are believed to be indigenous to most classroom instructional

situations. The two learning tasks appear to require a certain level of visual discrimination ability. It would appear that the way in which a child visually organizes a complex stimulus configuration would be related to his performance on two types of instructional tasks that require the same or similar visual perceptual abilities. If such a relationship is found to exist in a sample of Indian children, this would imploy that a particular mode of visual perceptual development would yield specified levels of performance on two types of classroom instructional tasks.

Statement of the Problem

From an examination of some of the variables that are related to students' performance on paired-associate and concept learning tasks, it was concluded that very little empirical knowledge existed which identified or described the variables that may affect the performance of Indian students on these two types of learning tasks. Thus, the present study defined the problem as a paucity of empirical research that identifies cognitive variables that are related to Indian students' performance on types of learning tasks that are believed to be involved in many classroom instructional situations. More specifically, there is a need to determine if cognitive style is related to Indian students' performance on selected conceptual and paired-associate learning tasks.

Purpose of the Study

One purpose of the present study was to determine if cognitive style is related to Indian students' performance on selected paired-associate and conceptual learning tasks. A second purpose of the study was to determine if Indians and non-Indians differ in terms of cognitive style.

A third purpose of the study was to describe the development of the construct cognitive style in a sample of Indian students.

Definition of Terms

1. Cognitive Style. An individual's consistencies in cognitive behavior resulting from the individual's perceptual and conceptual organization of the external environment. In this study, cognitive style was operationally defined in terms of the test score on the Children's Embedded Figures Test (CEFT) by Stephen Karp and Norma Konstadt. The construct cognitive style was viewed as being unidimensional and was measured on a continuum ranging from global to analytical.

2. Paired-Associate Learning Task. A task which required an individual to learn to associate pairs of items, one member of the pair being the stimulus item and the second member being the response item.

3. Paired-Associate Learning Trial. One trial consisted of a presentation of all paired-associate items.

4. Paired-Associate Learning. A process through which an individual acquires the ability to associate pairs of items. In the present study, paired-associate learning was operationally defined as the total number of trials necessary to complete one correct repetition of three paired items.

5. Concept Identification Task. A task which required an individual to learn to classify two or more somewhat different events or objects into a single category.

6. Concept Identification Learning Trial. One trial consisted of a presentation of one stimulus card, a response by the subject, and feedback to the subject regarding the correctness of the response.

7. Concept Learning. A process through which an individual acquires the ability to classify two or more somewhat different events or objects into a single category. In the present study, concept learning was operationally defined as the total number of trials necessary to correctly identify six successively presented stimulus cards as being or not being examples of the concept.

8. Indian Subjects. Those subjects who were one fourth or more of American Indian descent and were enrolled in the kindergarten, first-, or second-grade levels of the sampled schools. The samples of Indian and non-Indian subjects were selected from three public schools in Oklahoma.

9. Non-Indian Subjects. The non-Indian subjects were identified as those students who were not one fourth or more of American Indian descent and were enrolled in the kindergarten, first-, or second-grade levels of the sampled schools.

Hypotheses

The present study was designed to determine if a relationship existed between performance on the construct cognitive style and performance on selected paired-associate and concept identification tasks in a sample of Indian students enrolled in grades kindergarten, one, or two. In addition, the design yielded information needed to describe the developmental nature of cognitive style in a sample of Indian subjects and provided a comparison with a non-Indian sample at the three specified grade levels. The hypotheses to be tested are presented in the null form:

Hypothesis I: There is no significant relationship between the Indian subjects' performance on cognitive style and the Indian subjects'

performance on a paired-associate learning task at the kindergarten, first-, or second-grade levels.

Hypothesis II: There is no significant relationship between the Indian subjects' performance on cognitive style and the Indian subjects' performance on a concept identification task at the kindergarten, first-, or second-grade levels.

Hypothesis III: There is no significant difference between the Indian subjects' performance on cognitive style and the non-Indian subjects' performance on cognitive style at the kindergarten, first-, or second-grade levels.

Hypothesis IV: There is no significant difference in cognitive style among the Indian subjects at the kindergarten, first-, and second-grade levels.

Assumptions of the Study

1. Cognitive style (as defined) is a valid and measurable portion of an individual's total cognitive capacity.

2. A paired-associate learning task (as defined) is a sifficiently valid and reliable method by which to measure paired-associate learning.

3. A concept identification task (as defined) is a sufficiently valid and reliable method by which to measure concept learning.

4. Indian subjects (as defined) belong to a culture that has truly different aspects from the non-Indian culture.

Limitations of the Study

One limitation of the present study is concerned with the generalization of the results. The results of the present study can be

generalized to those primary-aged Indian and non-Indian subjects attending the schools which constitute the present sample. However, if other samples of Indian and non-Indian subjects are shown to be similar to the present sample, then the results of the present study may be generalized to them.

Significance of the Study

As discussed before, there exists a paucity of research which identifies cognitive variables which may affect classroom learning performance of Indian children. It is hoped that the present study will clarify the role that cognitive style plays in learning tasks that appear to be common to most classrooms. If cognitive style is related to performance on paired-associate and concept identification tasks, perhaps classroom instruction can be structured so as to capitalize on this relationship. If a particular ordering of the instructional process results in maximum achievement for a particular cognitive style, the classroom teacher could arrange her instructional strategies and methods so as to save time and effort. Finally, if the efficiency of classroom learning performance of Indian students can be improved, a concomitant increase in academic achievement may occur.

CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

The purpose of the present chapter was to review the research concerned with the relationship between cognitive style and performance on paired-associate and concept learning tasks. It is acknowledged that the majority of relevant research has concentrated on non-Indian children as subjects. One might question the appropriateness of searching for this relationship in a population of Indian children. Why should the present study expect to find such a relationship in a group of Indians? To answer such questions, the writer would like to point out that since the American educational system is attempting to educate the Indian population, the schools are at least assuming that Indian and non-Indian children have similar cognitive abilities. Until research indicates otherwise, one may assume that the variable, cognitive style, exists within an Indian population. Similarly, Indian and non-Indian children are involved in many of the same instructional situations and, therefore, experience the same paired-associate and concept learning situations. Thus, within an Indian population, one might expect to find a relationship between the variables involved in the present study.

The major divisions of the present chapter are: 1) Cognitive Style, 2) Paired-Associate and Concept Learning, 3) Relationship Between Cognitive Style and Paired-Associate and Concept Learning Tasks, and 4) Summary.

Cognitive Style

Ellis (1972) defined cognition as the symbolic, mental, and inferred processes of humans, More specifically, these processes are purportedly involved in such activities as thinking, reasoning, problem solving, and conceptual learning. These mental abilities or variables are believed to reside within an individual and have been shown to affect some types of learning performance or school achievement (Ausubel, 1968; Vinacke, 1974; and Saltz, 1971). Memory, motivation, and intelligence are commonly cited as cognitive variables which affect learning performance (Vinacke, 1974). The present study focused on one particular cognitive construct called cognitive style. The term cognitive style emerged from the literature within the last two decades and has evidenced a significant relationship to performance on certain learning tasks (Klausmeier, Ghatala, and Frayer, 1974).

As one begins to define cognitive style, the evasiveness of this psychological construct becomes readily apparent. A review of the literature revealed that the definition of cognitive style has become investigator specific. Kogen (1971) provided an excellent outline of the most prominant dimensions of the construct. According to Kogen (1971), these dimensions are defined as field independence vs. field dependence, scanning, breadth of categorizing, conceptualizing styles, cognitive complexity vs. simplicity, reflectiveness vs. impulsivity, leveling vs. sharpening,constricted vs. flexible control, and tolerance for incongruous experiences. The present study focused on the field independent vs. field dependent or analytical vs. global dimension. A field independent or analytical individual evidences a tendency to experience items separately from their backgrounds while a field dependent or global individual

tends to view the environment in a global manner, unable to distinguish specific items from and embedding context.

Kagan, Moss and Siegel (1963) discussed this dimension of cognitive style in the following way:

> Among children of adequate intelligence there are those who charactistically analyze and differentiate the stimulus field, applying labels to subelements of the whole. Others tend to categorize a relatively undifferentiated stimulus. Thus, some children are splitters, others are lumpers (p. 74).

Klausmeier, Ghatala, and Frayer (1974) stated:

> The two poles of this dimension are characterized by individuals who analyze and differentiate the components of the stimulus complex as opposed to individuals who fail to analyze and differentiate the components and respond to the stimulus as a whole (p. 37).

In terms of measuring an individual's level of analytical and global functioning, the work by Witkin (1962) seems to be paramount. The Witkin group has devised three procedures for assessing the analytic-global dimension of the construct cognitive style. These instruments include the Body Adjustment Test (BAT), the Rod and Frame Test (RFT), and the Embedded Figures Test (EFT). The EFT, which seems to be the most widely used, consists of a series of complex geometric figures in which a series of simple figures is embedded. The subject's task is to locate each of the simple figures. The present study has employed a downward extension of the EFT called the Children's Embedded Figure Test (CEFT). This test was designed expecially for children by Karp and Konstadt (1963).

Research aimed at discovering correlates of cognitive style has been plentiful but the results are not always consistent. Briefly, cognitive style has been related to such variables as sex (Maccoby, 1966), personality characteristics (Witkin, 1954), social behavior (Crandall and Sinkeldam, 1964), intelligence (Witkin, 1962) and learning performance

on specific types of learning tasks (Kagan et al., 1963). It has been argued (Coop and Sigel, 1971) that the last correlate, performance on learning tasks, is the most important for an educational setting and thus was the focus of the present study.

In summary, the present study concentrated on one aspect or dimension of cognitive style, the analytical vs. global dimension. This aspect refers to an individual's ability or inability to analyze and differentiate the component parts of a complex stimulus configuration. Cognitive style has been related to several correlates, one of which has special significance to educational procedures. This correlate is defined as performance on specific types of instructional tasks that are believed to be indigenous to most classrooms.

Paired-Associate and Concept Learning

An examination of most any textbook dealing with learning theories usually results in encountering several different types or forms of learning. As with cognitive style, one cannot offer a definition of learning that is accepted by all psychologists. The present study utilized a definition of learning proposed by Ellis (1972, p. 4):

> Learning is a relatively permanent process that is inferred from performance changes due to practice.

Thus, learning is inferred from performance. The present study was concerned with two types or kinds of learning performance, performance on a paired-associate learning task and performance on a conceptual learning task.

Paired-associate learning is common to many instructional situations (Ellis, 1972 and Gagne, 1970). Ellis (1972) stated that in paired-associate

learning the task of the learner is to learn to associate specific pairs of items, one member of the pair being the stimulus item and the second member being the response item. He further states that any procedure that requires the learner to associate specific verbal responses to specific stimuli constitutes paired-associate learning. Examples of primary classroom paired-associate learning situations are the learning of letter names, letter sounds, and grapheme cluster sounds. At most grade levels, students are repeatedly asked to learn to associate specific oral responses with certain verbal or visual stimuli (Samuels, 1973 and Samuels and Anderson, 1973).

In outlining the components of paired-associate learning, Ellis (1972) noted that the paired-associate procedure was originally developed to study the formation of simple rote associates. However, it now seems that paired-associate learning is much more complex than originally though and represents a multi-process affair. In defining some of the processes that are involved in paired-associate learning, Ellis (1972) recognized such processes as stimulus discrimination, response integration, stimulus selection, association formation, mediation, and organizational processes. Thus, some learning theorists view paired-associate learning as being very complex and consisting of several processes.

In Gagne's (1970) description of eight proposed types or kinds of learning, he specifies one type as verbal association learning. In describing the use of the paired-associate procedure to learn a list of new vocabulary words, Gagne (1970) sets forth at least four necessary conditions for the learning of the verbal chains. The first condition would be that the learner knows what the stimulus item actually is. Secondly, the learner must know how to verbalize the correct response

item. Thirdly, a coding connection or ability to associate the stimulus and response items must be present. The fourth condition requires contiquity. Each response items must be contiguous in time with the next response item. As with Ellis (1972), Gagne (1970) seems to veiw paired-associate learning as a complex, multi-process affair.

The appropriateness of using paired-associate learning tasks to study associative learning was pointed out by Goulet (1968), who recognized several adaptive features. First, the paired-associate task may be adapted or modified to study associative learning in many situations. The paired-associate task permits stimuli and responses to be functionally differentiated to the experimenter and to the subjects, something which may not be possible with other types of learning tasks. Finally, the paired-associate learning task can be designed to either capitalize or minimize the effects of prior learning. In summary, the paired-associate task appears to be a very versatile method by which to study associative learning.

The many different definitions of concept learning indicates that the acquisition of concepts has been viewed differently by many theorists. According to Gagne (1970), concept learning makes it possible for an individual to respond to things or events as a class. In Gagne's (1970) description of his eight types of learning, he discussed necessary prerequisites to learning. In essence, these eight types of learning are hierarchial in nature, each higher type requiring the mastery of previous ones. Thus, the learning of concepts is viewed by Gagne (1970) as requiring the mastery of prerequisite skills in a sequential fashion. For example, in his discussion of the learning of the concept "edge", Gagne (1970) states that the first prerequisite might be for a child to

achieve a S-R connection, so that the child can repeat the word edge after the instructor. Next, the child might learn to identify two or three specific edges by saying edge whenever an actual edge is referred to. The next prerequisite might be that the child establish discriminations between edge and stimulus situations that are not instances of the concept edge. Gagne (1970) states that when the prerequisite abilities have been developed, the child is ready to engage in concept learning. Concept learning occurs when the child is freed from control by specific stimuli. In other words, concept learning refers to the learner's ability to generalize a particular concept to new stimulus situations that did not play a part in the learning itself.

Concept learning was defined by Ellis (1972) as referring to any activity in which the learner must learn to classify two or more different events or objects into a single category. The events described by Ellis (1972) to ensure concept learning are very similar to those of Gagne's (1970). For example, in teaching the color concept of white to children, Ellis (1972) first states that the child must learn to repeat the response "white" in the presence of a specific stimuli, such as a white sheet of paper. Next, the child must be presented with additional objects that are examples of the concept and instances that are not examples of the concept. Finally, the learner is presented with other objects and asked to identify the correct examples of the concept. Thus, the result of concept learning is the development of the learner's ability to respond to the relevant dimensions of the concept and to ignore the irrelevant dimensions. It should be pointed out that in Gagne's (1970) and Ellis' (1972) description of concept learning, the final test

requires the learner to identify or classify instances of the concept from among several examples not used in the learning itself.

In summary, this section has reviewed basic components and conditions of paired-associate and concept learning. In essence, evidence of paired-associate learning was described as the learner's ability to respond correctly to a predetermined sequence of stimulus items. Concept learning was described as the learner's ability to identify instances of a particular concept, after instruction.

Relationship Between Cognitive Style and Paired-Associate and Concept Learning Tasks

From a review of the literature, research by Elkind, Koegler, and Go, (1963), Fredrick (1968), Davis (1967), Nelson (1972), and Ohnmacht (1966) have yielded information which is relevant to the variables to be examined in the present study. In each study, the relationship between cognitive style and concept learning tasks was examined.

The purpose of an experiment by Elkind, Koegler, and Go (1963) was to determine if an analytic approach to perception was superior to a global approach on a test that required perceptual concept formation. The short form of the Gottschaldt Embedded Figures Test was used to assess cognitive style or field independence-dependence. The test consists of twelve cards, each of which contains a complex figuration in which a simple figure is located. Each subject was allowed five minutes to find the simple figure and his score was the average recognition time for all figures. The abstraction test (SHA) of the Shipley Hartford Scale was used as the measure of perceptualconcept formation. This test consists of 20 items, with each item providing several correct examples

of a relation and one incomplete example. The subject must complete the incomplete example in order to demonstrate his abstraction of the relation. The Shipley Hartford Vocabulary Test (SHV) was also administered as a control measure. As the name implies this test consists of 40 multiple-choice items in which the subject was to choose a word most similar to a clue word. Finally, the SHA and SHV scores were used to arrive at estimate IQ equivalents (SHIQ).

A median split of the male EFT scores produced field independent (analytic) and field dependent (global) groups. Those which scored above the median were designated as field dependent while whose who scored below the median were designated as field independent. The same procedure was followed with the females. The total sample consisted of 30 males (ages 18 to 24) and 26 females (ages 18 to 27). Field independent and dependent Ss were then compared utilizing the mean scores on the SHA, SHV, and SHIQ. The results revealed that the field independent males and females obtained significantly higher scores than their field dependent counterparts on the SHA and SHIQ. This relationship did not hold true for the SHV. Elkind, Koegler, and Go, (1963) concluded that the analytic approach to perception was an asset on tests that measured perceptual concept formation. However, this did not seem to hold true for tests which were mostly verbal in nature. The relationship between field independence and IQ was attributed to the subjects' higher SHA scores since the SHV showed no significant differences. Finally, the authors stated that future research should be specific in delineating cognitive style and the type of tests used to examine them.

The purpose of a study by Davis (1967) was to determine the relationship between cognitive style and performance on concept indentification

problems of varying levels of complexity. Cognitive style was defined as an individual's score on the Hidden Figures Test (HFT). The HFT is composed of 32 complex geometric designs. Inside each complex design is embedded a specified number of simple designs. The subject's task was to identify the hidden figures. It was assumed that an ability to locate the simple designs represented an analytical cognitive style, while an inability to locate the designs represented a global cognitive style.

From the HFT scores of 310 high school males, three groups of 30 subjects each were identified as high analytic, middle analytic, and low analytic. Next, Davis (1967) presented a series of 128 unique stimulus patterns to the subjects. There stimulus patterns contained combinations of values from each of the following attributes: letter (H or L), number of letters (1 or 2), size of letters (large or small), color of letters (red or green), orientation of letter (upright or tilted), horizontal position of letters (left or right), and vertical position of letters (upper or lower). From these stimulus patterns three levels of complexity and two concept identification problems were constructed.

The two problems, problem A and B, differed only in terms of two relevant attributes. For problem A, letter and letter orientation were the relevant attributes. Horizontal position and size were the relevant attributes for problem B. Davis defined complexity as the number of pieces of irrelevant information contained within a configuration. The three levels of complexity were formulated by designating one, three, or five attributes of a configuration as irrelevant. For example, in the three-piece condition there were five attributes which varied -- two relevant and three irrelevant. For each problem the same two attributes

were relevant across the three complexity levels. After the subjects were instructed as to the operation of the apparatus and the nature of the problem, they were presented with a series of stimulus patterns which corresponded to one of the three complexity levels. The subject's task was to designate which category the stimulus figure belonged to. Criterion was set at 16 consecutive correct responses.

The results of an analysis of variance on errors to criterion showed significant main effects for cognitive style, complexity, and problems. Significant interactions were found between cognitive style by problem and complexity by problem. In analyzing the cognitive style by problem interaction it was evident that high analytic subjects committed fewer errors before reaching criterion than did low analytic subjects. However, further analysis of this interation indicated significatn differences between cognitive style means for problem A only. Thus, the authors concluded that cognitive style significantly influenced concept indentification, but only when the conditions used in problem A were met. Further analysis of the complexity by problem also produced interesting results. While it was recognized that the number of errors to criterion for both problems increased linearly with increased complexity, the rate of increase for problem A was much steeper than the rate for problem B.

In an experiment by Fredrick (1968), the purpose was to determine if cognitive style was related to age and performance on concept identification problems. The subjects consisted of 88 sixth graders, 82 eighth graders, and 86 tenth graders from three Wisconsin schools. All subjects were administered part one of the Hidden Figures Test (HFT). This test required the subjects to locate a figure embedded within a pattern context. Next, all subjects participated in two concept learning problems.

The first problem concerned itself with edible plants while the second dealt with animals. In addition, the first problem contained two irrelevant dimensions and was considered the low irrelevant information problem. The second problem contained five irrelevant dimensions and was considered the high irrelevant problem.

As was expected, a significant age trend was found with respect to the scores on the HFT. The mean scores for the sixth, eighth, and tenth grades were 5.08, 5.65 and 6.52 respectively. Thus, the data supported the contention that analytic ability increases with age. In an effort to determine the relationship between cognitive style and concept learning, the subjects were divided into high analytic (HA) and low analytic (LA) on the basis of their HFT scores. Then several analyses of variance were carried out using number of correct responses as the dependent measure. The results revealed that the HA subjects made significantly more correct responses than LA subjects on the animal (high irrelevant information) problem. Thus, the author concluded that, depending on the concept indentification problem, HA subjects performed better on concept learning tasks than LA subjects.

The purpose of an experiment by Nelson (1972) was to relate an individual's cognitive style to his ability to acquire subject-matter concepts. This aptitude-treatment paradigm was constructed by comparing the acquisition of geometry concepts by low and high analytic students under different instructional treatments. Utilizing the HFT, 108 seventh-grade students were ranked on the basis of their scores. From this distribution the upper one-third was designated as high analytic (HA) subjects while the lower one-third was designated as low analytic (LA) subjects. The HA and LA subjects were then randomly assigned to one

of two treatment methods. In one of the instructional methods the relevant attributes of geometrical concepts were pointed out or emphasized. In the other treatment, no emphasis was given to the relevant attributes. At the end of both treatments, a test of geometry knowledge was given.

Results from analyses of total test scores revealed significant main effects for cognitive style. Thus, analytic subjects performed significantly better on the test of concept acquisition than did the global subjects. Main effects for treatment conditions was not significant. Finally, the cognitive style by treatment interaction was not signifcant. Overall, the author concluded that the performance of analytic subjects was superior to the performance of global subjects on a test that measured the acquisition of subject-matter concepts.

Utilizing 40 undergraduate males, Ohnmacht (1966) attempted to determine the role that cognitive style played in the performance of a reversal and nonreversal concept-formation task. The Embedded Figures Test (EFT) was used to measure cognitive style. Next, all subjects participated in two concept learning problems. The first problem involved sorting response cards on the basis of a relation to a particular stimulus card. The first concept problem also involved the sorting of the response cards on the basis of positions of radii in a circle. The criterion for success was set at 15 consecutive correct sorts. The score for the first task was the number of sorting attempts required to achieve the criterion. Upon reaching the criterion the subjects were then required to learn a second concept. However, the task for half of the subjects was to change cues for the basis of solving the problem, while the task for the other half was to simply reverse the basis used in the first concept problem.

The results indicated no significant main effects for cognitive style on the first concept problem. However, an analysis of the second task's results did produce significant effects for cognitive style. The author concluded that field independent subjects are more successful than field dependent subjects in solving certain concept problems.

Thus, results from experiments by Fredrick (1968), Davis (1967), Nelson (1972), Elkind, Koegler, and Go (1963), and Ohnmacht (1966) indicated that there is a significant relationship between cognitive style and concept learning. It seems that high analytic individuals tend to perform better than low analytic individuals on certain types of concept learning tasks. However, it should be noted that cognitive style was not measured by the same instrument in each study and the concept learning tasks varied from one study to the next. Nelson (1972), Fredrick (1968), and Davis (1967) found relationships between the Hidden Figures Test (HFT) and certain types of concept learning tasks. Fredrick's (1968) concept task was primarily visual perceptual in nature and considered to be a high-irrelevant information problem since five irrelevant attributes were present. Davis' (1967) concept task was also visual in nature and emphasized letter and letter orientation as the relevant attributes. Nelson's (1972) concept test relfected three types of questions. They were questions that required recognition of attributes (Type I), recognition of examples (Type II), and knowledge of the concept definition (Type III). It was interesting that significant main effects for cognitive style were found when the total test scores and Item I scores were used as the dependent measure. Thus, it seems that these concept tasks require a discrimination process that is basically visual in nature.

Elkind, Koegler, and Go (1963) and Ohnmacht (1966) found relationships between the Embedded Figures Test (EFT) and certain types of concept formation tasks. Elkind, Koegler, and Go (1963) used a task that was primarily visual in nature and required a discrimination and sequencing process. It should be noted that cognitive style was not related to the vocabulary test. Ohnmacht's (1966) task was also visually oriented and cognitive style was not found to be related to a shift in the defining attributes of a concept.

From the findings of such studies, it seems that the concept learning tasks which differentiate analytic from global individuals appear to have certain commonalities. They required the learner to discriminate between visual attributes fo a concept. In addition, as the amount of verbal response increases, the relationship between cognitive style and concept learning apparently decreases.

In turning to the research concerned with paired-associate learning and cognitive style, studies by Ortiz and Morelan (1973) and Lee, Kagan, and Rabson (1963) yielded relevant information. Ortiz and Moreland (1973) designed a study to measure the effects of types of rewards and cognitive style on the learning performance of Mexican-American, fifth-grade children on a paired-associate (PA) learning task. The population consisted of 60 Mexican-American fifth graders who were considered to have normal intelligence. Using the portable Rod and Frame Test (RFT) as the measure of cognitive style, 44 subjects were selected for participation in the study. Twenty-two were designated by the RFT as field independent and the other twenty-two as field dependent. After being classified as either analytic or global, the subjects were randomly assigned to one of two learning conditions. The first learning condition employed

personalized rewards, while the second used impersonal rewards. After the instruction, the subjects participated in a PA learning task. The PA task consisted of one list of five nonmeaningful paired associates, the stimulus item being a stick figure and the response item being a three digit number. Three degrees of learning performance were investigated. The first (response learning) was defined as the first trial on which each subject correctly recalled each of the five response items. The second (associative stage one) component was defined as the first correct pairing of the response and stimulus items. The third (associative stage two) was defined as consistant pairing of the response with the stimulus items.

A 2 by 2 analysis of variance was used to analyze trials to criterion in each of the three component stages of learning. No significant main effects or interactions resulted from the analysis of the first two stages. However, the analysis of the third stage, associative stage two, resulted in a significant main effect for learning conditions. Cognitive style and interaction did not reach significance. The authors concluded that the use of personalized rewards tended to improve a student's learning performance. Students who received personalized rewards required fewer learning trials than did students who received impersonal rewards. The authors further concluded that the study failed to provide empirical support upon which to base differential assignment of children to instructional programs based on cognitive style. Finally, the authors noted that differences might have been found if more complex learning tasks were employed.

Lee, Kagan, and Rabson (1963) devised an experiment to determine if cognitive style was related to rate of learning different concepts.

Using a paired-associate learning paradigm, the Conceptual Style Test was administered to 39 third-grade boys as a measure of cognitive style. From this administration, 15 boys were designated as being analytic and 15 as being global. All subjects had average or above intelligence test scores. The types of concepts learned were defined as being analytic, inferential-categorical, and relational. The paired-associate learning task involved the subject learning to associate each of the concept types with a nonsense syllable response. One trial represented a presentation of all the stimulus concepts. The task of each subject was to give the response syllable for each concept. Criterion was set at three errorless trials. An analysis of variance on trials to criterion was then computed. The results revealed that analytic boys learned the analytic concepts more readily than the other two types. The global boys learned the relational concepts more readily than the other two types.

The results of the Ortiz and Morelan (1973) and Lee, Kagan, and Rabson (1963) studies provide interesting information about the proposed relationship between cognitive style and paired-associate learning task performance. The significant interaction found in the Lee, Kagan, and Rabson study indicated that the analytic subjects learned certain types of concepts more readily than others, when employing a paired-associate learning procedure. The inability of the Ortiz and Morelan (1973) study to find similar results may have been due to the type of stimulus and response items used in the paired-associate learning tasks. It is possible that the paired-associate task used in the Lee, Kagan, and Rabson (1963) study represented a higher degree of meaningfulness than the task used in the other study. Perhaps the use of letters facilitated learning more than numbers. Ellis (1972) has pointed out the role that

meaningfulness plays in paired-associate learning. As with concept learning, it seems that the relationship between cognitive style and paired-associate learning depends on certain characteristics of the paired-associate learning task itself.

Summary

The present chapter has reviewed research concerned with the definition of the various dimensions of the general construct called cognitive style. Secondly, the chapter reviewed the theoretical rationale underlying concept and paired-associate learning and discussed their respective methodologies. Finally, the present chapter has examined research that dealt with a proposed relationship between the variables involved in the present study, namely cognitive style and concept and paired-associate learning.

It seems that analytic children tend to solve paired-associate and concept identification tasks easier than global children. However, no research has examined this relationship in a sample of Indian children. Since the American Indian student is demonstrating difficulty in the classroom, perhaps some clarification as to the role that cognitive style plays in an Indian student's performance on two types of instructional tasks would be helpful to educators. In other words, does this relationship between cognitive style and performance on two types of instructional tasks exist in a sample of American Indian students?

CHAPTER III

DESIGN AND METHODOLOGY

Selection of the Sample

The schools involved in the present study were chosen because they provided accessibility to a high concentration of American Indian children. In each of the three public schools, all kindergarten, first-, and second-grade students were categorized as being Indian or non-Indian. The Indian children were verified by the Oklahoma State Department of Education as being one-fourth or more American Indian. From the categorization process, two master lists of subjects were constructed utilizing all three schools. One list consisted of Indian children while the other consisted of non-Indian children. From both lists and at each grade level, thirty subjects were randomly selected for participation in the study.

In an effort to control for any differences due to the sex of the subject, an equal number of male and femal subjects were selected from the Indian and non-Indian lists. The ratio of Indian to non-Indian subjects was equal for each school. Finally, since the three schools were primarily rural, it was assumed that students attending them were comparable for purposes of the present study.

Paired-Associate Task Materials

For the purpose of the present study, a paired-associate learning

task was defined as a task in which the subject is to learn to associate pairs of items, one member of the pair being the stimulus item and the second member being the response item (Ellis, 1972). The appropriateness of using paired-associate learning was pointed out by Goulet (1968). Goulet (1968) stated that the paired-associate task is one which allows stimuli and responses to be functionally differentiated to the experimenter and to the subjects. In addition, the paired-associate task can be constructed to maximize or minimize the effects of prior learning. Finally, Deese and Hulse (1961) stated that the paired-associate task appears to be representative of the method people use when they learn verbal material under normal conditions.

The paired-associate task used in the present study consisted of a set of instructions (Appendix A) and three paired items (Appendix B). Each of the paired items consisted of a stimulus item and a response item. The stimulus items (a triangle, square, and circle) were presented singularly on white, four by six inch cards. Cards were used because of their similarity to flash cards utilized in many classrooms. Each response item (Appendix B) consisted of a single trigram unit. A trigram unit is composed of two consonants and one vowel in the following order: consonant-vowel-consonant. The response items were verbally presented to each subject.

After instructions, each subject was simultaneously presented with a card showing the stimulus items and a pronounciation of the appropriate response item. This process continued until all three paired items were presented. The trigram units did not appear on any of the cards. The simultaneous presentation of the stimulus and response items for each successive paired-associate items constituted one paired-associate

learning trial. Then, the subject was presented with each successive stimulus item and asked to vocalize or state the appropriate response item or trigram unit. A subject's paired-associate task score was the total number of paired-associate learning trials necessary for the subject to vocalize the correct trigram unit for each of the three stimulus items.

In discussing relevant characteristics of any paired-associate task, Ellis (1972) mentions meaningfulness, intralist similarity, and order of presentation. Basically, the number of trials needed to learn a paired-associate list decreases as the meaningfulness of the items increases. Since the present study was primarily concerned with generalizing to classroom situations that involve relatively new material, the paired-associate task was devised using response items which appeared to be low in meaningfulness. Furthermore, the task was designed so as to minimize any possible preconceived associations between the stimulus and response items. In regard to intralist similarity, Ellis (1972) stated that stimulus and response similarity interferes with associate learning. Briefly, this means that the more similar the stimulus list and the response list, the more difficult it is to learn the paired associate items. Since the stimulus list contained three different figures and the response list contained seven different letters, the paired-associate task appeared to be low in intralist similarity. Finally, the order of the pairs of items was varied from trial to trial, randomly, in order to prevent the subject from using serial position as a cue.

Concept Identification Task Materials

The present study defined a concept as a class of stimuli or events that share in one or more common characteristics. Concept learning is

said to have occurred when the subject is able to discriminate between classes or events and generalize within classes of events (Ellis, 1972). The present study defined a concept identification task as a task that required an individual to learn to classify from two to three somewhat different objects into a single category. The concept selected for each Indian subject to learn is presented in Appendix D. It consists of a square containing three circles arranged in a particular pattern. The concept identification task was administered to each Indian subject individually and consisted of a set of instructions (Appendix C) and 30 stimulus cards (Appendix D).

After the instructions were read to the Indian subject, the first stimulus card was presented. The subject responded as to whether or not the stimulus card was an example of the concept to be learned and then received feedback from the investigator regarding the correctness of his response. The investigator then presented the subject with a second stimulus card, waited for the subject's response, and again provided feedback. This procedure continued until the subject could correctly classify six successive stimulus cards as being examples or non-examples of the concept to be learned. In any six successive stimulus cards, the number of examples of the concept randomly ranged from two to three. A presentation of a stimulus card, response from the subject, and feedback constituted one concept identification learning trial. The subject's concept identification task score was defined as the number of learning trials necessary for the subject to correctly classify six successive stimulus cards.

In order to solve the concept identification task, each Indian subject had to focus on the shape of the items presented on the stimulus

cards. Each stimulus card depicted a square containing one, two, or three circles arranged in a particular pattern. The concept to be learned (Appendix D) was a square containing three circles arranged in a specific pattern. The color and size of each square and circle was held constant.

Instruments

The Children Embedded Figures Test (CEFT) was developed by Stephen Karp and Norma Konstadt in 1963. Essentially, the CEFT is a revision of the Goodenough-Eagle modification of the Embedded Figures Test. The CEFT purports to measure a dimension of cognitive style termed by Witkin (1962) as field dependence-independence. This dimension is viewed as an individual's cognitive or perceptual style and its development supposedly accounts for an individual's attainment of greater psychological complexity. The Embedded Figures Test has been the most widely used measure of cognitive style, but has proven too difficult for children. Therefore, Goodenough and Eagle modified the test into the CHEF. However, even this test proved too complex for young children. Karp and Konstadt's revision simplified the tasks and instructions so that the test is suitable for children between the ages of five and nine.

The CEFT is composed of two series of figures which require the subject to locate a simple form in a complex one. Meaningful figures are employed to keep the attention of young children. The first series consists of eleven items which involve a tent. The subject's task is to locate a simple tent-like figure in a complex configuration. The second series consists of fourteen "house" items in which the subject is to locate a simple house-like figure in a complex configuration. The subject's score is the total number of items correct in both series. A

high score indicates an analytical mode of cogntive style while a low score reflects a global mode of cognitive style.

Reliability estimates were obtained from a standardization sample that included boys and girls ranging in age from five to twelve. Internal reliability coefficients ranged from .83 to .90. The test manual reported six month test-retest reliability coefficients of .87 for five to six year olds (Dreyer, Nebelkopf, and Dreyer, 1969). In terms of validity, the test manual reported correlation coefficients ranging from the mid .80's at the eleven and twelve year old level to the low .70's at the nine and ten year old level between the CEFT and the EFT.

Methodology and Testing Procedure

As discussed earlier, two master lists of subjects were constructed utilizing the three public schools. One list contained all Indian students in the kindergarten, first-, or second-grades while the other list contained all non-Indian students in the same grade levels. At each grade level, thirty Indian subejcts were randomly selected from the list of Indian students. At the same grade levels, thirty non-Indian subjects were also selected at random from the list of non-Indian students.

For each Indian subject at each grade level, the investigator administered the Children's Embedded Figures Test (CEFT), the paired-associate learning task, and the concept identification learning task. For each non-Indian subject at each grade level, the investigator administered only the CEFT.

Statistical Analysis

To test Hypothesis I, Pearson Product-Moment correlation coefficients

(r) were computed between the scores on the CEFT and the scores on the paired-associate task for the Indian subjects at each of the kindergarten, first-, and second-grade levels. Each Pearson Product-Moment correlation coefficient (r) was tested for a significant difference from 0.0 with a critical-ratio z-test (Bruining and Kintz, 1968). The confidence level for all tests of significance was set at the .05 level. Raw score data were used in all tests of significance. Further analyses consisted of tests (Fisher's Z) for significant differences between those correlation coefficients which were statistically significant.

To test Hypothesis II, Pearson Product-Moment correlation coefficients (r) were computed between the scores on the CEFT and the scores on the concept identification task for the Indian subjects at each of the kindergarten, first-, and second-grade levels. Each correlation coefficient (r) was tested for a significant difference from 0.0 with a critical-ratio z-test (Bruining and Kintz, 1968). The confidence level for all tests of significance was set at the .05 level. Raw score data were used in all tests of significance. Further analyses consisted of tests (Fisher's Z) for significant differences between those correlation coefficients which were statistically significant.

To test Hypothesis III, Indian and non-Indian subjects' scores on the CEFT were compared at each grade level with t-tests. Before the t-tests were computed, F tests were performed on the sample variances in an effort to satisfy the homogeneity of variance assumption. The appropriate t-test was used, depending upon the results of the F tests.

To test Hypothesis IV, three separate t-tests were computed from the Indian subjects' scores on the CEFT at the kindergarten, first-, and second-grade levels. Before the t-tests were computed, F tests were

performed on the sample variances in an effort to satisfy the homogeneity of variance assumption. The appropriate t-test was used, depending upon the results of the F tests. Again, the confidence level was set at the .05 level.

Summary

The present chapter has described the selection of the sample, the paired-associate learning task, the concept identification task, the CEFT, the methodology and testing procedure, and the statistical methods employed in the present study.

CHAPTER IV

ANALYSIS OF THE DATA

Introduction

The present chapter describes the statistical treatment of the data and an analysis of the results. The hypotheses stated in Chapter I are tested under the following headings: (1) relationship between cognitive style performance and paired-associate task performance and between cognitive style performance and concept identification task performance of Indian subjects, (2) cognitive style performance differences between Indian and non-Indian subjects at the kindergarten, first-, and second-grade levels, and (3) cognitive style performance differences among Indian subjects at the kindergarten, first-, and second-grade levels.

Relationship Between Cognitive Style Performance and Paired-Associate Task Performance and Between Cognitive Style Performance and Concept Identification Task Performance of Indian Subjects

Hypothesis I: There is no significant relationship between the Indian subjects' performance on cognitive style and the Indian subjects' performance on a paired-associate learning task at the kindergarten, first-, or second-grade levels. Table I shows the number of Indian subjects, the obtained Pearson Product-Moment correlation coefficient (r),

z value, and the level of significance for each of the three grade levels under Hypothesis I.

It can be seen from Table I that the obtained correlation coefficients for the kindergarten and second-grade levels were significant at the .05 level of confidence. Thus, Hypothesis I was rejected for the kindergarten and second-grade levels. Hypothesis I was not rejected for the first-grade level. This means that a significant negative relationship was found between the CEFT and paired-associate task scores for the kindergarten and second-grade levels, but not for the first-grade level. The direction of the correlation coefficient was a function of the scoring system of the CEFT. Those subjects who were analytical (high scores) required fewer trials to solve the paired-associate learning task.

TABLE I

PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENTS BETWEEN CEFT AND PAIRED-ASSOCIATE TASK SCORES

Category	N	r	z	P
Kindergarten	30	-.38	-2.05	.05
First-Grade	30	-.23	-1.23	n.s.
Second-Grade	30	-.73	-3.93	.05

Further analyses consisted of a test (Fisher's Z) for significant differences between the kindergarten r of -.38 and the second grade r of -.73. The obtained Z score was 1.94 which was not significant at the

.05 level. This means that the correlation coefficient obtained from the kindergarten group was not statistically different from the coefficient obtained from the second grade group.

Hypothesis II: There is no significant relationship between the Indian subjects' performance on cognitive style and the Indian subjects' performance on a concept identification task at the kindergarten, first-, or second-grade levels. Table II shows the number of Indian subjects, the obtained Pearson Product-Moment correlation coefficient (r), z value, and the level of significance for each of the three grade levels under Hypothesis II.

TABLE II

PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENTS BETWEEN CEFT AND CONCEPT IDENTIFICATION TASK SCORES

Category	N	r	z	P
Kindergarten	30	.15	.81	n.s.
First Grade	30	.48	2.59	.05
Second Grade	30	.08	.43	n.s.

It can be seen from Table II that the obtained correlation coefficient for the first-grade level was significant at the .05 level of confidence. Thus, Hypothesis II was rejected for only the first-grade group. Hypothesis II was not rejected for the kindergarten and second-grade levels. This means that a significant relationship was found

between the CEFT and concept identification task scores for the first-grade level, but not for the kindergarten or second-grade levels. No further analyses were conducted since only one correlation coefficient was statistically significant.

Cognitive Style Performance Differences Between Indian and Non-Indian Subjects at the Kindergarten, First-, and Second-Grade Levels

Hypothesis III: There is no significant difference between the Indian subjects' performance on cognitive style and the non-Indian subjects' performance on cognitive style at the kindergarten, first-, or second-grade levels. Before t-tests were computed, a test for homogeneity of variance was computed from the CEFT scores for each comparison. The three tests for homogeneity of variance yielded F scores of 1.71 (d.f.=24/30), 2.18 (d.f.=24/30), and 1.05 (d.f.=24/30) for the kindergarten, first-, and second-grade comparisons, respectively. The F scores for the kindergarten and second-grade comparisons were not significant at the .05 level, thus indicating equal variances. The F score for the first-grade comparison was significant at the .05 level of confidence, thus indicating unequal variances.

To test Hypothesis III, the CEFT scores of the Indian and non-Indian subjects were treated with t-tests at the kindergarten, first-, and second-grade levels. Table III shows the means, standard deviations, the number of Indian and non-Indian subjects, the obtained t value, the degrees of freedom, and the level of significance of each of the three t-tests.

It can be seen from Table III that only one t value (kindergarten) was significant at the .05 level of confidence. Thus, Hypothesis III was rejected for only the kindergarten level. Hypothesis III was not rejected for the first- and second-grade levels. This means that a significant difference in cognitive style was found between the Indian and non-Indian subjects at the kindergarten level only. No significant difference in cognitive style was found between the Indian and non-Indian subjects at the first- and second-grade levels.

TABLE III

TEST FOR DIFFERENCES BETWEEN MEAN CEFT SCORES OF INDIAN AND NON-INDIAN SUBJECTS

Category	$\bar{X}$	SD	N	t	df	P
Kindergarten						
Indian Subjects	3.67	1.67	30	2.27	58	.05
Non-Indian Subjects	4.83	2.18	30			
First-Grade						
Indian Subjects	5.30	2.44	30	1.27	29	n.s.
Non-Indian Subjects	4.60	1.65	30			
Second-Grade						
Indian Subjects	7.23	1.75	30	.98	58	n.s.
Non-Indian Subjects	6.77	1.79	30			

Cognitive Style Performance Differences Among Subjects at the Kindergarten, First-, and Second-Grade Levels

Hypothesis IV: There is no significant difference in cognitive style among the Indian subjects at the kindergarten, first-, and second-grade levels. Before t-tests were computed, three tests for homogeneity of variance were computed utilizing the CEFT scores of the Indian subjects. The tests for homogeneity of variance yielded F scores of 2.14 (d.f.= 24/30), 1.11 (d.f.=24/30), and 1.93 (d.f.=24/30) for the kindergarten vs. first-grade comparison, kindergarten vs. second-grade comparison, and first-grade vs. second-grade comparison, respectively. None of the obtained F scores were significant at the .05 level of confidence. Thus, it was concluded that the sample variances were apparently homogeneous.

To test Hypothesis IV, the CEFT scores of the kindergarten, first-, and second-grade Indian subjects were treated with three separate t-tests. Table IV shows the means, standard deviations, number of Indian subjects, the obtained t value, the degrees of freedom, and the level of significance for each of the three t-tests.

From the results presented in Table IV, it was evident that all three t-tests were significant at the .05 level of confidence. Thus, Hypothesis IV was rejected. This means that a significant difference in cognitive style was found among the Indian subjects at the kindergarten first-, and second-grade levels.

Summary of Findings

This chapter has presented a detailed analysis of the statistical treatment of the data. Hypothesis I was rejected for the kindergarten

TABLE IV

TEST FOR DIFFERENCES BETWEEN MEAN CEFT SCORES OF INDIAN SUBJECTS

Category	$\bar{X}$	SD	N	t	df	P
Kindergarten	3.67	1.67	30	2.91	58	.05
First Grade	5.30	2.44	30			
Kindergarten	3.67	1.67	30	7.74	58	.05
Second Grade	7.23	1.75	30			
First Grade	5.30	2.44	30	3.38	58	.05
Second Grade	7.23	1.75	30			

and second-grade levels. Thus, a significant relationship was found between CEFT and paired associate task scores for the kindergarten and second-grade levels, but not for the first-grade level.

Hypothesis II was rejected for only the first grade level. Thus, a significant relationship was found between the CEFT and concept identification task scores for the first-grade level, but not for the kindergarten or second-grade levels.

Hypothesis III was rejected for only the kindergarten level. Thus, a significant difference in cognitive style was found between the Indian and non-Indian subjects at the kindergarten level only.

Hypothesis IV was rejected. A significant difference in cognitive style was found among the Indian subjects at the kindergarten, first-, and second-grade levels.

CHAPTER V

SUMMARY AND CONCLUSIONS

Overview

The primary purpose of the present study was to describe a proposed relationship between cognitive style and performance on one paired-associate learning task and one concept identification learning task in a sample of primary-aged Indian children. In addition, the study attempted to determine if Indian and non-Indian children differed in terms of cognitive style and to describe the development of cognitive style within a sample of Indian subjects. The Indian and non-Indian subjects were randomly selected from three Oklahoma public schools. The three schools were chosen because of high Indian enrollment and accessibility. The total sample consisted of 90 Indian and 90 non-Indian subjects. This number included 30 Indian and 30 non-Indian subjects from each of the kindergarten, first-, and second-grade levels. An equal proportion of male-female and Indian-non-Indian subjects was selected from each school. Each Indian subject was individually administered the Children's Embedded Figures Test (CEFT), a paired-associate learning task, and a concept identification learning task. Each non-Indian subject was administered only the CEFT.

To describe the relationship between cognitive style and performance on each of the two learning tasks, the data were treated with the Pearson Product-Moment correlation coefficient. To describe the differences in

cognitive style between the Indian and non-Indian subjects and to describe the development of cognitive style within a sample of primary-aged Indian subjects, the data were treated with the t-test for differences between two independent means. The .05 level of significance was selected as the level necessary for rejection of the null hypothesis.

Discussion of Findings

Hypothesis I stated that there was no significant relationship between cognitive style and the Indian subjects' performance on a paired-associate learning task at the kindergarten, first-, or second-grade levels. This hypothesis was rejected for the kindergarten and second-grade levels only. The kindergarten r of -.38 and the second grade r of -.73 were both significant at the .05 level of confidence. As pointed out in Chapter IV, the negative correlation coefficients were a function of the scoring system for for CEFT. Therefore, for both the kindergarten and second-grade levels, those Indian subjects with high CEFT scores (high analytic) required fewer paired-associate learning trials to solve the paired-associate learning task than did those Indian subjects with low CEFT scores (low analytic).

Hypothesis II stated that there was no significant relationship between cognitive style and the Indian subjects' performance on a concept identification task at the kindergarten, first-, or second-grade levels. This hypothesis was rejected for only the first-grade level. The first grade r of .48 was significant at the .05 level of confidence. Therefore, for the first-grade level, those Indian subjects with high CEFT scores (high analytic) required more concept identification learning trials to

solve the concept identification learning task than did those Indian subjects with low CEFT scores (low analytic).

Hypothesis III stated that there were no significant differences in cognitive style between the Indian and non-Indian subjects at the kindergarten, first-, or second-grade levels. Hypothesis III was rejected for the kindergarten level only. The kindergarten Indian subjects were significantly more global than the kindergarten non-Indian subjects. There were no significant differences in cognitive style between the Indian and non-Indian subjects at the first- or second-grade levels.

Hypothesis IV stated that there were no significant differences in cognitive style among the Indian subjects at the kindergarten, first-, and second-grade levels. Three mean comparisons were made to test this hypothesis. The first mean comparison was between the kindergarten and first-grade CEFT scores. The second comparison was between the kindergarten and second-grade mean CEFT scores. The third comparison was between the first- and second-grade mean CEFT scores. All three comparisons produced t values which were significant at the .05 level of confidence. Thus, the kindergarten ($\bar{X}$=3.67), first-grade ($\bar{X}$=5.30), and second-grade ($\bar{X}$=7.23) mean CEFT scores were significantly different from each other. An increase in grade level resulted in an increase in analyticalness. The Indian subjects became more analytical with age.

Conclusions

One purpose of the present study was to determine if cognitive style was related to Indian subjects' performance on selected paired-associate and concept identification learning tasks. Previous research (Fredrick, 1968); Davis, 1967; Nelson, 1972; Elkind, Koegler, and Go, 1963;

Ohnmacht, 1966; and Lee, Kagan, and Rabson, 1963) has indicated that children who are analytically oriented tend to solve certain types of paired-associate and concept identification tasks at a faster rate than to those children who are globally oriented. However, these studies have not examined this relationship in a sample of American Indian children. Utilizing a sample of primary-aged Indian children, the present study attempted to determine if the global vs. analytic dimension of cognitive style was related to performance on a paired-associate learning task and a concept identification learning task. From Table I presented in Chapter IV, it was noted that a relationship between cognitive style and paired-associate learning task performance was found for the kindergarten and second-grade levels. This relationship appears to be similar to the relationship reported in previous research using non-Indian populations. For the kindergarten and second-grade levels, the Indian subjects who were analytically oriented tended to solve the paired-associate learning task at a faster rate than did those Indian subjects who were globally oriented. For those Indian subjects in grade one, no relationship was found between the global vs. analytic dimension of cognitive style and performance on a paired-associate learning task. It could be that the first-grade Indian student does not exclusively rely on his analytical mode of cognitive style when solving paired-associate learning tasks. Perhaps the first-grade Indian student is beginning to rely on other processes, such as short-term memory, when solving paired-associate learning tasks. The first-grade Indian student spends more time in school than the kindergarten Indian student and could be forced into developing more problem-solving strategies than his kindergarten counterpart.

In determining if the global vs. analytic dimension of cognitive style was related to the Indian subjects' performance on a concept identification learning task, a significant relationship was found for the first-grade Indian subjects only. The results reported in Table II of Chapter IV indicate that those first-grade Indian subjects who were analytical in their mode of cognitive style tended to require more concept identification learning trials than did those first-grade Indian subjects who were global in their mode of cognitive style when solving the concept identification learning task. This finding does not agree with previous research that utilized non-Indian populations. Previous studies (Fredrick, 1968; Davis, 1967; and Nelson, 1972) have indicated that analytically oriented individuals tend to require fewer trials than globally oriented individuals when solving concept identification learning tasks. An explanation for these conflicting findings could be that those first-grade Indian students who exhibit an analytical mode of cognitive style may have difficulty in screening out irrelevant characteristics of a concept identification learning task which is primarily visual in nature. In other words, the first-grade Indian student who is analytically oriented may get so involved in analyzing a visual stimulus that he can't remember the relevant characteristics of the stimulus or concept to be learned.

Table II of Chapter IV also shows no significant relationship between the global vs. analytic dimension of cognitive style and concept identification learning task performance by the kindergarten or second-grade Indian subjects. The absence of any relationship indicates that the global vs. analytic dimension of cognitive style may not play a significant role in kindergarten or second-grade Indian students' performance

on concept identification learning tasks. It could be that the kindergarten and second-grade Indian students' concept identification learning task performance is not completely dependent upon a particular mode of cognitive style, but rather a process that requires visual memory.

A second purpose of the present study was to determine if Indian and non-Indian subjects differed in terms of cognitive style. From an analysis of the mean CEFT scores presented in Table III of Chapter IV, it was evident that kindergarten Indian and non-Indian subjects differed significantly in terms of cognitive style. The kindergarten Indian subjects were significantly more global than the kindergarten non-Indian subjects. The Indian and non-Indian subjects at the first- and second-grade levels did not differ significantly in terms of the CEFT scores.

In view of the results presented in Table III of Chapter IV, it seems that the Indian and non-Indian students begin their first year of formal schooling with different modes of cognitive style. The kindergarten Indian students are apparently more global than kindergarten non-Indian students in terms of cognitive style. However, this difference between the Indian and non-Indian student's mode of cognitive style apparently disappears as the student progresses through the next two grade levels. It could be that the kindergarten Indian student comes from an environment that stresses the importance of a cognitive style which is globally oriented while the non-Indian kindergarten student comes from an environment which fosters an analytical type of cognitive style. Perhaps kindergarten Indian and non-Indian students come from qualitatively different preschool environments, such as the home environment, which may foster the development of different types of cognitive style.

A third purpose of the present study was to describe the developmental nature of the construct cognitive style within a sample of primary-aged Indian children. From an analysis of the mean CEFT scores for the Indian subjects at the kindergarten, first-, and second-grade levels, it was evident that cognitive style became analytical with an increase in grade level. This increase in analyticalness has been suggested in previous research (Kagan, Moss, and Siegel, 1963; Klausmeier, Ghatala, and Frayer, 1974). Therefore, it was concluded that the Indian subjects involved in the present study apparently progressed from a global to an analytical orientation as the grade level increased. It appears that the development of cognitive style within this sample of Indian subjects tends to parallel the development found in non-Indian populations.

Implications

The present study found that kindergarten and second-grade Indian subjects who were analytically oriented tended to require fewer paired-associate learning trials to solve a paired-associate learning task than did those kindergarten and second-grade Indian subjects who were globally oriented. When using a classroom instructional task which resembles the paired-associate learning task employed in the present study, perhaps kindergarten and second-grade teachers would save time by grouping together those kindergarten or second-grade Indian students who are globally oriented. It seems that globally oriented Indian students tend to require more instruction than analytically oriented Indian students in order to solve or complete the instructional task.

When using a classroom instructional task that resembles the concept identification learning task used in the present study, perhaps the

first-grade teacher would save time by grouping together those first-grade Indian students who are analytically oriented. The first-grade Indian students who are analytically oriented may require more instruction than the globally oriented Indian students in order to solve the concept identification learning task or instructional task.

When dealing with those visual abilities of kindergarten Indian students which affect or are affected by the construct cognitive style, perhaps the kindergarten teacher should be aware that kindergarten Indian and kindergarten non-Indian students may differ in terms of an analytical or global orientation towards an instructional task. First- and second-grade teachers should be aware that first- and second-grade Indian students and first- and second-grade non-Indian students may not differ in terms of an analytical or global orientation towards an instructional task.

Generally speaking, the classroom teacher may assume that the global vs. analytic dimension of cognitive style, along with its visual ramifications, tends to progress from a global to analytical orientation in primary-aged American Indian children. The teacher of primary-aged Indian children should be aware that kindergarten, first-, and second-grade Indian students apparently develop a cognitive style which becomes more analytical with age.

Recommendations

Based upon the findings of the present study, the following areas are suggested for future research:

(1) A study which replicates the design used in the present study but utilizes a concept identification learning task which requires

virtually no verbal interaction between the investigator and subject.

(2) A study to compare cognitive styles of older Indian and non-Indian subjects.

(3) A study to determine what other types of instructional tasks are affected by the construct cognitive style.

(4) A study to determine if certain instructional strategies or methods will interact with cognitive style to produce optimal learning results.

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APPENDIXES

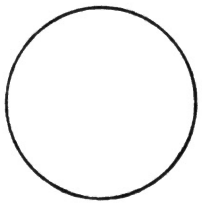
APPENDIX A

INSTRUCTIONS FOR PAIRED-ASSOCIATE LEARNING TASK

I have three cards to show you. Each card has a design on it. You already know the real name for each design, so we will give each design a new name. I will show you each design one at a time and tell you the new name of each. After I have told you the new names for all three designs, I will then show you only the designs and let you tell me the new names.

APPENDIX B

PAIRED-ASSOCIATE LEARNING TASK ITEMS



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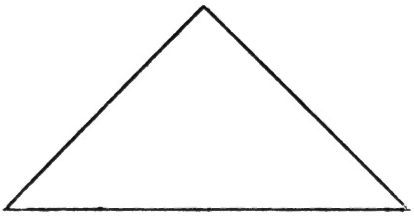

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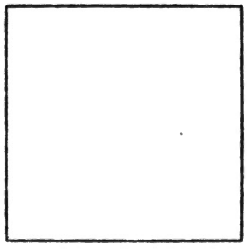


CIB

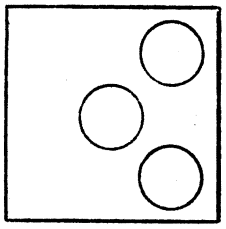
APPENDIX C

INSTRUCTIONS FOR CONCEPT IDENTIFICATION LEARNING TASK

I have chosen a special type of block or square to use in building a dog house. I want to see if you can learn which type of block is the special kind. I will show you a card with a block drawn on it and ask you if that is one of the special blocks. If you think it is, say "yes" and if you think it is not, say "no." After you give me your answer, I will tell you if you are right or wrong. Your job is to figure out which type of block is the special one. Here is the first card. Is this one of the special blocks?

APPENDIX D

CONCEPT IDENTIFICATION LEARNING TASK ITEMS



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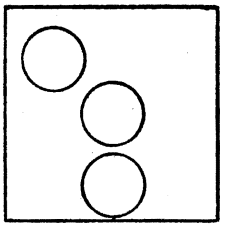

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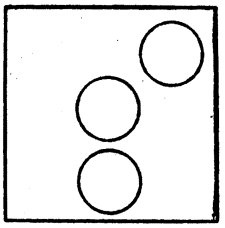

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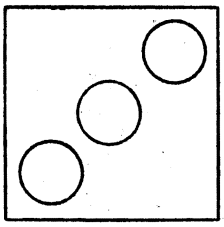

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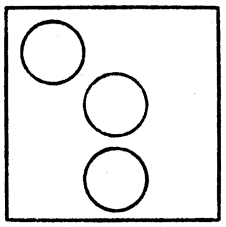

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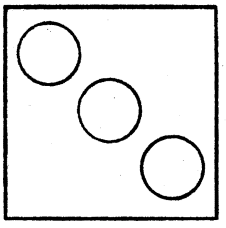

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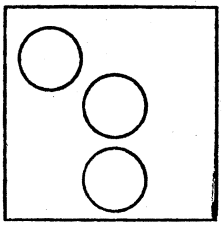

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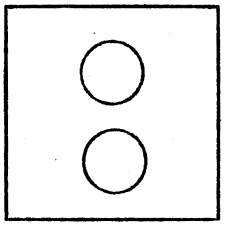

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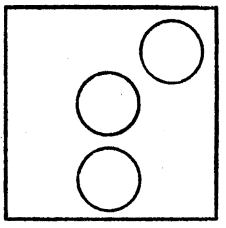

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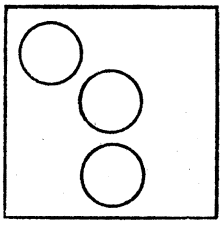

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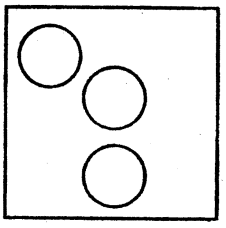

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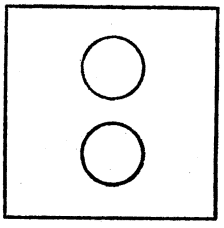

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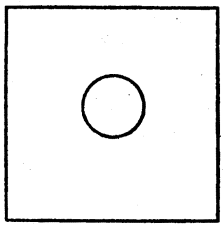

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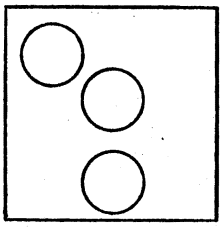

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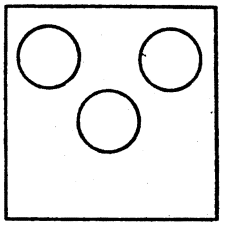

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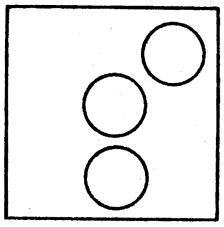

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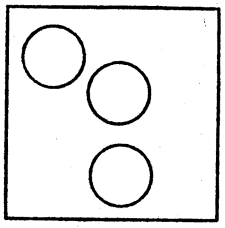

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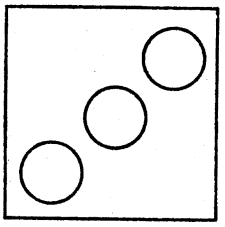

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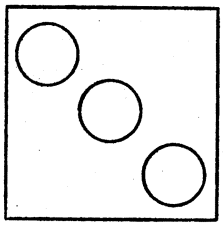

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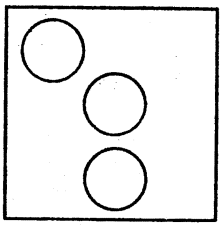

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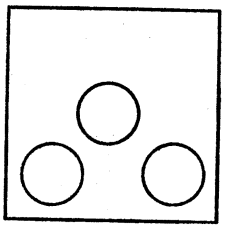

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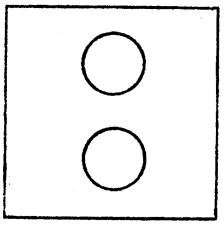

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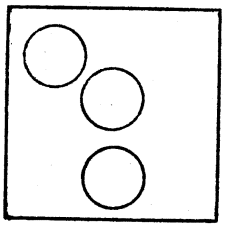

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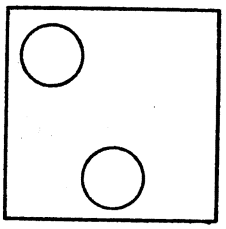

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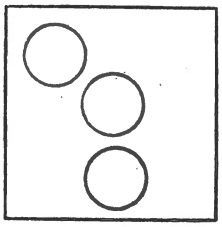

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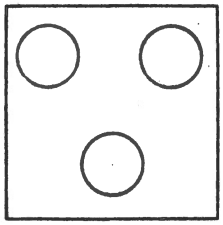

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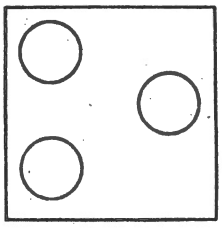

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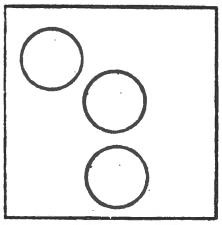

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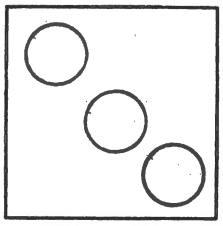

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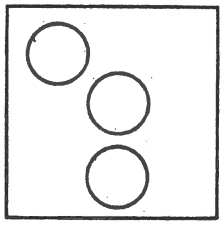

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VITA

James Carl Martin

Candidate for the Degree of

Doctor of Education

Thesis: COGNITIVE STYLE AND ITS RELATIONSHIP TO PAIRED-ASSOCIATE AND CONCEPT IDENTIFICATION TASK PERFORMANCE OF PRIMARY-AGED INDIAN CHILDREN

Major Field: Educational Psychology

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