COGNITIVE STYLE AND PREFERENCES IN SCHOOL TASKS

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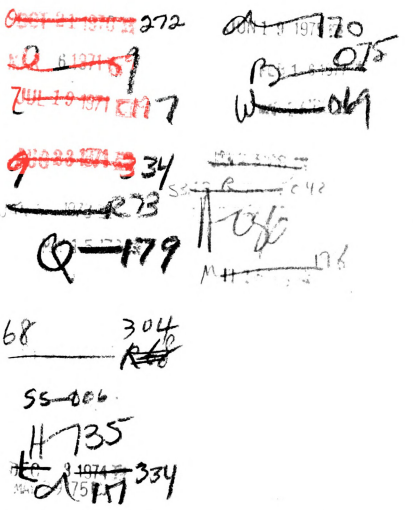

ABSTRACT

COGNITIVE STYLE AND PREFERENCES
IN SCHOOL TASKS

by Sarah Dinham Hervey

The major theoretical approaches to cognitive style hold in common one important principle, that cognitive style permeates a wide variety of behaviors and situations. The purpose of this study was to determine whether the construct called "cognitive style" is specific only to its defining tasks, or if it indeed generalizes to other situations and behaviors, in this case school behavior.

The major hypothesis of the study was that the individual's cognitive style is reflected in his school behavior. Cognitive style was defined in the theoretical framework developed by Kagan, Moss, and Sigel and more recently refined by Sigel. School behavior was defined broadly to include especially the individual's preferences for ways of organizing tasks to be performed and his preferences for certain tasks over others. A systematic description of school tasks was developed independently of the cognitive styles position represented in Kagan, Moss, and Sigel's research. This formulation of school tasks subsumed classroom tasks under three processes: information processing, making inferences, and forming relationships. It was hypothesized that the individual's preferences for certain

of these cognitive processes might be related to his preferences for perceptual organization and conceptual categorization, that is, his cognitive style.

The study employed the most recent instrument of a series arising from Kagan, Moss, and Sigel's research, the Cognitive Styles in Categorization Behavior Task, developed by Sigel. Preferences in school tasks were measured by an instrument of two parts, in which the subject indicated (1) how he prefers to organize unstructured tasks, by choosing which of several approaches he would use to write themes on each of several general subjects; and (2) his preferences for various types of school tasks, by choosing which of several topics he would prefer to learn about in a hypothetical college class. The sample consisted of 80 male volunteer upperclassmen representing a variety of academic fields of study.

The predicted relationships between parallel dimensions of the cognitive style (SCST) and school task (SRT) instruments, and the prediction that subjects exhibiting similar patterns of SCST scores would exhibit similar SRT scores, were not supported in the analyses. The two possible interpretations of these results are that cognitive style and school behavior (1) are not related, or (2) are related in some way other than that represented in these predictions. The latter possibility was explored further through examination of some uncontrolled factors which might have influenced measurement of cognitive style and school behavior, and through analyses of the relationships of some other school behaviors (academic aptitude, major field of study) with cognitive style.

From these further explorations and analyses, and from the convincing weight of theoretical and laboratory evidence, it was concluded that cognitive style is undoubtedly related to school behavior, but its influence in actual classroom tasks may be masked by the influences of other stronger and more immediate factors such as motivation, interests, and past experiences.

COGNITIVE STYLE AND PREFERENCES IN SCHOOL TASKS

By

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Sarah Dinham Hervey

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CHAPTER I

INTRODUCTION

Purpose

The term "cognitive style" is generally used to refer to the mode of organizing one's experience and of perceiving and understanding the environment. The purpose of this study was to determine whether the behavior described by this construct is specific only to its defining tasks, or if the construct generalizes to other situations, for example to school behavior.

Although theories of cognitive style have been advanced from a number of diverse theoretical positions, there is agreement on one important principle: cognitive style is expected to permeate a wide variety of behaviors and situations. This principle suggests that cognitive style indeed generalizes to other behaviors, and should be reflected in them. The central question to which this study was addressed was whether cognitive style is reflected in school behavior.

This study focused particularly upon school behavior as a likely source of evidence for cognitive style's generality. The choice of school-related behavior also had a practical basis, however. If cognitive style "makes a difference" in school behavior, then it would seem reasonable to wonder about the implications of cognitive style for instruction in classrooms,

and especially for pupils' learning processes. Conceivably it might some day be possible to match the stylistic preferences of teachers and pupils in order to maximize learning. For this study, however, such speculations were deferred, and attention was focused on determining whether the construct called "cognitive style" is specific to its defining tasks or is reflected in other behavior as well.

Theories of Cognitive Style

Among the many views of cognitive styles there is disagreement as to exactly what is meant by cognitive style. Such names as "cognitive controls," "preferred perceptual attitude," "strategies," "cognitive attitude," and "conceptual systems," as well as "cognitive style" have been used to describe the same general construct (Cain, 1966). The term "cognitive style" was used in this study because it is the most widely accepted and the most neutral of the terms in common use. Witkin offered this definition of cognitive style: The "characteristic, self-consistent way of functioning an individual shows across perceptual and intellectual (i.e. cognitive) activities" (1965, 34).

The many views of cognitive style arose from a diversity of theoretical positions. For example, Witkin's investigations of "psychological differentiation" started as an investigation of behavior in purely perceptual tasks, Gardner defined cognitive style, or "cognitive controls," as adaptive mechanisms in the manner of psychoanalytic theory. Kagan, Moss, and Sigel's investigations of cognitive style, or categorization behavior,

arose from their research in child development. These three theoretical positions account for most of the current research in cognitive style.

Psychological Differentiation

The view of cognitive style advocated by Witkin and his associates focuses upon perceptual processes. Perception is defined broadly to include the many cognitive operations associated with the purely physical act of perceiving. Witkin's research concentrates upon a dimension called "psychological differentiation," or the "ability to overcome an embedding context, that is, to experience an item independently of an organized field of which it is a part" (1963a, 119). Psychological differentiation is measured by four instruments: in the Rod-and-Frame Test, the Body Adjustment Test, and the Embedded Figures Test the subject is required to extract stimuli from deceptive fields, and the Draw-a-Person Test is scored for the degree to which the subject has differentiated specific elements of his drawing.

In their research, Witkin and his associates have centered on the relationships between psychological differentiation and other variables, notably personality and intellectual behaviors. Their research has led to the conclusion, for example, that

> field-dependent subjects generally tend to be passive and submissive, to lack self-esteem, and to have relatively primitive, undifferentiated body images. They are unfamiliar with their own impulses, fear them, and lack control over them. Field independent subjects, called 'analytical,' are generally active, independent, and relatively high in self-esteem. They are aware of

> and in control of their impulses, and have differentiated body images (Cain, 1966, 8).

The relationships between psychological differentiation and some intellectual behaviors have also been examined. Faterson reported a study by Goodenough and Karp addressed to the question of whether "the distinction between global and analytical styles of functioning on perceptual tests is specific to perceptual situations, or whether it extends to intellectual functioning as well" (1962, 172). A factor analytic study of children included three of Witkin's tasks, the 12 Weschler Intelligence Scale for Children (WISC) subtests, and selected special tests. Of the three major factors found, one included the three perceptual tasks and the WISC Block Design, Picture Completion, and Object Assembly; the other two factors appeared to be verbal and attention-concentration factors similar to those found in other WISC factor-analytic studies. Faterson concluded that these results support the hypothesis that "the cognitive style in question — the global versus analytical style of experiencing — extends to a wide variety of intellectual tasks" (174). It must be pointed out, however, that this conclusion rests largely upon three WISC subtests, in which, as in Witkin's tasks, visual perception and organization are important contributors to performance.

Witkin recently addressed himself to the implications of cognitive style for education (1965). In this paper he described his own research at length, making tentative hypotheses about the possible usefulness of cognitive style in such school activities as evaluation (for example the

evaluation of intelligence) and school placement. However, this discussion was not directly relevant to the questions posed in the present study because it did not deal with the basic questions of cognitive style's generality and its role in pupil behavior.

Cognitive Controls

A second theoretical approach to cognitive style arose from psychoanalytic theory. A group of Menninger Foundation psychologists developed the concept of "cognitive controls," or "modes of coping with certain insistent configurations and events in external reality" (Gardner, 1959, 127). The basic assertion is that just as individuals seek to bring needs, impulses, and wishes into harmony, they also seek to balance the many stimuli and claims of external reality by employing pervasive and stable internal structures — cognitive controls.

Gardner and his associates define five independent cognitive controls:

> Leveling-sharpening is defined as the "level of articulation" in a sequence of stimuli. The sharpener exhibits "maximal complexity and differentiation of the field," and the leveler exhibits a wholist or general response to stimuli. The two tasks used to measure leveling-sharpening are judgment of sizes of squares of increasing size, and comparative judgment of weights.
>
> Tolerance for unrealistic experiences is exhibited in subjects' responses to perceptual stimuli of two tasks, one involving apparent motion in a flashing tachistoscopic presentation and the other employing aniseikonic lenses. The person intolerant of perceptual ambiguity, or reluctant to admit the ambiguity, is characterized by a longer time lag before reporting the nature of the particular illusions (motion or environment distortion); the tolerant person reports the illusions more rapidly.

Equivalence range describes the categorization behaviors of subjects in terms of the relative width of categories they create. The score for equivalence range is the number of categories or groups into which stimulus objects are classified. Subjects with a narrow range (many groups) tend to have relatively exact judging standards for defining similarity. Broad-range subjects, on the other hand, are less particular about the precision of group definitions. The relative width of categorization is not a function of whether the subject notices differences, but rather indicates the degree to which he tends to act upon or ignore his awareness of the differences.

Focusing has two elements — the tendency to narrow awareness and to keep experiences discrete, and the tendency to separate affect from idea. The two tasks used are a visual perception task in which it is hypothesized that focusers are highly accurate despite distracting cues (i.e. are able to narrow their awareness), and a picture-sorting task, in which it is hypothesized that the focuser will sort relatively many pictures from a sample of neutral, sexual, and aggressive pictures into an "indifferent" pile rather than a "like" or "dislike" pile.

Constricted-flexible describes the ability to respond correctly to a task when faced with a field of conflicting cues. The chief measure used is the Stroop Color-Word test. Constricted-control subjects tend to resort to counteractive measures in their attempts to overcome the disruptive effect of intrusive cues. Flexible-control subjects are more comfortable in situations involving contradictory or intrusive cues, and are capable of differential responses to the field in the face of interfering cues (Gardner, 1959, 22-54 passim).

Recent investigations have explored the interrelationship of these variables, as well as psychological differentiation, with intellectual tasks. Included in these studies were verbal knowledge, general reasoning, associative memory, induction-deduction abilities, and spatial relations and orientation tasks. Gardner reported that "intellectual abilities and cognitive controls are not isolated aspects of cognitive organization

but are mutually interrelated. The arbitrary distinction that has sometimes been maintained between intelligence and the broad-scale organization of cognitive controls thus seems inappropriate" (1960, 123). Other recent investigations of the cognitive control concept have focused upon establishing further the stability and correlates of the cognitive control variables (1962). Recently Gardner and others turned their attention to the relationship between cognitive controls and some tasks related to the learning process. Gardner and Long (1960) studied the role of cognitive controls as determinants of learning and remembering, employing such tasks as learning and recall of nonsense syllables, conditioning in a perceptual learning task, and serial rote learning. Their research did not, however, deal with any classroom behaviors.

Categorization Style

Kagan, Moss, and Sigel (1960, 1963) originated the third theoretical approach to cognitive style. They had observed that even when intelligence, differential maturation rates, and abilities to differentiate and to abstract were taken into account, the explanation of qualitative differences in intellectual performance among school age children seemed far from adequate. They hypothesized that the mode of conceptualizing environmental stimuli is one of the important variables contributing to these differences in children's cognitive activities. "Cognitive style" was defined as stable individual preferences in mode of perceptual organization and conceptual categorization of the external environment.

Kagan, Moss, and Sigel developed their position through a series of exploratory studies conducted with children and adults at the Fels Institute. In these early studies, the subjects classified a number of stimulus pictures into groups. The subjects' reasons for forming the groups were examined, and three basic conceptual categories were defined:

> Analytic-descriptive: Concepts based on similarity in objective elements of the stimuli grouped together — for example: people who have no shoes on.
>
> Inferential-categorical: Concepts involving an inference about the stimuli grouped together, in which any stimulus is an independent instance of the group concept — for example: poor people.
>
> Relational: Concepts based on a functional relationship among the grouped stimuli, in which each stimulus depends for its membership on its relationship to other stimuli in the group — for example: a family (1963, 76).

Kagan, Moss, and Sigel turned in subsequent research to investigations of the significance of a preference for one dimension, the analytic style. Eight studies of the analytic-nonanalytic dimension were conducted. Two studies of adult men established the existence of distinct personality, perceptual, and intellectual differences between analytic and nonanalytic subjects. For example, analytic men were more reluctant to be dependent upon family or friends, showed greater concern for intellectual mastery, had slightly higher I.Q.'s, strived more for social recognition, had shown in childhood more persistence in the face of problem situations, confidence in their approach to challenging intellectual tasks, and motivation to obtain achievement-related goals, and in a perceptual vigilence task analytic men exhibited greater accuracy of perception (77-78).

Studies of the analytic-nonanalytic dimension in children included language and memory tasks, interpretation of ambiguous stimuli, performance in stimulus-learning tasks, and reaction time. The results of these separate studies suggested that

> an analytic style is associated with a reflective attitude, a tendency to differentiate experience, and the ability to resist the effects of distracting stimuli on ongoing behavior. The nonanalytic child tends to be impulsive, more reactive to external stimuli, and less likely to differentiate complex stimulus situations (101).

These empirical findings were supported also by case study observation of Fels children.

The emphasis in these studies upon one dimension, analytic-nonanalytic, was a marked deviation from the original studies of three stylistic dimensions. While Kagan continued exploring the analytic-nonanalytic dimension (Kagan, et al., 1964; Lee, Kagan, and Rabson, 1963), Sigel's research continued with the original three dimensions. Sigel's research in cognitive style has been done largely with children, focusing on all three dimensions and their correlates in personality (Sigel, 1965) and school behavior.

A significant study by Scott and Sigel (1965) examined the relationship between cognitive style and processes operating in classroom learning — in this case science concept acquisition. They had proposed that while cognitive styles might not be relevant in highly structured classroom activities, styles of categorization would become more critical in situations

where learning is by discovery. One hundred fifty schoolchildren (grades 4, 5, and 6) were taught a series of science concepts by conventional methods and 150 were taught using Inquiry, a discovery approach. At the end of the school year all the children were given a science concept achievement test, a creativity task, and a cognitive styles task. Analysis centered on the effects of the teaching method upon science concept achievement, divergent thinking (creativity), and cognitive styles, and the possible existence of sex differences in the dependent variables. The results indicated that boys and girls were differentially influenced by the same teaching process, as seen in their cognitive style task performance. In addition some differences due to teaching method were found in science concept achievement, no differences were found in divergent thinking, and some complex differences were found in cognitive style (96-97). Scott and Sigel concluded their discussion of the cognitive style results by observing that

> The styles of categorization task (SCST) showed that the conceptual processes of the Inquiry children were significantly different from conventionally taught students. The important aspect of these findings was not so much that there were differences but that stylistic preferences of the Inquiry children were definitely related to the problem-solving strategy used in the science lessons. Through the use of an instrument that was sensitive to the perceptual and conceptual activities of children, a wealth of new information is available that would probably still be beyond our grasp. It is recommended that further research probing into the cognitive domain be done with testing tools that can . . . offer glimpses past the obvious and into the unique mental workings of the human mind (92-93).

Review

The three theoretical approaches to cognitive style discussed here vary markedly in focus, yet all three deal with "cognitive style." Inherent in all three is the implication that style is a pervasive trait, one which should permeate many diverse aspects of an individual's behaviors. For example, Gardner stated that one premise of his research was that "the wide range of behaviors with which an individual encounters reality may be encompassed by relatively few dimensions of organization" (1959, 1). He continued, in defining cognitive controls, to emphasize their independence of situational context:

> Cognitive controls are conceived of as slow-changing, developmentally stabilized structures: (a) they are relatively invariant over a given class of situations and intentions; (b) they are operative despite the shifts in situational and behavioral contexts typical of cognitive activity from moment to moment. Cognitive controls refer to a level of organization that is more general than the specific structural components underlying perception, recall, and judgment. . . . They are the individual's means of programming the properties, relations, and constraints of events and objects in such a way as to provide an adaptively adequate resolution of the intentions which brought him into an encounter with reality (1959, 5-6).

In describing the variety of behaviors subsumed by psychological differentiation, Witkin also emphasized the stability and pervasiveness of style:

> These patterns suggest consistency in psychological functioning which pervades the individual's perceptual, intellectual, emotional, motivational, defensive, and social operations. In addition to this cross-sectional consistency, we have been able to demonstrate through longitudinal studies of development a marked continuity

> in some of these aspects of personal functioning over long periods of time.
>
> With findings such as these, an investigation that had dealt with individual differences in a seemingly narrow perceptual activity developed into a study of broad differences among people in what seemed to add up to a "style of life" (1963b, 4).

Kagan, Moss and Sigel also stated that the mode of organizing or categorizing the environment should influence behavior in many situations. The results of their eight studies suggested that "an individual's preferred conceptual strategy is implicated in a wide variety of behaviors" (1963, 109).

In summary, cognitive style defines the individual's mode of organizing or conceptualizing the world of diverse stimuli. Cognitive style is characterized by longitudinal stability, and it permeates a wide variety of behaviors and situations. This definition implies that cognitive style should generalize to a variety of cognitive behaviors. The present study asked in particular whether cognitive style is reflected in school behavior.

Cognitive Style Theories and School Behavior

The purpose in examining these theoretical positions was to determine which are most relevant for studying cognitive style as it relates to school behavior. In this study, "school behavior" was defined broadly, to include especially the individual's preferences for various kinds of tasks and his way of organizing tasks to be performed. The Kagan, Moss, and Sigel formulation of cognitive style was chosen as the position most relevant

to this broad view of school behavior because in this definition of cognitive style the individual demonstrates his unique preferences for a certain stylistic pattern, rather than being classified stylistically by his ability to perform certain tasks.

Kagan, Moss, and Sigel present the subject with a task to which he may respond in his own characteristic way. There are no "better" responses, and in fact subjects generally give all three kinds of responses. The individual's cognitive style is defined by the particular and unique pattern he exhibits. The other research viewpoints, on the other hand, define cognitive style by the ability or lack of ability to perform certain tasks. Most of these tasks impose upon the subject a situation to which he either does or does not respond appropriately. For example, he either can or cannot extract a hidden figure from a complex stimulus array (Witkin's Embedded Figures Test) or he can or cannot accurately estimate the increasing size of squares (Gardner's leveling-sharpening task). The choice of Kagan, Moss, and Sigel's position was influenced by this distinction between cognitive style as an expression of cognitive preferences and cognitive style as the appropriateness of performance in specific tasks. Since the focus in this study was upon the individual's particular ways of dealing with school tasks, it was necessary to choose a theoretical position which allowed the greatest flexibility in describing the individual's stylistic pattern. Kagan, Moss, and Sigel's task, in permitting the individual to respond in his preferred way, thus seemed more relevant

than did the approaches using highly structured tasks wherein the subject could not exhibit his individual response patterns.

A Systematic Description of School Tasks

A description of school tasks was developed independently of the cognitive styles position discussed above. A representative listing of the kinds of tasks required of pupils might include such tasks as:

learn names and dates
learn applications
remember facts
form concepts
understand relationships
draw conclusions
observe
interrelate
evaluate

A majority of these behaviors could be subsumed under three general processes: information processing, forming relationships, and making inferences. It was within this system that the realm of school-related behaviors was defined for this study.

In information processing, the student assimilates items of information, sorts and stores them, and recalls them at the appropriate time. The information processing rubric includes a substantial portion of classroom experiences — reading, listening, and seeing items of information, learning them, remembering them. The items of information may be concepts or principles, but more often they tend to be facts or other specific kinds of information. The important characteristic of information processing is that elements are dealt with in their original form, without manipulation.

A second process required of students in classroom situations is forming and understanding relationships between or among items of information. For example, the student must understand the interrelationships of government policy and the national economy or the similarities and differences between the League of Nations and the United Nations, or is required to test something (his own writing, a legislative proposal, a scientific theory) against something standard. These tasks require the student to deal with two or more categories of related information. Often the process of forming relationships involves determining what information is general, or conceptual in nature, and which is narrow and may be subsumed under the general. Outlining a lecture or a proposed essay involves, for example, determining what elements are broad topics and which are relevant details or examples. The important characteristic of the "forming relationships" process is that elements of information from two different sets are brought together into some functional relationship.

Making inferences, the third process proposed in this description of school behavior, involves, in Bruner's words, "going beyond the information given." A student makes inferences about given information, applies old information to new situations, extrapolates from the known to the unknown, deduces from the general to particulars, or induces from information to conclusion. The inference process may merely involve simple classifications of an undifferentiated array of information on the basis of an inference about them, or it may involve extrapolations, applications, or cause-effect judgments.

This structuring of school tasks resembles at least three other classifications of school-related operations. The six hierarchically arranged educational goals specified in the Taxonomy of Educational Objectives — Cognitive Domain (Bloom, et al., 1956) parallel the three processes described here. For example, knowledge may be described as an information processing operation; comprehension, synthesis, and evaluation as forming relationships; and application as making inferences. Smith and Meux's well-known classification of teacher activities (1962) also parallels the system developed here. Defining, describing, designating, stating, and reporting all are activities associated with information processing; substituting, classifying, and comparing-contrasting reflect relationships; conditional inferring is an inferential process.

Approaching the classification of school tasks from the viewpoint of student behavior, Scott and Sigel have discussed the operations involved in science achievement: "To solve a problem in science it is necessary to be able to identify relevant details, use inferences to explain the change or the reasons for particular occurrences, and understand relationships." However, although some competency in all three operations is necessary for adequate school performance, and while most students are able to perform all of these operations with some degree of success, they may well have individual preferences and may tend to approach problems in particular ways. For example, "if one has a predisposition to deal with the manifest, and is reluctant, for whatever reason, to deal with relationships

or make inferences, some difficulty will be encountered in coming to grips with a problem" whose solution requires making inferences or forming relationships (1965, 3).

It is thus possible to hypothesize that students might, in specially constructed tasks, demonstrate preferences for using some of these operations. It is thus further possible to hypothesize that these school task preferences might be related to the preferences called "cognitive style."

Relationships Between Cognitive Style and School Behavior

In order to define the relationships that might exist between preferences for certain school tasks and preferences as exhibited in cognitive style, it is necessary to return to the definition of cognitive style originally formulated by Kagan, Moss and Sigel: Cognitive style "refers to stable individual preferences in mode of perceptual organization and conceptual categorization of the environment" (1963, 74). Since cognitive style is assumed to permeate many diverse aspects of human behavior, including school behavior, we may examine this definition of cognitive style for its implications regarding school behavior. Two implications of cognitive style for school behavior formed the basis for this study.

First, if cognitive style is the mode of organizing or categorizing the environment, then cognitive style should be manifest in a school situation wherein the student must organize or structure his own task. In many cases the tasks to be performed by students are structured by the teacher, but in some school situations the structuring process is left to the student.

The assignment may be to "do a science project" or "write a theme on civil rights." In such a situation the student himself must determine how he will do the task. One may hypothesize that cognitive style should be influential in the student's processes of determining how such tasks should be organized. This assertion formed the basis for one school task used in this study.

Second, if cognitive style refers to preferred mode of organization-categorization, then cognitive style should be manifest in the student's preferences for various types of school-related concepts. Scott and Sigel suggest that individuals do have stylistic preferences in their approaches to school tasks, even though they may be able to perform successfully using any of the approaches. If such is the case, then it is possible to hypothesize that in a free-choice situation where preferences may be indicated, students will express school-related preferences which are parallel to their stylistic preferences. This assertion formed the basis for the second school task used in this study.

General Hypothesis

The general hypothesis of this study was that cognitive style is reflected in school behavior. This hypothesis was based upon the position developed in this chapter. It reflects the two assertions stated above, that cognitive style should be manifest in the individual's structuring or organizing of an unstructured task, and that it should be manifest also in the individual's preferences for various types of school-related operations.

These general assertions were operationalized in the form of seven specific research hypotheses, which are presented in Chapter II.

CHAPTER II

PROCEDURES

Overview

The study employed a cognitive styles instrument devised by Sigel, the Cognitive Styles in Categorization Behavior Task (SCST), and an instrument especially prepared to examine preferences in two school-related tasks. The seven research hypotheses were expressed in terms of the scores from these instruments. The subjects were 80 male university upperclassmen from a variety of major fields of study. Test-retest reliability of the two instruments was established through retesting of 27 subjects. The statistical analysis employed simple correlation, one-way analysis of variance, and chi-square methods. The analysis also included some explorations into the nature of the data beyond the analyses prescribed by the research hypotheses.

Instruments

Cognitive Style

The Cognitive Styles in Categorization Behavior Task (SCST) is the most recent instrument of a series that began with the groups of pictures used by Kagan, Moss, and Sigel in their original research. In all these instruments, the subject groups stimulus pictures on some common basis and gives reasons for the groupings. The kinds of reasons given define

the individual's "cognitive style." These instruments are based upon the assumption that the system or style the subject uses to group or categorize the stimuli presented in the instrument is representative of the style which characterizes all his organizing and categorizing behavior — his cognitive style.

Format and administration. — The SCST is a booklet of 35 triads of pictures representing foods, people, animals, vehicles, furniture, and tools.[1] For each triad of pictures the subject selects pairs of pictures on the basis of similarity or some other relationship, and indicates the reasons for his selections. For example, in a triad composed of a straight-backed chair, a simple table, and an upholstered chair, the straight chair and the table may be paired because they are used together; the two chairs may be paired because they are instances of the same class, "chair"; or the straight chair and table may be paired because they both lack a fourth leg, or because they both appear to be made of the same material. The subject indicates as many pairs and reasons as he can in the time allotted for each. Sample test items, answer sheet, and the instructions to the subject for the SCST are presented in Appendix A.

For this study, special SCST instructions and administration procedures were developed. The administrator of the instrument read directions to the subjects and gave an example to show the proper procedure. Three

[1]The Cognitive Styles in Categorization Behavior Task was used with the kind permission and assistance of Dr. Irving E. Sigel, Merrill-Palmer Institute, Detroit, Michigan

points were emphasized in the instructions: (1) there are different ways in which people see familiar objects; some ways are obvious to some people and other people may see different things; (2) there are therefore no right or wrong answers; and (3) this is neither a test of speed nor of productivity — the reasons given are important.

Scoring. — The SCST is scored by assigning each reason to one of the three conceptual categories:[2]

> Descriptive — part-whole: Concepts are formed on the basis of observable physical attributes of the stimuli. The statement involves direct references to part or all of the physical stimuli themselves. Examples: right hand raised; made of wood.
>
> Inferential-categorical: Concepts are formed on the basis of an inference made about the stimuli. The concepts usually name a class or category to which the stimuli are assumed to belong. Examples: fruit; mammals.
>
> Relational-contextual: Concepts in which two or more ideas are tied together in such a way that no stimulus is an independent instance of the concept; any stimulus derives its meaning from its relationship with the other stimulus. Examples: a family; the man uses the tool.

Each subject is assigned three scores, the numbers of responses falling into each of the three conceptual categories.

The total number of responses produced generally varies widely among subjects. This factor was controlled by converting each subject's three scores into proportions of his total number of responses. For example, a subject giving 112 responses might have given:

---

[2]The scoring manual is included in Appendix A.

56 descriptive — part-whole responses
36 inferential-categorical responses
20 relational contextual responses

Conversion of these three to percentages of the total 112 would yield these three proportion scores:

50% descriptive — part-whole responses
32% inferential-categorical responses
18% relational-contextual responses

The scores used in SCST analyses were these converted proportion scores.

One important characteristic of the SCST is that subjects' scores tend to be arranged in patterns. For example, one common pattern is

45-55% Descriptive — part-whole
30-35% Inferential-categorical
15-18% Relational-contextual

In contrast, this pattern is also frequently observed:

25-35% Descriptive — part-whole
35-45% Inferential-categorical
25-35% Relational-contextual

Since each subject has three SCST scores, he cannot justifiably be classified as a "type" — for example as an "inferential type." He is better characterized by the pattern shown in his three scores. In this study, analyses of SCST responses were performed using both the individual scores and the patterns of scores.

Scoring agreement. — The agreement among SCST scorers (a form of interjudge reliability) is exceedingly high. Untrained scorers following the scoring rules agree on 90 percent of the responses they score (Wallach and Kogan, 1965, 118); trained scorers who are very familiar with the

instrument agree 98 percent (Scott and Sigel, 1965, 29). For this study, three persons were trained to score the answer booklets. Scorer A scored 18 booklets, Scorer B scored 18 booklets, and Scorer C scored 44 booklets. Table 1 shows the scoring agreement obtained by duplicating three answer booklets (a total of 354 responses) and adding them, without the scorers' knowledge, to the booklets being scored. A retest scoring agreement figure was also calculated for Scorer C, who scored a majority of the booklets.

Table 1. Scoring Agreement on the SCST[1]

	Scorer A	Scorer B	Scorer C
	%	%	%
Scorer B	95.76		
Scorer C	97.04	96.33	98.02 (retest)

[1]The errors in scoring were found to be distributed randomly over the three scoring categories; no category contributed excessively to the scorers' errors.

Reliability. — When the SCST is used with children, its split-half reliability ranges from .51 to .61, depending on the age of the subjects, and the test-retest reliability centers on .70 (Scott and Sigel, 1965, 29). With college seniors Sigel has obtained a split-half reliability coefficient of .53 for twelve items; extended by the Spearman-Brown prophecy formula to 35 items this coefficient is .77. Since in the present study the major concern regarding reliability was stability over time (the test's homogeneity already having been established), the test-retest reliability of the SCST

over three weeks' time was calculated for the first 20 items of the instrument. These coefficients were then extended by the Spearman-Brown prophecy formula to the length of the original instrument (Table 2). These coefficients indicated that the SCST is acceptably stable over time.

Table 2. Test-retest Reliability Coefficients for the SCST

	SCST Dimension		
	Descriptive Part-Whole	Inferential Categorical	Relational Contextual
Reliability for 20 items	.76	.65	.51
Extended by prophecy formula to 35 items	.85	.77	.65

School Tasks

An instrument written especially for this study was used to examine the subject's behavior in school-related tasks. The instrument focused on two aspects of school-related processes — the student's preferences for organizing or conceptualizing tasks, and the student's preferences for material to be learned. Under the assumption that since cognitive style reflects the mode of organizing or conceptualizing the environment, cognitive style should be an important factor in organizing or conceptualizing a school task, the first approach was operationalized as the way the student would prefer to organize a very general assignment. Part I of the School-Related Task instrument (SRT) presents the student with a number of general titles on which a hypothetical "theme" might be written. For

each theme title there are listed two or three alternate subtopics to which his theme may be addressed. These alternate subtopics represent information processing, making inferences, and forming relationships. The subject chooses one of the alternate subtopics to illustrate the one aspect of the hypothetical title on which he would prefer to write.

The second approach to school behavior, the student's interest in, or preference for, certain types of school-related tasks, was based on the assumption that since cognitive style reflects the preferred mode of organizing or conceptualizing the environment, the individual's preferences or interests in various school-related tasks should reflect stylistic preferences. Each item in Part II of the SRT lists topics the student might learn about in a given hypothetical college course. The student indicates which of the topics would interest him most. Each alternative topic was written to reflect either information processing, making inferences, or forming relationships.

Development of the SRT instrument. — The two parts of the school-related task instrument originated separately. The items of Part I, dealing with a hypothetical "theme" assignment, were first gathered in a pilot study. In the pilot study 25 senior men, from a diversity of academic backgrounds, responded to the cognitive styles task (SCST) and the pilot SRT instrument. The pilot SRT consisted of 30 titles representing a variety of academic areas. To each title the subject responded with a phrase describing the way he would write a theme addressed to such a title. In

an effort to secure responses as divergent as possible, the phrases offered by subjects who had scored at the farthest extremes of the SCST dimensions were used as a basis for SRT items, and provided a model for writing additional items.

Part II of the SRT instrument was patterned after the format of the Educational Set Scale developed by Siegel and Siegel (1965). In this scale, the student indicates his degree of interest in items of information to be learned or tasks to be performed in certain hypothetical college courses. A number of the items for Part II of the SRT came from the Educational Set Scale, or were patterned after items in that scale.

The first trial form of the entire SRT instrument, the pilot study items and the Educational Set Scale items, was submitted to four judges for preliminary establishment of validity.[3] The subject's task was explained to the judges and the three SRT processes (information processing, etc.) were discussed in full. The judges, acting independently, then designated the process reflected in each item (the items were "scrambled" so a judge could not label two of three alternatives in a group and thereby be assured of "knowing" the label for the third).

For the second trial form of the SRT instrument, those items on which the judges had been unanimous were retained and were used as a model for writing more items. The retained and new items were then submitted

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[3]These judges were two doctoral students in counseling psychology, one in educational psychology, and one in curriculum research.

to another panel of judges who, again working independently, designated the processes reflected in these items.[4] These judges also indicated the extent to which each item was a clear example of the designated process. Those items rated unclear were rewritten for clarity and resubmitted to the judges for final approval.

Thus both parts of the final form of the SRT instrument consisted of items for which construct validity had been established by judges. The three major academic areas — literature and the arts, natural science, and social science — were equally represented by numbers of items; and the three school-related processes were represented by equal numbers of alternatives. The SRT final form also included 25 unscored "filler" items, which were added at random through the instrument to break the pattern of the alternatives reflecting the three SRT processes.

Format and administration. — The SRT was presented to the subjects in a mimeographed test booklet (reproduced in Appendix B) containing the instructions for Part I, the 45 multiple-choice items of Part I, the instructions for Part II, and the 54 Part II items. The instrument was administered in the same testing session as the cognitive styles instrument; the timed SCST was administered first, followed by a brief time to relax and then the SRT instrument. Before leaving, the subjects responded to three informal questions.

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[4]The two counseling psychology students and the curriculum research student were retained for this panel; the fourth judge was a doctoral student in educational measurement and research. Her lack of judging experience in comparison with the other judges did not appear to affect her ratings of the items.

The SRT was introduced as an instrument on which the subjects would be able to demonstrate their preferences for certain kinds of assignments and learning. It was made especially clear that there were not, and in fact could not be, any "correct" or "incorrect" answers in the SRT. After this preface, the directions for Part I were read aloud while the subjects read them from the test booklet. Any questions were answered and points of clarification discussed. The subjects were then told that about halfway through the test they would encounter a new set of directions, which they should read carefully and then follow for the remaining items. After a discussion of the use of machine-scoring answer sheets (with which all were familiar), the subjects were told to proceed. The SRT was untimed, and the subjects progressed at their own speed, most finishing in 45 minutes.

At the end of the testing session an attempt was made to estimate the presence of biases or other systematic factors in the testing. Before leaving the testing session, the subjects responded briefly in writing to the questions:

A. One of the important things about the test with the pictures is that some people develop a system for giving their answers. Did you figure out what the test is about, or did you use any particular system for the test? And if so, what was your system?

B. In the other test, the one about the way you write and things you prefer to learn, some people also use a system, or give certain kinds of answers. If this is true of you, what kinds of answers did you give?

C. Can you make an "educated guess" as to the purpose of this study?

SRT scoring. — The answer sheets were scored by Michigan State University's IBM Optical Scanner scoring machine. Each paper was scored six times, once each for the information processing, making inferences, and forming relationships keys for the two parts of the test. Thus for each subject six scores were obtained:

Part I: Information processing total
Making inferences total
Forming relationships total
Part II: Information processing total
Making inferences total
Forming relationships total

Since the SRT instrument had a forced-choice item format, the scores for each part of the instrument were ipsative.

SRT reliability. — The test-retest reliabilities for the SRT subscores were calculated for a shortened form of the test and extended by the Spearman-Brown formula to the length of the original test. The items in the shortened form of the test paralleled the longer form — there were equal numbers of items for each content area and equal numbers of alternatives representing each of the three processes.

The test-retest reliability coefficients for the SRT are reported in Table 3. From these coefficients it was concluded that the SRT instrument measures only moderately consistently over time.

Table 3. Test-retest Reliability Coefficients for the SRT

	Information processing	Making inferences	Forming relationships
Part I: Coefficients for 18 items	.68	.56	.37
Part I: Extended by prophecy formula to 29 items	.77	.67	.49
Part II: Coefficients for 17 items	.75	.41	.56
Part II: Extended by prophecy formula to 29 items	.84	.54	.67

Research Hypotheses

The general hypothesis of this study, as previously stated, was that cognitive style is reflected in school behavior. The actual research hypotheses examined in this study were expressed in terms of SCST and SRT scores.

Two groups of research hypotheses were examined in this study. The first group asserted that there should be relationships between scores reflecting the three dimensions of the Cognitive Styles in Categorization Behavior Task (SCST) and subscores reflecting the parallel processes of the School-Related Task instrument (SRT).

Hypothesis 1: Preference for descriptive — part-whole categorizations on the SCST is correlated with preference for information processing as measured by the SRT.

Hypothesis 2: Preference for inferential-categorical categorizations on the SCST is correlated with preference for making inferences as measured by the SRT.

Hypothesis 3: Preference for relational-contextual categorizations on the SCST is correlated with preference for forming relationships as measured by the SRT.

The second group of research hypotheses dealt with the SCST patterns, rather than the individual scores, and their relationship to the SRT subscores. These hypotheses were based on the assertion previously discussed that individuals may more appropriately be characterized by their patterns of SCST scores than by classification according to one dominant score — for example by labeling the individual as an "inferential type." It was hypothesized that persons exhibiting similar SCST patterns would demonstrate similar school-related behaviors.

Hypothesis 4: Subjects exhibiting different patterns of SCST scores will differ in the number of information processing choices on the SRT.

Hypothesis 5: Subjects exhibiting different patterns of SCST scores will differ in the number of making inferences choices on the SRT.

Hypothesis 6: Subjects exhibiting different patterns of SCST scores will differ in the number of forming relationships choices on the SRT.

Hypothesis 7: The array of response patterns on the SCST is related to the array of response patterns on the SRT.

Population and Sample

The population to which this study applied was young adult men of average to above-average intelligence. Recent cognitive style research has revealed that stylistic preferences vary greatly with sex and with age (for example, Scott and Sigel, 1965; Wallach and Kogan, 1965). These two factors were controlled in this study by selection of young adult men as subjects. College students were used as subjects because of their availability at Michigan State University. The sample consisted of 80

male volunteer M.S.U. upperclassmen.[5] Their mean age was 21 (standard deviation 1.97) and their mean grade point average on the four-point scale was 2.83 (standard deviation .544). There were no foreign students in the sample.

Because academic preferences, as expressed in the selection of a major field of study, might conceivably be associated with cognitive style, an attempt was made to assure a broad representation of academic majors among the subjects, as shown in Table 4.

Table 4. Academic Majors of 80 Subjects

Major field of study	Number	
American studies	1	
Comparative literature	2	
English	9	
Humanities	2	
Journalism	1	
Speech	6	
Television-radio	1	
Theatre	2	
Total Literature and Communications		24
Biochemistry	5	
Chemistry	14	
Mathematics	1	
Physics	9	
Zoology	1	
Total Natural Sciences		30
History	2	
Police administration	1	
Political science	4	
Psychology	1	
Social science (divisional)	16	
Sociology	2	
Total Social Sciences		26

[5]Eighty-one students were tested. One was dropped from the sample because he did not qualify; he was a graduate student who had come to the testing session without having been invited to participate.

The subjects were obtained through Michigan State University English, sociology, speech, physics, and chemistry classes. Several professors were approached with the plan of the study and were asked if subjects could be solicited in one of their classes. The students who qualified as potential subjects were sent letters explaining the study and requesting their help. The investigator visited the classes several days later and was introduced by the professor, who indicated to the class that he felt the study would be an interesting experience. The investigator described the study briefly and indicated that participation was totally voluntary since no compensation or academic reward could be given. The persons who indicated their interest and willingness to participate were given a choice of testing sessions and were reminded by telephone of their appointment.

CHAPTER III

RESULTS AND FURTHER EXPLORATIONS

Data

The data for the analyses consisted of two sets of scores for each subject, the SCST scores and the SRT scores.

SCST: Pattern of scores, composed of:

- Proportion of descriptive — part-whole responses
- Proportion of inferential-categorical responses
- Proportion of relational-contextual responses

SRT: Part I:

- Number of information processing choices
- Number of making inferences choices
- Number of forming relationships choices

Part II:

- Number of information processing choices
- Number of making inferences choices
- Number of forming relationships choices

The means and standard deviations for these variables are presented in Table 5 for the total group and for crossvalidation samples one and two.[6]

Results

Hypotheses One, Two, and Three

The first three hypotheses dealt with the relationship between parallel subscores of the cognitive styles instrument (SCST) and the school-related task instrument (SRT).

[6]The statistical calculations were performed on Michigan State University's Control Data Corporation 3600 computer, using the SCOPE series of statistical programs.

Table 5. Parameters of Distributions for Total Sample and Two Crossvalidation Samples

Variable	Sample					
	Total		First Cross-validation		Second Cross-validation	
	Mean	s.d.	Mean	s.d.	Mean	s.d.
SCST: Total Number of Responses	112.05	19.98	114.55	22.16	109.55	17.47
SCST: Proportion of Descriptive — Part-whole Responses	50.37	9.08	50.12	8.77	50.61	8.52
SCST: Proportion of Inferential-categorical Responses	32.98	7.76	32.58	7.02	33.39	6.90
SCST: Proportion of Relational-contextual Responses	16.68	6.88	17.35	6.89	16.00	10.75
SRT-I: Number of Information Processing Responses	8.76	5.90	8.28	6.41	9.25	5.38
SRT-I: Number of Making Inferences Responses	12.81	4.80	13.15	4.22	12.48	3.95
SRT-I: Number of Forming Relationships Responses	13.46	3.72	13.55	3.74	13.88	3.75
SRT-II: Number of Information Processing Responses	8.06	4.09	7.17	3.73	8.75	4.27
SRT-II: Number of Making Inferences Responses	16.09	3.48	17.15	3.63	15.03	3.00
SRT-II: Number of Forming Relationships Responses	14.83	3.23	14.65	3.43	15.00	3.05

Hypothesis 1: Preference for descriptive — part-whole categorizations on the SCST is correlated with preference for information processing as measured by the SRT instrument.

Hypothesis 2: Preference for inferential-categorical categorizations on the SCST is correlated with preference for making inferences as measured by the SRT.

Hypothesis 3: Preference for relational-contextual categorizations on the SCST is correlated with preference for forming relationships as measured by the SRT.

Table 6 presents the correlation coefficients bearing directly upon these hypotheses. None of the correlation coefficients were upheld in cross-validation. Hypotheses one, two, and three were not supported by these results.

Table 6. Correlations Between the SCST Dimensions and Parallel Subscores of the SRT, Parts I and II

	SCST		
SRT	Descriptive part-whole	Inferential categorical	Relational contextual
I: Information processing	.02		
I: Making inferences		.05	
I: Forming relationsips			.02
II: Information processing	.09		
II: Making inferences		.12	
II: Forming relationships			-.02

The analysis presented in Table 6 used the proportion scores for each of the three SCST dimensions. As a check on the advisability of using these proportion scores instead of the raw scores, and as a confirmation of the rejection of these three research hypotheses, the analysis was repeated using the raw SCST scores. The results of this correlation analysis

are presented in Table 7. Hypotheses one, two, and three were not supported by this analysis.

Table 7. Correlations Between the SCST Dimensions (raw scores) and the Parallel Subscores of the SRT, Parts I and II

	SCST		
SRT	Descriptive part-whole	Inferential categorical	Relational contextual
I: Information processing	-.16		
I: Making inferences		.11	
I: Forming relationships			.12
II: Information processing	-.03		
II: Making inferences		.18	
II: Forming relationships			-.00

Hypotheses Four, Five, and Six

The second group of hypotheses dealt with the relationship between patterns of scores on the SCST instrument and responses on the three dimensions of the school-related tasks instrument.

Hypothesis 4: Subjects exhibiting different patterns of SCST scores will differ in the number of information processing choices on the SRT.

Hypothesis 5: Subjects exhibiting different patterns of SCST scores will differ in the number of making inferences choices on the SRT.

Hypothesis 6: Subjects exhibiting different patterns of SCST scores will differ in the number of forming relationships choices on the SRT.

The system for patterning SCST scores was based upon the distributions of scores for the three dimensions. Each subject was classified as being above or below the mean on each dimension; the patterns were defined by

the subjects' arrays of high-low classifications. Although with this system theoretically eight (2^3) patterns could result (Table 8), because SCST scores are ipsative patterns 0 and 7 were not defined. Patterns one through six were observed.

Table 8. Patterns of SCST Subscores

Pattern	SCST Dimensions		
	Descriptive part-whole	Inferential categorical	Relational contextual
0	High	High	High
1	High	High	Low
2	High	Low	High
3	High	Low	Low
4	Low	High	High
5	Low	High	Low
6	Low	Low	High
7	Low	Low	Low

Analyses of variance employing these patterns as the independent variable were performed using the six school-related task subscores as dependent variables. The results are presented in Table 9. Hypotheses four, five, and six were not supported.

Hypothesis Seven

Hypothesis 7: The array of response patterns on the SCST is related to the array of response patterns on the SRT instrument.

An exact parallel of the system used for classifying the SCST scores was used for classifying SRT scores. SRT Parts I and II were combined for this analysis; if they had been treated separately, 64 SRT patterns (2^6) theoretically could have resulted, and with only 80 observations

Table 9. Results of Six Analyses of Variance:
SCST Pattern is the Independent Variable and the SRT Subscores the Dependent Variables

SRT Subscore	Means for the SCST Patterns						MS between	MS within	F	Probability of the F
	1	2	3	4	5	6				
I-Information processing	9.64	7.62	9.10	7.18	8.67	10.50	17.12	35.96	.48	.79
I-Making inferences	12.64	14.85	12.15	13.45	13.00	10.70	22.51	16.21	1.39	.24
I-Forming relationships	12.63	12.54	13.95	14.36	13.33	13.80	6.74	14.35	.47	.80
II-Information processing	8.36	7.38	8.55	7.09	7.93	8.90	5.87	17.42	.34	.89
II-Making inferences	16.27	16.69	15.40	16.91	16.13	15.50	5.10	12.55	.41	.84
II-Forming relationships	14.27	14.92	15.00	15.00	14.93	14.60	1.02	11.09	.09	.99

such an arrangement would have been meaningless. With the two SRT parts combined, again eight (2^3) patterns were theoretically attainable but only six were observed. The tabulation of 80 observations arranged by SCST and SRT patterns is presented in Table 10. The frequencies in Table 10 provide the raw data for the chi-square analysis originally intended. Because of the many very small expected frequencies in this 36-cell table, the chi-square statistic was inappropriate. When the frequencies in Table 10 are examined informally, only one consistency is apparent. The subjects exhibiting SCST pattern 4 (low descriptive — part-whole, high inferential-categorical, high relational contextual) tend to score below the group mean on information processing (SRT patterns 4, 5, and 6).

Table 10. Observed Frequencies of SCST and SRT Patterns

	SCST Pattern					
SRT Pattern	1	2	3	4	5	6
1	4	1	2	1	2	0
2	0	0	3	0	3	2
3	3	4	4	1	3	6
4	2	4	5	5	3	1
5	1	4	2	1	3	1
6	1	0	4	3	1	0

Summary

Hypotheses one, two, and three of this study, dealing with the relationship between parallel subscores of the SCST and SRT, were not supported

by the results of correlation analyses, as reported in Table 6. Hypotheses four, five, and six, dealing with the relationship between patterns of SCST scores and the various SRT subscores, were not supported by the analyses of variance reported in Table 9. Analysis of the data for examining hypothesis seven was not possible because of the large number of pattern combinations (36) in comparison with number of subjects (80).

Discussion

The results presented above indicate that the two instruments are not related as hypothesized. This lack of relationship may be due to one of two causes: (1) there is indeed no relationship between cognitive style and school task behavior and preferences; or (2) a relationship between cognitive style and school behavior does exist, although the relationship was not apparent in this study. Further explorations of the instruments used and data obtained in this study were addressed to the second alternative, that there is a relationship although it did not appear in this study. The first alternative, that no relationship exists, could not be pursued by further analyses of the available data, but will be considered in Chapter IV.

Further Explorations: The Possibility of a Relationship

The assertion that cognitive style should be manifest in school behavior derives from a principle underlying all cognitive style theories, that stylistic preferences are not only evident in the specific tasks used to define cognitive style, but also influence other cognitive activity. In order to examine the role of cognitive style in the cognitive activity called

"school-related behavior," one systematization of school behavior was developed and used as the basis for investigation. The choice of one school-behavior definition placed an important restriction upon the study. Although school behavior involves an infinitely wide and varied group of individual behaviors, the entire burden of the study's main hypothesis rested upon only one behavior — preferences for certain ways of dealing with school tasks. All other factors in the realm of school behavior were thus excluded.

This problem is not uncommon in the researcher's attempts to study behavior in situ. By specifying an operational definition of the behavior in question, the social scientist of necessity excludes the many subtleties and tangential factors associated with that behavior. He must assume two things in defining the behavior to be examined: (1) the additional factors associated with the behavior in question will not significantly influence definition or measurement of that behavior, and (2) the behavior he has defined is in fact the behavior most relevant to the question he seeks to examine.

These two assumptions were examined for their relevance to this study: first, the possibility that the many other factors associated with school behavior did in fact contaminate measurement by the SRT, and second, that some aspects of school behavior excluded from the original formulation could have greater relevance to cognitive style.

Extraneous Factors Influencing SRT Responses

The first possibility to be examined was that other factors contaminated the SRT measurement. On the basis of several sources of evidence it appears appropriate to suggest that responses to the SRT did not reflect solely the system of school tasks originally proposed, but instead the subjects responded to this formulation of school tasks plus some other factors. These several "other" factors are discussed below.

Some subjects indicated in their written comments after the testing that they had responded to the SRT in terms of a "system" which they had perceived in the test. They expressed the "system" they saw as a choice between alternatives dealing with one piece of information (i.e. information processing) and alternatives dealing with two. The SRT was seen as measuring whether the subject preferred dealing with discrete items of information or with complexities. Very few subjects saw the further division into inferences and relationships.

The subjects' informal written comments also disclosed that the task in Part I of the SRT was somewhat confusing. In Part I the subjects were given a hypothetical theme assignment topic and were asked to choose which alternative best represented the "way you would write such a paper." A number of subjects experienced difficulty in establishing for themselves the criterion upon which this decision was to be made. Sample comments demonstrate the variety of criteria upon which the students operated:

> I simply followed how I could best limit the topic. I always picked the most basic or fundamental topic which the others would have to rely on.

> I tried to pick subjects that would present a better paper.
>
> I gave answers that fit my interests primarily.
>
> I answered in terms of my self-concept — one which is concerned about people, and my knowledge of them.

Here it is apparent that at least four different criteria were used: most restrictive, most interesting, wisest choice for a grade, and a personal criterion entirely irrelevant to the task. These criteria are far from the original formulation of the "structuring" or "organizing" process, suggesting that Part I of the SRT might have reflected a number of school-related factors in addition to the processes it was intended to measure. (The subjects' comments demonstrated that they had responded to Part II as instructed, and that the task had been considerably easier for them to understand.)

Although the SRT was constructed to allow the subject to reveal his preferences for the three kinds of school tasks, an artifact of the instrument's construction had the effect of suppressing the range of SRT subscores. For example, consider Subject X, who vastly prefers information processing over any other activity. Every time he is presented with an information processing alternative he chooses it. Ideally his SRT scores should be:

Information processing	74
Making inferences	0
Forming relationships	0

But only in 58 items is he presented with information processing choices;

the other items require him to choose between making inferences and forming relationships, neither of which he would prefer to choose. Assuming he chooses at random in these situations, his observed SRT score would be:

Information processing	58
Making inferences	8
Forming relationships	8

A comparison of this score with his ideal score shows that his observed score is misrepresenting his interests and also is artificially reducing the disparity between his preferred process and the two he clearly does not prefer. Since Subject X is only one of 80, it is clear that the variance of SRT subscores for the entire group might easily have been suppressed. It is necessary to conclude that although responses to the SRT did, as intended, reflect preferences in school tasks, the measurement did not reflect those preferences entirely accurately.

Further examination of the written comments, as well as conversations with the subjects, revealed that many were responding to the SRT questions partially on the basis of their previous contact with the content material in the alternatives. Thus, for example, if they had already learned about or knew they would not be interested in two alternatives offered in an item, they chose the third by default. Such a choice is not consistent with the original formulation of the instrument, of course, and does not reflect the processes originally built into the SRT.

The possibility that the school preferences and behaviors measured

by the SRT included other factors was also evident after further examination of the procedure for establishing the SRT's construct validity. Construct validity was originally established by consensus among judges. In order that the consensus might be attained, the items were written very carefully. The result of this careful writing was that many items had key words or phrases in common — for example the words "cause" or "result" for making inferences, or "compare and contrast" for forming relationships — and thus the judges might have based their appraisal on internal verbal cues in the items. The judgments were consistent, perhaps due to the presence of these internal cues, but the items might not have actually reflected the processes they were judged to reflect. Thus if the items did not reflect the three intended processes, the subjects could not have been responding solely to these processes. Again, the conclusion must be that the subjects possibly were responding to factors other than those originally written into the instrument.

Summary. — These examples point to the conclusion that while the SRT was indeed measuring certain school-related preferences, it could not be ascertained what behaviors were being measured in addition to those intentionally written into the instrument. The reason for this problem was to be found in the task of defining "school-related behaviors." It appears to be almost impossible to delineate one aspect of school behavior — in this case the three-cognitive-operations description of school tasks — and expect to measure it without contamination from other uncontrolled

aspects of school behavior, for example interests and past experience. In this study, the SRT measured school-related preferences and behaviors, but the behaviors it measured apparently included some not originally planned in the formulation of this instrument.

The Relevance of Other School Behaviors

School behavior may be defined in a variety of ways, only one of which was used for the basis of the SRT. The question to be raised next is whether other school behaviors may be more relevant to cognitive style than those tapped in the SRT. In the university environment, two important manifestations of school preferences and behavior might be closely related cognitive style. They are major field of study and academic performance.

Major field of study. — Of all the school behaviors which at the college level might be practical expressions of cognitive style, the selection of a major field stands out as the behavior perhaps most reflective of the individual's preferences for perceiving and organizing his environment. It may be hypothesized, for example, that students in the three academic areas represented in this sample would score differently on the SCST because of these differing preferences. The results of a one-way analysis of variance performed to test this hypothesis are presented in Table 11. No definitive conclusions may be drawn from these results, although it is possible to suggest that preferences for the inferential-categorical dimension is one to which major field of study may possibly be related. In

Table 11. Results of Three Analyses of Variance:
Major Field of Study is the Independent Variable and the SCST Subscores the Dependent Variables

SCST Subscores	Means for the Major Fields of Study: Literature and Communications	Natural Sciences	Social Sciences	MS between	MS within	F	Probability of the F
1. Descriptive — part-whole	52.65	49.16	49.43	87.14	82.34	1.58	.35
2. Inferential-categorical	30.51	34.69	33.30	118.19	58.78	2.01	.14
3. Relational-contextual	16.87	16.03	17.25	10.98	48.31	.23	.80

this analysis, the science students demonstrated the higher inferential-categorical scores.

A second analysis of these data was performed by dividing SCST responses on each dimension into groups scoring above and below the mean and examining by the chi-square test of independence the relationship between high and low SCST scores and major field of study. Three chi-square tests of independence, one for each SCST dimension, were used to examine this relationship. The groups did not differ in their descriptive — part-whole and relational-contextual preferences, but science students clearly demonstrated inferential-categorical preferences ($X^2=17.71$, $p<.005$), as illustrated in Table 12.

Table 12. Observed Frequencies of SCST High and Low Scores for Three Major Fields of Study

	SCST					
	Descriptive Part-Whole		Inferential Categorical		Relational Contextual	
Major Field	H	L	H	L	H	L
Literature and Communications	14	10	6	18	13	11
Natural Sciences	14	16	20	10	11	19
Social Sciences	16	10	11	15	10	16

In summary, a tentative conclusion was drawn regarding the relationship between cognitive style and selection of a major field of study. Apparently the inferential-categorical stylistic preference is associated with selection of a major field. This relationship was complicated, however, by a third factor to be discussed below.

Academic performance. — Studies of the relationship of cognitive style and school-related behavior have focused often on the relationship of style to performance in free-response school tasks. Sigel is presently examining this relationship; preliminary results suggest that there is a definite relationship between style and performance. For example, "descriptive" persons tend to prefer dealing with the manifest, while "relational" people prefer dealing with interrelationships among items of information.

Another more practical question is the relationship between cognitive style and classroom performance. This relationship was explored through correlations between university "grade point average" and the three dimensions of the SCST. Those coefficients were -.15 for descriptive — part-whole, +.18 ($p<.10$) for inferential-categorical, and .00 for relational-contextual. Although the inferential-categorical coefficient was not upheld in crossvalidation (the values being .29 and .08), it is important to notice that again this dimension may be related to a school behavior while the others definitely are not.

The possibility of a relationship between academic excellence and cognitive style was pursued in one further analysis. In an attempt to determine which component of college performance might be associated with cognitive style, the verbal, numerical, and information entrance test data for these subjects were chosen as a useful breakdown of academic ability and thus a step toward determining the meaning of a relationship between academic performance and cognitive style. The three entrance

test subscores were correlated with the cognitive style dimensions. The results of this analysis are presented in Table 13. The one relationship upheld by crossvalidation, between numerical aptitude and inferential-categorical preferences, deserves special notice. The relationship of inferential-categorical preferences with the information subscore also is noteworthy, although this relationship was not upheld in crossvalidation (the coefficients being .43 and .13).

Table 13. Correlations Between the Cognitive Style and Academic Aptitude Measures

	SCST		
Academic Aptitude	Descriptive Part-Whole	Inferential Categorical	Relational Contextual
Verbal	-.07	-.02	.12
Information	-.17	.29	-.09
Numerical	-.12	.28*	-.16

*Upheld by crossvalidation: $p<.02$.

Relationships among major field, academic performance, and academic aptitude. — The results presented above suggest that the SCST inferential-categorical dimension may be related to several aspects of school behavior. Further analyses demonstrated that these aspects of school behavior were substantially interrelated. One analysis performed was an analysis of variance with major field of study as the independent variable and grade point average the dependent variable. The result of this analysis is presented in Table 14. Clearly the science majors exhibited a higher grade point average. In a second analysis, they also exhibited higher information and numerical aptitudes (see Table 15).

Table 14. Analysis of Variance Results:
Major Field of Study is the Independent Variable and Grade Point Average the Dependent Variable

Means for the Major Fields of Study						
Literature and Communications	Natural Sciences	Social Sciences	MS between	MS within	F	Probability of the F
2.61	3.17	2.63	2.84	.23	12.52	.001

Table 15. Results of Three Analyses of Variance:
Major Field of Study is the Independent Variable and
Academic Aptitude Subscores the Dependent Variables

	Means for the Major Fields of Study						
	Literature and Communications	Natural Sciences	Social Sciences	MS between	MS within	F	Probability of the F
1. Verbal	58.00	62.03	54.65	382.35	244.19	1.57	.21
2. Information	49.29	63.63	52.81	2051.86	168.29	12.19	.001
3. Numerical	30.04	46.50	33.00	2141.55	122.60	17.47	.001

It is clear that the major field of study, grade point average, and academic aptitude variables are so interwoven that it is difficult to separate their effects and to determine their relationship to cognitive style. It is possible, however, to find some consistencies among them and then to relate cognitive style to these consistencies. Because science major, high college grades, and higher numerical aptitude scores are related, the question of cause appears to be unanswerable. But the key to the answer may lie in the other academic aptitude scores. Science majors would not necessarily be expected to demonstrate a greater command of general information, nor would they necessarily be expected to score higher on total academic aptitude as they did ($p<.001$). A possible conclusion is that this group of students is "brighter," that is, they demonstrate in their academic work signs of greater academic capability. The common factor running through major field of study, grade point average, and academic aptitude seems to be this particular demonstration of capability.

The science students exhibited a greater preference for inferential-categorical categorizations on the cognitive styles instrument. The academic aptitude dimensions were also related to the SCST inferential-categorical dimension. Grade point average was related to inferential-categorical preferences. Since the three variables are interwoven it is difficult to justify a conclusion on the basis of these separate marginally significant results, but it does seem justifiable to suggest that the common factor, academic capability, appears to be related to preferences for inferential-categorical organizations on the cognitive styles instrument.

Summary. — A second assumption made implicitly in any behavioral science research is that the behavior defined and studied is the behavior most relevant to the question being asked. Several analyses suggested that perhaps the systematic description of school behavior represented in the SRT was not the most relevant behavior to have studied. It became apparent that more practical school-related behaviors such as major field of study and academic performance might be more relevant to cognitive style than the more artificial description of school tasks formulated for this study. The academically capable students demonstrated inferential-categorical stylistic preferences.

Recapitulation

The results of analyses addressed to the original hypotheses indicated that no relationship could be found between the cognitive styles instrument and the formulation of school behavior represented by the SRT instrument. From these results two interpretations are possible: either no relationship exists between cognitive style and school behavior, or there indeed is a relationship but it did not appear in this study.

These two alternative explanations were the basis for further explorations and analyses. Although the possibility of no relationship could not be examined, the possibility of an undiscovered relationship was explored by examining two assumptions implicit in all behavioral science research: (1) the tangential factors associated with the behavior in question will not contaminate measurement of that behavior, or will have a random

effect; and (2) the behavior defined and measured is in fact the behavior most relevant to the question under examination. The presence of additional tangential factors in the measurement of school behavior was confirmed, as was also the possibility that some school behaviors may indeed be more relevant to cognitive style than the systematization of school behavior originally proposed.

The two alternative explanations for the results of this study are discussed, after a summary of the study, in Chapter IV. The two alternatives from which a conclusion must be drawn are: (1) no relationship between cognitive style and school behavior exists, and (2) a relationship between cognitive style and school behavior does exist although it did not appear in this study.

CHAPTER IV

SUMMARY AND CONCLUSIONS

Summary

The major theoretical approaches to cognitive style hold in common one important principle, that cognitive style permeates a wide variety of behaviors and situations. The purpose of this study was to determine whether the construct called "cognitive style" is specific only to its defining tasks, or if it indeed generalizes to other situations and behaviors, in this case school-related behavior.

The diversity in the theoretical positions regarding cognitive style is illustrated by the approaches taken by the three major groups investigating this construct. Witkin's research began as an investigation of behavior in specific perceptual tasks and was expanded only when it became evident that the behaviors originally thought to reflect "individual differences in a seemingly narrow perceptual activity" actually represented "broad differences among people in what seemed to add up to a 'style of life.'" Gardner and his associates, in contrast, based their explorations of "cognitive controls" on psychoanalytic theory; cognitive controls are adaptive mechanisms, modes of "coping with certain insistent configurations and events in external reality." Kagan, Moss, and Sigel's explorations of cognitive style arose from their studies of cognitive activity in

children. They suggested that differences in perceptual organization and conceptual categorization of the external environment might account for some of the differences in children's cognitive activity remaining even when intelligence, differential maturation rates, and abilities to differentiate and to abstract are taken into account. Preference for certain modes of perceptual organization and conceptual categorization, or "cognitive style," was defined by responses to a picture-sorting task in which the subjects' reasons for their groupings were classified into one of three conceptual categories: analytic-descriptive, inferential-categorical, and relational. The Kagan, Moss, and Sigel approach to cognitive style was used in this study.

The major hypothesis of the study was that the individual's cognitive style is reflected in his school behavior. School behavior was defined broadly to include especially the individual's preferences for ways of organizing tasks to be performed and his preferences for certain tasks over others. A systematic description of school tasks was developed independently of the cognitive styles position represented in Kagan, Moss, and Sigel's research. This formulation of school tasks subsumed classroom tasks under three processes: information processing, making inferences, and forming relationships. It was hypothesized that the individual's preferences for certain of these cognitive processes might be related to his preferences for perceptual organization and conceptual categorization, called his cognitive style.

The study employed the most recent instrument of a series arising from Kagan, Moss, and Sigel's research. The Cognitive Styles in Categorization Behavior Task (SCST), developed by Sigel, measures preferences for categorizing familiar items of the environment, under the assumption that such preferences are representative of the preferences characterizing all the individual's organizing and categorizing behavior — his cognitive style. The instrument is a booklet of 35 triads of pictures to which subjects respond by indicating the ways pictures may be paired. The reason for each pairing is scored as reflecting one of three dimensions: descriptive — part-whole, inferential-categorical, or relational-contextual. In this study, the SCST test-retest reliability was high (.85, .77, and .65), and the scoring agreement among judges was exceptionally high, averaging 96.6%.

Preferences for school tasks were measured by a two-part instrument especially written for this study. In Part I of the School-Related Task instrument (SRT), the subject was presented with a number of general topics on which a hypothetical "theme" assignment might be written. With each theme topic were listed two or three alternate subtopics to which the hypothetical theme might be addressed. These alternate subtopics represented a choice among information processing, making inferences, and forming relationships; the subject chose one to illustrate how he would prefer to organize the more unstructured general topic. In Part II, the subject's interest in, or preference for, certain types of school

tasks was observed. Each item in Part II listed two or three ideas or concepts the subject might learn about in a given hypothetical college course. The subject indicated for each item which of the alternatives (written to embody the information processing, making inferences, and forming relationships processes) interested him most. The test-retest reliabilities of the SRT indicated that the instrument measured only moderately consistently over time.

The sample for this study consisted of 80 male volunteer upperclassmen representing a variety of major fields of study.

The research hypotheses predicted relationships between parallel dimensions of the two instruments, and predicted that subjects exhibiting similar patterns of SCST scores would also exhibit similar SRT scores. The hypotheses were not supported in the analyses.

Two alternative interpretations of the results were offered. First, it was suggested that there may indeed be no relationship between cognitive style and school behavior, and that the generality of the cognitive style construct thus cannot be assumed. Second, it was suggested that there may be a relationship between cognitive style and school behavior, although for some reason the relationship was not apparent in this study.

Although the data did not make possible an analysis of the first possibility, the second possibility was explored through some further analyses. The problem in establishing a relationship between a hypothetical construct such as cognitive style and a more concrete behavior such as preferences

in school tasks was discussed in the larger perspective of the social scientist's continuing effort to generalize from the laboratory to the field. In studying behavior in situ, the social scientist must base his research on two assumptions: (1) the additional, tangential uncontrolled factors associated with the behavior he is examining will not significantly influence definition or measurement of that behavior, or will have a random effect upon the behavior; and (2) the behavior that he has defined and is examining is in fact the behavior most relevant to the question he seeks to answer. The implications of these two assumptions for this study were examined: (1) it is possible that the many complex factors comprising school behavior did in fact contaminate measurement by the SRT, and (2) aspects of school behavior excluded from the original formulation could indeed have greater relevance to cognitive style than does the description of school behavior represented in the SRT instrument.

First, the responses to the SRT instrument, as well as examination of the subjects' informal comments, disclosed that the SRT instrument reflected not only the processes it was constructed to reflect but also other tangential factors such as the subjects' various criteria for choosing responses, their previous contact with the subject matter of the items, and perhaps artifacts of the instrument's construction. Thus it was concluded that the school-related preferences and behaviors measured by the SRT included a few factors other than those comprising the original formulation of the instrument.

The second explorations focused on other school-related behaviors which showed a promising relationship to cognitive style. The subjects' academic capability as demonstrated in their grade point averages and academic aptitude test scores was related to the preferences for inferential-categorical stylistic responses on the cognitive styles instrument. From this ancillary analysis it was concluded that there may very likely be a relationship between cognitive style and some aspects of school behavior, perhaps not those represented in the SRT instrument.

Conclusions

Two alternative interpretations have been suggested and must now be considered as alternative conclusions. First, it is possible that there is no relationship between cognitive style and school behavior, and therefore that the principle common to all theories of cognitive style — that cognitive style should be reflected in other cognitive behaviors — is not supported by this empirical evidence. It is also possible, however, that a relationship does indeed exist between cognitive style and school behavior, despite the lack of support in this study of the research hypotheses. If this conclusion is made, it must be reconciled with the results of this study. This alternative will be examined first.

A Relationship Does Exist

Some evidence that there is a relationship between cognitive style and school behavior was found in the analyses of major field of study, grade point average, and academic aptitude. From these analyses it

was concluded that academic capability as reflected in these variables is related to inferential-categorical preference. This one association between cognitive style and a school behavior clearly is due to the principles of inference and abstraction common to both; the inferential-categorical style is based upon preferences for making inferences about the stimuli and classifying them according to some abstract principle, while academic capability is closely related to measured intelligence, which of course is heavily dependent upon abstraction abilities. Although this evidence is persuasive, however, it is hardly a sufficient basis for concluding that a relationship exists. Any conclusion about a relationship must be reconciled with the results of the major analyses, rather than deriving from this secondary analysis.

The purpose of this study was to determine whether cognitive style is manifest only in its defining tasks, or if the construct generalizes to school behavior. While previous explorations of cognitive style had been devoted almost exclusively to laboratory studies of stylistic preferences and their manifestations in certain specialized tasks, the present study represented an attempt to apply the knowledge gained in these laboratory situations to a setting outside the laboratory. The major hypothesis of this study, that cognitive style is reflected in school behavior, was examined not in the laboratory, where it had already achieved confirmation, but in the classroom, where few research studies had ventured. The shift from laboratory to classroom appears to have been the source

of the discrepancy between the theoretical expectations developed through past studies and the empirical evidence from this study.

Laboratory studies of cognitive style and other behaviors invariably employ controls for those many factors which, in addition to cognitive style, may influence the other behaviors. In the school setting, however, these factors cannot all be controlled. For example, in this study the subjects' past experience with the topics listed in the SRT instrument could not be controlled. Cognitive style may indeed influence behavior in school situations, but its influence may be minute compared to the stronger influence of other factors. In the classroom such factors as intelligence, motivation, interests, experiences, and even learned responses to abstract tasks may be far more influential in school behavior than cognitive style. The heterogeneity of factors in the classroom setting is likely to mask any relationship between school behavior and a subtle and elusive construct such as cognitive style.

The possibility that a relationship exists must be considered in this light. The theoretical evidence favors the existence of a meaningful relationship between cognitive style and school behavior. Indeed the evidence gathered in laboratory studies supports the contention that stylistic preferences would influence certain school-related behaviors. The critical problem in reconciling these findings with the results of this study lies in the effort to generalize from the laboratory to the classroom.

To conclude that there is a relationship between cognitive style and

school behavior is to place greater credence in the weight of theoretical assertion and laboratory evidence than in the results of one empirical study. Since that one study also reflected to a considerable degree the social scientist's continuing problem of generalization from laboratory to field, the possibility of a functional relationship between cognitive style and school behavior must not be discarded.

The Alternative: No Relationship

In considering the possibility that no relationship can be established between school behavior and cognitive style, two explanations for such a possibility arise. First, the relationship may be so masked by other school-related variables that the effects of cognitive style upon school behavior are not visible. And second, there may be no relationship; the two may indeed be entirely independent.

The possibility that cognitive style's effect upon school behavior is hidden by the more obvious effects of other variables has already been discussed. The problem in determining the appropriateness of this conclusion or the conclusion of no relationship (hidden or other), is that the two cannot be properly assessed from the available empirical evidence. On the side of the no-relationship argument is the tradition of assuming no relationship until one sufficiently strong is observed. On the side of the masked-relationship conclusion, however, is the weight of three independent theoretical arguments and their respective laboratory studies and also the evidence, though sketchy, of some classroom setting relationships — Scott and Sigel's findings and the inferential style-academic capability relationship found in the present study.

The appropriate conclusion for this study seems clear from these alternatives. Although no definite and distinct functional relationship was demonstrated in this study, but since the theory and the available laboratory evidence predict a relationship, it is evident that there very likely is a relationship between cognitive style and school behavior, but it is masked in empirical studies by the complexity of the classroom setting.

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APPENDIX A

SCST Instructions for Administration, Sample Items, Answer Sheet, and Scoring Manual

INSTRUCTIONS FOR ADMINISTERING THE COGNITIVE STYLES IN CATEGORIZATION BEHAVIOR TASK (SCST)

Introductory Directions

"The two measures we will be using today are distinctly different. The first is quite abstract, dealing more with how you think; the second deals with what you do in class assignments and the kinds of learning you prefer to do. The first is timed; in the second you work at your own pace."

Hand out packet of answer sheets and test questions.

"Please fill in the information on the top of the second page."

While students are doing this, write 'page,' 'pair' and 'reason' on the board as a model for the example item.

SCST Directions

"This first measure was developed by psychologists at Fels Institute in Ohio and Merrill-Palmer Institute in Detroit."

Hold up answer booklet, second page, and say:

"Look now at the three pictures below the information you just filled in. We know that people see groups of familiar things like these in different ways. None of these ways is better or worse than another, but the differences between people do exist, just as there are differences in the ways people think. This test examines the way you see groups of familiar things."

"The way the test goes is very simple. Here in this example you'll see a chair, labeled X, a table, labeled Y, and another chair, labeled Z. What I want you to do is to pick out any two of the three pictures which go together, belong together, or are related in any way. Then you would write the letters of the two you have chosen over to the left on your answer sheet, like this:"

Have a model on the blackboard and write XY on it.

"Now, for what reason could X and Y be chosen as a pair?"

Elicit about two reasons.

"O.K., good. Opposite XY, write in the reason for your choice of X and Y as a pair. Write this pair in on the example space on your answer sheet."

Wait. Write in on blackboard.

"Now, you could also choose other pairs. What, for example?"

Elicit other pairs and reasons.
Write in on blackboard.

"There are also some ways to put these together in pairs that <u>don't</u> follow the rules. For example, you could say X and Y are furniture, Y and Z are furniture, and X and Z are furniture; but these reasons don't exclude the third picture. The reason for choosing a pair must exclude the third picture. The pairs and reasons we have on the board do follow this rule — the exclude the picture not chosen."

Demonstrate with examples on the board.
Ask for questions on this.

"You will be using a book of pictures like this."

Hold up SCST book and page through for them to see.

"For each page, what you will do will be to put down as many pairs as you can that go together, belong together, or are related in any way, and give your reason for each chosen pair. Continue giving pairs and reasons until time is called for that page of pictures. If you run out of pairs and reasons before time is called, just wait until you are told to go on to the next page. You will have a minute for each page, so you won't be rushed. Put down all the pairs and reasons that you see — don't reject one just because it seems obvious — it may not be obvious to someone else. It's best to put down the pairs and reasons as they occur to you because if you gather all your ideas and then start to write them down, you're liable to run out of time when you still have ideas."

Ask for questions so far.

"Remember, there are no right or wrong answers. We are interested in the different ways that people see familiar things. Some of you may see many things on a page, some of you only a few. Some pages have many imbedded in them, some have only a few. Just put down what you can think of. Don't worry about spelling or neatness. If you want to change something, simply cross out the old and write in the new. Always keep the reason right across from the letters you choose, so I'll know what reason goes with what two letters."

"This isn't a test of speed, or of productivity. Quality is more important in your answers than sheer quantity, so if you find yourself giving answers

that are desperate attempts to fill in the time, just stop and wait until the next page."

Hand out booklets and say while handing out:

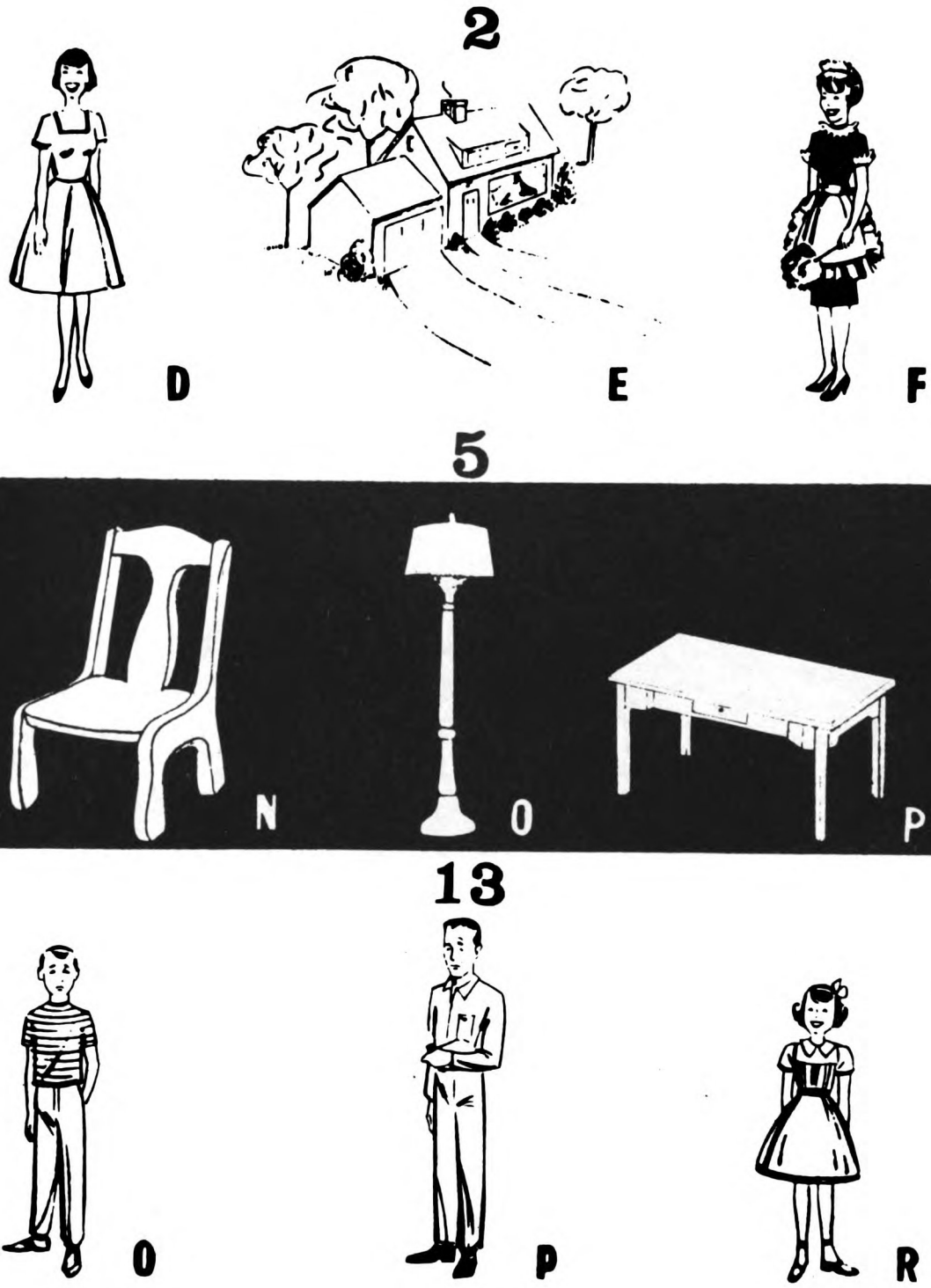
"Don't open these until I tell you, please."

"O.K., turn the page on your answer sheet . . . and open the booklet . . . and begin on number one."

At the end of 60 seconds, say:

"Turn to number two, please."

Continue timing through number 35.



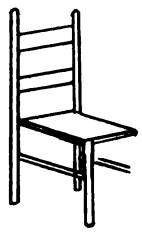
SCST Sample Items

ANSWER SHEET

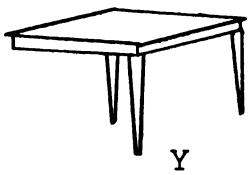
NAME_____AGE_____STUDENT NUMBER_____

LOCAL ADDRESS_____TELEPHONE_____

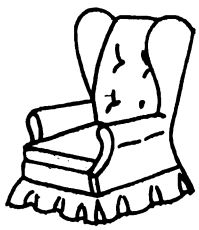
MAJOR FIELD_____GRADE POINT AVERAGE_____



X



Y



Z

We know that people see groups of familiar things like these in different ways. None of these ways is better or worse than another, but the differences between people do exist, just as there are differences in the ways people think. This test examines the way you see groups of familiar things.

EXAMPLE

Pairs Reasons

Put down as many pairs as you can that go together, belong together, or are related in any way, and give your reason for each chosen pair. Continue giving pairs and reasons until time is called for that page of pictures. If you run out of pairs and reasons before time is called, wait until you are told to go on to the next page. You will have a minute for each page, so you will not be rushed. Put down all the pairs that you see — don't reject a pair just because it seems obvious — it may not be obvious to someone else. It is best to put down the pairs and reasons as they occur to you.

Page	Pair	Reason
1.		
2.		
3.		
4.		

SCST SCORING MANUAL — FORMAL COGNITIVE CATEGORIES

DESCRIPTIVE. Stimulus-centered

Basis of similarity in physical attributes or properties (shape)
Description of physical attributes (legs)
Discrete age categories (old people, children)
Sex as basis for grouping (female, women)
Age and sex together
Physical attributes, for example structural material (made of wood)

RELATIONAL. Concepts used to tie together the two

Theme or story: interaction is implied. (She's going to shoot him)
Geographical: instances are related in space (they swim in water, grow above ground, found in circuses)
Comparison between the two (older-younger)
Interdependent use or function (ham + bread = sandwich)
Understood relationship between figures (mother-son)
Both related to some social event or institution (armed forces, fire-fighting)

CATEGORICAL. Representatives of a stated total class. The two are not interdependent, and the class is not based on observable characteristics

Common behavior or function (tools for building, to lie on)
Participles of action (people all doing the same thing)
Inherent common role class, or attribute (animals, violence)
Moral or aesthetic judgment (good, ugly)
Common affect state (unhappy)
Common locale (jungle animals)
Class naming (chairs, buildings, invalids)
Selection of an unseen or presumed constituent part. Anything you know about the objects that is not in the actual picture. (seeds, color, they have fur)
Intrinsic worth (these are useful, good for you)
Plays on words, or puns (man and saw both have teeth)

APPENDIX B

School-related Task Instrument,
Parts I and II

QUESTION SET I

Consider yourself in the following situation:

In a class you have been assigned a paper on some suggested topic. Your assignment is not to write on the whole topic, but instead you are to write on only one part, or one aspect, of the suggested topic.

Thus, before you write, you must first decide what aspect of the suggested topic you will choose to write on.

On the next pages are listed some topics that could be suggested in an assignment like this. With each topic are listed two or three alternative choices for the subject of your paper.

For each suggested topic, please choose which of the alternatives is most like the way you would write such a paper.

EXAMPLE

The behavior of large groups

1. Mob behavior in emergencies such as fire
2. Orderly demonstration contrasted with disorderly riot
3. Behavior of people in small groups compared with their large-group behavior

1 2 3 4 5

This person has marked his answer sheet to indicate that if he were to write on the suggested topic "The behavior of large groups," he would choose to write on orderly demonstrations in contrast with disorderly riots.

Go on to the next page...

Of course most of the time a decision like this is influenced partly by your familiarity with the choices offered, and by the possible difficulty of the choices.

Assume in this case that you have enough time and resources to deal thoroughly and adequately with all of the choices, so familiarity and difficulty are not major problems for you.

You also may find that all the alternatives are equally appealing, or that you wouldn't prefer any of them. You must make a choice, however, so choose the most appropriate alternative you can.

When you have chosen the alternative most like the way you would write such a paper, indicate your choice on the answer sheet.

QUESTION SET I

Directions: Indicate on the answer sheet which alternative is most like the way you would write this "paper."

1. Contagious disease
    1. Describe a major disease, for example cholera, Hansen's disease, or smallpox
    2. Applying the principles of contagion to prevention of contagious disease

2. Medieval society
    1. The relationship of the church to other segments of the medieval society
    2. The feudal system
    3. The influence of the feudal system on subsequent societies

3. The Emancipation Proclamation
    1. What the Proclamation implies about Lincoln's beliefs and policies
    2. The text of the Proclamation and the events surrounding its signing
    3. Ties between the Proclamation and other events in the Civil War years

4. Flight
    1. The importance of flight in modern military operations
    2. The principles of flight from an aircraft carrier
    3. Flight as an important means of commercial transportation

5. Nutrition
    1. Differences between diets in different cultures
    2. The influence of diet on general health

6. Discovery of gold in California in 1849
    1. How the discovery of gold affected the American economy
    2. The "Gold Rush" immediately following the discovery of gold

7. Weather
    1. The climatic conditions producing tornadoes
    2. Weather as an influence on people's temperments

8. Modern art
    1. Contemporary trends in modern art
    2. Modern art in comparison with the painting styles of other periods
    3. Determining contemporary artists' philosophies of man from their work

9. George Washington
    1. George Washington the person, in comparison with other well-known presidents
    2. George Washington — a description of his many roles as plantation owner, general, president

10. Isolation
    1. Isolationism as a national policy
    2. Students' feelings of isolation and alienation
    3. The importance of isolation in the control of scientific research

11. Water
    1. Water transportation as a factor in the progress of world civilization
    2. The water pollution problem

12. The Greek heritage in modern society
    1. Some examples — in art, philosophy, architecture
    2. Ancient Greece and modern America: similarities in architecture, government, sculpture

13. The fall of the Bastille
    1. The effect of the battle on the French Revolution
    2. Social and political reasons for this event
    3. Characteristics of the persons who participated in the battle

14. The Engligh language
    1. The form of the English language in comparison with the Romance and Germanic languages
    2. Possible uses of English as an international language

15. Heredity
    1. The interrelationship of heredity and environmental influences in determining intelligence, sociability, etc.
    2. Applying present knowledge of the hereditary process for controlling heredity
    3. Present knowledge of the hereditary process — chromosomes, genes, and DNA

16. Ancient Egyptian art
    1. The relationship of the Egyptians' art to their religion
    2. The forms and types of art in ancient Egypt
    3. The impact of Egyptian art on later developments in the history of art

17. Shakespearean drama
    1. Shakespeare in comparison with other major playwrights
    2. The intricate technical processes of staging Shakespearean drama in a modern theater

18. Religious architecture
    1. Architecture as a tangible expression of a theological view
    2. Some famous examples of religious architecture — for example St. Peter's in Rome, Westminster Abbey in London, the Blue Mosque in Istanbul

19. Atomic energy
    1. The development of the atom bomb in the early 1940's
    2. Current research with nuclear energy
    3. Peaceful uses of atomic energy

20. The American court system
    1. The structure of the American court system
    2. How Supreme Court decisions have influenced policies and decisions in lower courts
    3. The interrelationship of politics and the courts in the United States

21. Communication
    1. Ethical problems in radio or television treatment of controversial topics
    2. Recent development and growth of F. M. broadcasting
    3. The F. C. C. and its control over radio

22. Hemingway
    1. Hemingway's life as soldier, sportsman, writer
    2. Hemingway's early work compared with his later writing
    3. How Hemingway's war experiences influenced his philosophies

23. Earthquakes
    1. The effect of stresses in the earth's surface on the occurrance of earthquakes
    2. Geological formations characteristic of earthquake belts

24. Minerals
    1. The mineral composition of granite
    2. The influence of weathering processes on the structure of various minerals
    3. Comparing minerals on Mohs' Scale of Hardness

25. The Cuban crisis
    1. Causes of the Cuban crisis
    2. The critical events of September 1962
    3. U. S. prestige abroad before and after the Cuban crisis

26. Creativity
    1. The interrelationship of creativity and intelligence
    2. The importance of the creative mind in scientific research
    3. The role of childhood environment in developing creativity

27. International economics
    1. The United Nations programs involving economic development
    2. Predicting the economic future of underdeveloped nations
    3. Differences between economic policies of developed and underdeveloped nations

28. Mark Twain
    1. Mark Twain the storyteller in contrast with Mark Twain the bitter satirist
    2. The influence of Twain's Missouri childhood upon his writing

29. Air
    1. Composition of air in urban areas compared with rural areas
    2. How industrialization influences the composition of air
    3. Gaseous composition of the atmosphere

30. Biological research
    1. New technical tools of biological research
    2. Similarities and differences in the biologist's techniques and those of the physicist
    3. How the biologist's scientific attitude affects his research results

31. Karl Marx's philosophies
    1. The Marxist theory of economic and social history
    2. Marxian communist theory compared with contemporary Russian communist theory
    3. The influence of the original 19th century Marxian theories upon contemporary social thought

32. The Magna Charta
    1. The effect this document had on our Bill of Rights
    2. The changes in English political structure brought about by the document
    3. The history of Prince John's signing of the Magna Charta

33. Technology
    1. The most important technological advances that have occurred since 1950
    2. Technological advances made in wartime compared with those made in times of peace
    3. Possible consequences of technological cooperation among nations

34. Musical shows
    1. The differences between stage and motion picture production of musical shows
    2. The influence of musical vaudeville on modern musicals

35. Stress
    1. Stress as a contributor to mental illness
    2. Allowing for stress in designing buildings
    3. Interpersonal stresses in family relations

36. Jazz
    1. Differences among several important jazz forms, such as dixieland, blues, modern jazz
    2. How African and American Negto music contributed to jazz

37. Digestion
    1. The interrelationship of digestion and such psychological factors as nervousness
    2. The influence of the digestive processes on general health
    3. The process of digestion in the human body

38. The contemporary novel
    1. Similarities between modern novels and other contemporary writing — poetry, journalism, for example
    2. The influence of social issues on modern writers

39. Gravity
    1. Techniques for escaping the earth's gravitational pull
    2. The problems brought on by weightlessness in space travel

40. The decline of the Roman empire
    1. The reasons commonly suggested for the decline and fall of Rome
    2. The similarities between the social-political character in modern America and Rome's social-political structure prior to the decline of the empire

41. The "new math" in our schools
    1. What is the "new math"?
    2. How does the "new math" differ from traditional mathematics?

42. The Protestant Reformation
    1. Persons playing an important role in the Reformation, and their contributions
    2. Religious views arising in the Reformation in comparison with contemporary Protestant views

43. Labor unions
    1. History of unions in America — their goals, formation, accomplishments
    2. Industrial production and worker satisfaction in unionized versus nonunionized companies
    3. The influence of unions on the contemporary American economy

44. Cross-cultural relations
    1. Observing cultures by participating in the activities of the cultural groups
    2. Studying cross-cultural relations through comparative case studies
    3. Miscommunication as a contributor to political misunderstanding

45. William Faulkner's South
    1. The Southern society in which Faulkner lived
    2. The influence of Southern society on Faulkner's works
    3. The South as portrayed by Faulkner in comparison with the South of 1966

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Go on now to the directions for Question Set II and then continue with that section.

QUESTION SET II

Read these directions very carefully:

We have selected several areas in which most students study. For each area are listed things to be learned, information presented, or topics to be covered.

Assume that you are enrolled in courses in these areas, and therefore are required to learn about what is listed.

The things to learn about are listed in groups. For each group, you are to decide which item you would be most interested in learning about. Again, your choice in each group should not be based on familiarity, or on possible difficulty, but instead should reflect your interests.

EXAMPLE

1. The length of the Panama Canal
2. The influence of terrain upon farming procedures
3. The location of major United States timber resources

1 2 3 4 5

This person has marked his answer to indicate that he would be most interested in learning about the location of major United States timber resources.

Since you are already a specialist in your academic major area, you will find that some groups of items are very familiar to you while others are very unfamiliar. Deal as competently as you can with the unfamiliar, and in the familiar areas don't let your specialized knowledge keep you from choosing on the basis of your interests.

When you have chosen from a group the item in that group that you would be most interested in learning about, indicate your choice on the answer sheet.

Don't hesitate to ask a question if these directions are not clear.

Go on to the next page...

QUESTION SET II

Directions: Indicate on the answer sheet which item of each group you would most like to learn about. Continue on the same answer sheet.

A. Social Sciences

46.
1. Differences in job satisfaction of persons in various occupational classes
2. The incomes of various classes of occupations in the U.S. — unskilled, professional, technical, etc.

47.
1. How government manipulation of the economy affects the average consumer-taxpayer
2. Economic principles involved in the law of supply and demand
3. Senate investigations into consumer problems and misrepresentative advertising

48.
1. Characteristics of the pioneers who went west in the mid-19th century
2. The influence of legislation such as the Homestead Act upon the western population migration in the United States

49.
1. The world's major seaports
2. The role of seaports in the national economy

50.
1. The steps involved in amending the United States Constitution
2. The process by which new states are admitted to the United States
3. The procedure for changing one's voter registration

51.
1. The influence of childhood environment on intelligence
2. The relationship between I.Q. and scholastic success
3. I.Q. — what it is, and what it means

52.
1. Predicting birth, marriage, divorce rates from present trends
2. Current birth, marriage, divorce rates in the Northeastern, Southern, Midwestern, and Western United States
3. Marriage and divorce rate differences in wartime and peacetime

53.
1. Comparison of the World War I Allied Powers with the Central Powers in economic strength, militia, political stability
2. The political situations leading to the First World War

54.
1. Diagnosing mental illness
2. Symptoms differentiating psychotic (insane) behavior from neurotic behavior

55.
1. Ages at which children walk, talk, understand numbers, etc.
2. Predicting mental ability from events in early childhood
3. The social development of children with and without nursery school experience

56.
1. Applying international law to current international problems
2. The provisions of the present code of international law

57.
1. Differences between the U.S. and other western nations on policy toward Red China
2. The official U.S. position regarding Red China

58.
1. Long-range estimation of family income and expenses
2. How to budget family income for rent, food, clothing, recreation, etc.

59.
1. Oil as an important influence on the development of some nations
2. The world's major oil deposits — their location, production, ownership, etc.

60.
1. Possible consequences of DeGaulle's desire for independence from the other western nations
2. France's position in comparison with that of various other European nations regarding NATO, the Common Market, etc.

61.
1. The 1929 Depression as one of the major factors leading to World War II
2. The similarities and differences between inflation prior to the 1929 Depression and inflation in the present American economy

62.
1. Ethical problems of the psychologist's dealings with people
2. Tests used by psychologists for diagnosis
3. Psychiatrists, psychologists, and psychoanalysists — who they are and what they do

63.
1. The branches of the United Nations and their purposes, activities, accomplishments
2. The similarities and differences between the United Nations and the post-World War I League of Nations

B. Sciences

64.
1. The chemical composition of basic organic compounds such as fats, proteins, carbohydrates
2. Comparisons of the functions of fats, carbohydrates, and proteins in plants and animals
3. The principles of chemical change in bodily processes

65.
1. The composition of blood — plasma, white and red cells, etc.
2. Using information from a blood count to diagnose disease

66.
1. Developing scientific interests and encouraging scientific talent in youngsters
2. Government support for school science programs
3. The role of industry in supporting scientific research

67.
1. Similarities and differences between natural sugar and artificial sweetner
2. How sugar is produced from sugar cane or sugar beets
3. The effects of sugar deprivation upon the body

68.
1. Comparing the physical properties of the various planets in our solar system
2. Predicting from the actions of other planets the discovery of Uranus

69.
1. The names of the elements in the halide group
2. Using information about chlorine to predict how iodine would react chemically

70.
1. The influence of glacial movement on soils for agriculture
2. Characteristics of the world's major glacial areas
3. Influence of glacial movement on climate

71.
1. Comparing penicillin's uses and effectiveness with that of more recently developed antibiotics
2. Penicillin — its discovery, development, chemical structure, uses
3. The principles of scientific experimentation leading to the discovery of penicillin

72.
1. Fluorination of water as a form of preventive medicine
2. Moral arguments for and against fluorination of water

73.
1. The operation of a jet engine
2. Comparison of jet with reciprocating engines — efficiency, uses, etc.

74.
1. The influence of developments in computers upon the way mathematics can be taught to children
2. How the computer's operations compare with those of the human mind.

75.
1. Characteristics of the solar system
2. Theories about the composition of the moon
3. Possibilities of life in other solar systems

76.
1. The influence of pressure upon solubilities of gasses
2. The interrelationship of pressure and temperature as factors in solubility
3. The nature and purpose of various solvents

77.
1. A comparison of electrical and neural systems of transmitting impulses
2. The effects of chemical factors on the transmission of neural impulses
3. The elements and structure of the nervous system

78.
1. Artificial synthesis of hormones
2. Chemical composition of antibiotic drugs

79.
1. The effects of a catalyst in chemical reactions
2. Factors distinguishing organic substances from inorganic substances

80.
1. The effects of changing atmospheric density on hearing
2. The differences between man's hearing and that of other animals

81.
1. Chemical analyses as part of crime detection
2. Chemical substances in the household, for example baking soda, vinegar, ammonia
3. Valences, atomic weights of important chemical substances

82.
1. The procedure for converting centigrade temperature readings to fahrenheit readings
2. The interaction of temperature, boiling point, and pressure in liquids

C. Literature and the Arts

83.
1. The effects of major social upheaval (for example, war) upon artistic expression
2. Comparing artists in their portrayal of the same theme, for example war

84.
1. Differences between Greek and Roman literature
2. Evidences of Greek or Roman social philosophy in their literature

85.
1. The use of color in painting
2. Perspective as a technique in painting
3. Composition and balance in painting

86.
1. The differences, for example in subject, characterization, "message," between prose, poetry, and drama
2. Important forms of writing — for example short story, novel, drama

87.
1. Comparing 20th century semiclassical music (for example, Gershwin) with classical music
2. Biographies of great musicians — Chopin, Beethoven, etc.

88.
1. 20th century American literature
2. 19th century American literature
3. 18th century American literature

89.
1. Learn about contemporary authors and their major works
2. From reading several contemporary writers, determine what the major concerns are of today's generation

90.
1. The major types of modern art — artists and their styles
2. How modern art compares with art forms of earlier historical periods

91.
1. The poet's influence on contemporary society
2. The dates and major works of recent well-known American poets, for example Robert Frost

92.
1. How modern music compares with music of other periods
2. The type of music characteristic of each major period in music history

93.
1. Medieval drama
2. Shakespearean plays
3. The modern theater

94.
1. Comparing tragedy and comedy in the ways they comment on human nature
2. Shakespeare's comedies — their plots and characters

95.
1. Applying principles of good writing to your work as a way to improve your writing
2. Using other people's good writing as a standard for judging your own written composition

96.
1. Differences between writers' and historians' views of contemporary society
2. The effects of 20th century historical events upon modern literature
3. Characteristics of 20th century American literature

97.
1. Mechanics of music — tones, melody, counterpoint
2. Periods of music — baroque, romantic
3. Forms of music — symphony, etude, sonata

98.
1. The influence of literary criticism on the popularity of new novels
2. Differences between literary criticism and creative writing

99.
1. Read writers' biographies and then their writing to see how their lives influence the fiction they write
2. Read the biographies of some of the more interesting writers, like Hemingway

***

Please hand in these pages and get the one short page to be done before you go.