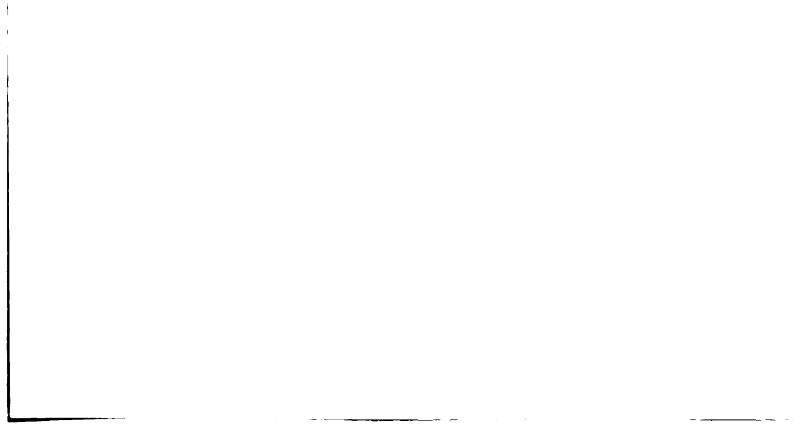
AN EXPLORATION OF EDUCATIONAL COGNITIVE STYLES AS A VEHICLE FOR DETERMINING POTENTIAL SUCCESS OF COMMUNITY COLLEGE STUDENTS WITHIN SELECTED OCCUPATIONAL CURRICULA

Thesis for the Degree of Ph. D.
MICHIGAN STATE UNIVERSITY
Marion Miller Rice
1973



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ABSTRACT

AN EXPLORATION OF EDUCATIONAL COGNITIVE STYLES AS A VEHICLE FOR DETERMINING POTENTIAL SUCCESS OF COMMUNITY COLLEGE STUDENTS WITHIN SELECTED OCCUPATIONAL CURRICULA

By

Marion Miller Rice

The major purpose of this study was to determine if there were any significant cognitive style differences between the selected ideal students and the selected non-ideal students in three curricula:

1) Law Enforcement
2) Cosmetology
3) Business Administration

In addition, it was the purpose of this study to further determine the degree of congruence between the collective cognitive style of the theoretical ideal student as judged by instructors within the Collective Cognitive Style rating scale and the actual tested collective profile as measured by the cognitive style test battery for the selected ideal and non-ideal student groups within the respective curricula. The defined population for the study was composed of instructors and second year students within the Business Administration, Law Enforcement and Cosmetology curricula at Oakland Community College, a comprehensive, multi-campus community college located in the Metropolitan Detroit area of

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Michigan. Data was collected by employing all the instructors within each curriculum and the class lists of all students within the given curricula. The instrumentalities employed in the study included; (a) the instruments associated with the cognitive style testing, and the survey of instructor identification of the theoretical ideal student and (b) the techniques of informal interviewing associated with explaining and clarifying the performance requested of the instructors regarding the defining of a "theoretical ideal" student, and the identification of actual enrolled students as "ideal" or "non-ideal" types, respectively.

Results of the study indicate that instructors are not highly discriminating between the selected ideal and selected non-ideal student groups for the following empirically derived observations:

a. the large quantity of elements held in common by the selected ideal and selected non-ideal

b. the small quantity of elements that are unique to the selected ideal and the selected non-ideal student groups

It had been anticipated that the selected ideal student groups would differ from the selected non-ideal groups in obvious differentiations and also the number of differences.

The findings also indicated that grade point averages discriminate between the ideal and non-ideal students within the Business Administration and Law Enforcement curriculum. It should be noted, however, that the use of grade point averages as verifiers or discriminators would be dependent on selected occupational curricula for the following reasons:

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a. immediacy of employment upon completion of the occupational curriculum

b. continuity of specific skills activities from the classroom to the entry step of the occupation

c. the professional skills classes are in greater proportion that the academic classes within the occupational curricula

Further exploration is recommended in the use of grade point averages as discriminators within the two-year technical areas for two reasons: First, there is greater probability of intensive interaction between students and teachers; and second, the instructor feels an immediate responsibility for placing the student in the employment field. It is further recommended that the grade point averages computed be based on technical classes only and should not include general education classes.

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By

Marion Miller Rice

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

College of Education

1973

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TO MY PARENTS

Jack and Anna Miller

This thesis is dedicated to you for your constant and willing sacrifices throughout my life so that I might become an educated citizen with an appreciation for the rights and responsibilities associated with that privilege.

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ACKNOWLEDGEMENTS

No one is more aware, than I, of the many people who helped me develop and complete this study. The guidance and support of the writer's major advisor, Dr. Max Raines has been of immeasurable value throughout the study. The helpful suggestions and "faith" of Dr. Perry Lanier, Dr. Mel Buschman and Dr. Keith Groty, the members of my committee are held in gratitude.

Appreciation and thanks are extended to Bruce Martin, Director of Data Processing at Oakland Community College for his technical advice, Dr. George Mitchell for his demanding professional expectations, to Mrs. Eugenia Klingler for her assistance and aid whenever I needed it and to Mr. Joseph Harman of the Auburn Hills LRC for his willing and helpful "searches." My thanks also go to the Auburn Hills Counseling Department, to the classified staff, to Miss Gwendolyn Smith for her assistance, to Mr. Arthur Batten for his "graphic" contributions, to Mr. Euth Cocoves for his professional consultation, and to Mrs. Sylvia Pascouau for her help and ready "smile."

A special expression of gratitude goes to Dr. Joseph Hill for his infinite patience and continuing support of graduate students who need him.

The model of our behavior,

not our radical arguments,

is what is most persuasive.

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INTRODUCTION

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BACKGROUND OF THE STUDY

INTRODUCTION

This chapter deals with the background of the study, the purpose of the study, the significance of the study, the questions to be answered, the assumptions underlying the study, and the definition of key terms. A section of this chapter has been devoted to each of the topics identified herein.

BACKGROUND OF THE STUDY

Counselors for many years have attempted to determine what personal and environmental factors contribute to vocational choice and are conducive to vocational achievement. Traditionally, in the field of guidance, it has been popular to interpret a person's scores on vocational interest inventories and his choice of vocation as a function of his "vocational interests," as if these interests were different from or independent of personality. A long adherence to this concept produced an independent literature known as "interest measurement." The work of Berdie, Strong, Darley and Hagenah, and Super and Crites epitomizes the view that interest inventories measure interests, vocational choices and vocational preferences.

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Holland indicated that "the growing knowledge about the personal and environmental factors associated with a person's vocational choice made explicit the need for a broader conception."[1] This need became clearer in Holland's research study in 1963 that indicated vocational choices are influenced by personality traits, responses to certain projective devices, values and goals, attitudes of parents and many other personal and situational forces.[2] Bordin states "interest inventory scores are measures of self-concept."[3] Super and Crites[4] state "vocational choice is developmental." Holland[5] also says:

> If vocational preference is construed as an expression of personality, then "vocational interests represent the expression of personality in work, hobbies, recreational activities, and the classroom.

The validity of vocational interest inventories is predicated on the assumption that there are vocational stereotypes. Not only do people agree upon the stereotypes for a given vocation, but also scientific evidence gives support to some aspects of the stereotypes.

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[1]John L. Holland, The Psychology of Vocational Choice (Waltham, Massachusetts Blaisdell Publishing Company, 1966), p. 2.

[2]John L. Holland, "Some Explorations of a Theory of Vocational Choice 1. One and Two Year Longitudinal Studies." Psychological Monographs, 1962, 76, 26 (Whole No. 545).

[3]E. S. Bordin, "A Theory of Interests As Dynamic Phenomena." Educational and Psychological Measurement, 1943, 3, p. 49.

[4]Super, D. E. J. O. Crites, R. C. Hummel, H. P. Moser, et al. Vocational Development. (New York: Teachers College, Columbia University, Bureau of Publications, 1957).

[5]John L. Holland, Op. Cit., p. 3.

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Studies related to this position have been contributed by Beardslee and O'Dowd,[6] Grunes,[7] Holland,[8] Roe,[9] and Super.[10]

If a person enters a given vocation because of his particular personality and history, it would seem to follow that each vocation attracts and retains people with similar personalities. This assumption is supported by Roe.[11] Would it also follow that definitive vocational curricula in a community college would retain and provide a success experience to those students who are a prototype expectation of the instructors in a given curriculum?

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[6]D. C. Beardslee and D. D. O'Dowd. College Student Images of A Selected Group of Professions and Occupations. Wesleyan University, (Middletown, Connecticut, 1960)

[7]W. F. Grunes, "Looking at Occupations," Journal of Abnormal and Social Psychology, 1957, 54, 86-92.

[8]John L. Holland, "A Classification for Occupations in Terms of Personality and Intelligence." American Psychologist, 1959, 14, 476.

[9]Anne Roe. The Psychology of Occupations. (New York: Wiley, 1956).

[10]D. E. Super and P. B. Bachrach, Scientific Careers and Vocational Development Theory. (New York: Teachers College, Columbia University, Bureau of Publications, 1957).

[11]Anne Roe, "Early Determinants of Vocational Choice." Journal of Counseling Psychology, 1957, 4, 212-217.

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Robert Linton first publicized the term "role" and defined it as "the behavioral enacting of the patterned expectations attributed to a particular position in a social system."[12] In a study of teacher expectations, Watson[13] states:

> Role theory would imply that successful goal attainment in the classroom would be related to at least three variables: 1) the means for achieving these goals which are employed by the teachers, 2) the student's perception of the goals to be attained; and 3) the student's acceptance or rejection of the goals to be attained. Past research has focused on the relation between the means for achieving and goal attainment. Seemingly, these studies have assumed that teacher identification and implementation of the means for achieving particular goals are the only necessary and sufficient facets of goal attainment, and that this attainment should be measurable after relatively short instructional periods. However, the success of achieving such goals is logically and psychologically dependent on adequate communication of the goals to the student and his acceptance of them.

It would seem, then, that the questions generally researched in curriculum studies might be premature ones in that teacher expectations and student behaviors as perceived by both teachers and students should be determined first.

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[12] Robert Linton, The Study of Man, (New York: Appleton-Century, 1936).

[13] Elizabeth Watson, "Dimensions of Teacher Expectations and Student Behavior in High School of Social Studies Classes." The Journal of Educational Research, Vol. 66, No. 2 October 1972.

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[15]Ibid, p.

[16]Ibid, p.

The sphere of influence that the teacher exerts is not always a conscious one. According to Merton,[14] in his concept "Prototypes for Imitation" he states that the person exerting influence is not aware that interaction has resulted in modification of the others' subsequent behavior. The instructor's influence can evoke a self-fulfilling prophesy.

A student who is not capable of modeling after the revealed prototype expectation of an instructor could become convinced that he is destined to fail. The anxious student devotes more time to worry than to study and then turns in a failing exam. Merton, examines this when he states:

> The self-fulfilling prophecy is, in the beginning, a false definition of the situation evoking a new behavior which makes the originally false conception come true. The specious validity of the self-fulfilling prophecy perpetuates a reign of error. For the prophet will cite the actual course of events of proof that he was right from the very beginning.[15]

Merton also refers to people "talking-past-each-other." He states:[16]

> Often, the basic agreement in the analysis of a situation is plentifully obscured by the basic disagreement in the evaluation of that situation. As a result, it is erroneously assumed that the opponents differ in their cognitive procedures and findings, whereas they differ only in their sets of values.

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[14]Robert Merton, Social Theory and Social Structure, (rev. ed.; New York: The Free Press, 1964), p. 419.

[15]Ibid, p. 423.

[16]Ibid, p. 45.

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Much of vocational development and choice theory have emphasized that young adults "know" what they want to do--what their career goals will be. However, little consideration has been given to those students in higher education who "know" what they want to do and then either change their mind or fail before completion of their "chosen" program. This writer believes that while career decision-making is critical in the counseling process, the possibility of an "aborted" career choice must also be considered by the counselor. Counselors must be aware of the real world as well as the theoretical world and part of that real world is the institutional environment which either nurtures the development of a student or adapts him to its own needs and goals. Classroom expectations or "press" can contribute to the success or failure of an occupational choice.

The preceding section dealing with interest measurement, vocational choice, and role theory has been discussed for their relevancy to the educational science known as cognitive style. The investigator believes that cognitive style can be an index to the measurement of curriculum role expectation.

One of the significant approaches to designs for the establishment of a conceptual framework for education in which the classroom environmental press may be described and defined is that of the "educational sciences." Traditional approaches to investigations of cognitive behaviors have dealt mainly with concept formation. These types of studies have tended to be limited to such considerations as: What are concepts? How are they attained? How are they learned? In effect, these efforts have been directed toward investigations of various

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ramifications of what might be termed "concept learning." Investigators, involved in these types of studies, however, have not examined cognitive functions in the context of cognition as a facet of personality. Witkin,[17] for example, has advanced the notion that the phenomenon described as cognitive style is a type of personality construct expressed in the interaction between perceptual (cognitive) response systems and antecedent conditions in the life history of the subject (person). Dr. Joseph E. Hill[18] and his associates at Wayne State University, Oakland Community College, and elsewhere have developed a conceptual framework in the form of the Educational Sciences and have defined the various "sciences" comprising this structure. In their efforts to develop the educational sciences, Hill and his associates consider education as the process of searching for meaning, i.e. understanding and knowledge. The formal and institutionalized process of searching for meaning is the configuration commonly called "school," the purpose of which is to help the individual in the search for meaning in the formal structures of the fundamental disciplines, in the applied or derived fields of knowledge, and in the areas of general information. Informal or self-education can and does occur in almost any setting or context, and a large part of the behavior of members of formal organizations is a process of searching for meaning.

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[17]H. A. Witkin, "Individual Differences in Ease of Perception of Imbedded Figures" Journal of Personality. Vol. 19, 1950, p. 1-15.

[18]Joseph A. Hill, "An Outline of the Educational Sciences" (an unpublished manuscript, Wayne State University, July, 1968), p. 1.

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[19] Ibid.

[20] Ibid.

The seven educational sciences include the following:

1) symbols and their meaning

2) cultural determinants of the meaning of symbols

3) modalities of inference

4) biochemical and electrophysiological aspects of the memory function

5) cognitive style

6) administrative style, counseling style, and teaching style

7) systemic analysis--decision-making

According to Hill each body of information includes "factual descriptions, concepts, generalizations and principles which apply to certain aspects of education, and therefore can be considered as a science in its own right."[19]

Through the use of cognitive style "maps" one can inventory the manner in which a person derives meaning and acquires knowledge. Specifically one can determine a person's major and minor orientations in the use of theoretical and qualitative symbols as well as how the person is influenced by his family, his associates, as well as his own individuality in his efforts to derive meaning and acquire knowledge. Another component included in a person's cognitive style are the modalities of inference or reasoning patterns most generally employed by him in the process of deriving meaning or acquiring knowledge from his environment and personal experiences."[20]

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[19] Ibid.

[20] Ibid.

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[21] Ibid.

The use of the educational science known as "cognitive style"[21] can therefore be a means for examining methods of determining potential success of students within certain occupational curricula. There is a need for such a study.

PURPOSE OF THE STUDY

The purpose of the study is to determine if there are any significant cognitive style differences between the selected ideal students (30 credits or more) and the selected non-ideal students in three curricula:

1) Law Enforcement
2) Cosmetology
3) Business Administration

In addition, it is the purpose of this study to further determine the degree of congruence between the composite theoretical ideal student as judged by instructors within the Collective Cognitive Style rating scale and the actual tested composite profile as measured by the cognitive style test battery for the selected ideal and non-ideal student within the respective curricula.

SIGNIFICANCE OF THE STUDY

The significance of the study resides fundamentally in its potential for employing the cognitive style "map" as an index to a student's success in a particular curriculum. This index, since it includes personality characteristics (Qualitative symbols--see definition of key terms) of students could be a valuable tool employed by counselors for use in

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[21] Ibid.

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self-exploration and occupational exploration. Pritchard suggests that self- exploration and occupational exploration should become more fully correlative processes.[22]

Gural[23] also states:

> There appears to exist a tendency in vocational counseling to dichtomize self-exploration and occupational exploration as independent from each other, i. e., first to construct a picture of the individual and then to turn to a consideration of vocational information in the hope of discovering a match. This kind of matching approach must be overcome. Bridges between the individual and vocational life, if they are to be psychologically meaningful, must be developed on dynamic as well as factual grounds.

The composite prototypes of the aggregate instructors within given occupational curriculum observed and matched to the cognitive styles of graduates could provide such a "bridge." This kind of information would have value in group instruction in the social psychology of careers, for the purpose of encouraging greater realism regarding the social context in which individual decisions are made.

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[22]David H. Pritchard, "The Occupational Exploration Process: Some Operational Implications," in The Psychology of Vocational Development, ed. by Robert M. Roth, David B. Hersheson, and Thomas Hilliard (Boston: Allyn and Bacon, Inc. 1970), p. 23.

[23]James R. Gural, "A Cognitive Style Approach to the Reconceptualization of a Curriculum for Vocational Guidance and Counseling" (unpublished doctoral dissertation, Wayne State University, 1972.

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Super and Bachrach[24] state:

> The classical trait emphasis becomes less appropriate in the study of vocational development in early and mature adulthood, as the variables normally stressed by the personality approach become prepotent, while social variables continue to exert themselves as strongly as ever at these stages.

An instrument that can provide some insight into the influence of instructor attitudes and expectations on the vocational development of students could provide content for in-service training programs within the instructional areas. Instructor self-awareness of their role expectations could have a direct implication in determining classroom objectives. The most difficult task faced by the educational technologist is the introduction of behavioral objectives to the classroom. To many teachers, "technology" smacks of mechanization, dehumanization, and automatism. Their claims to knowledge about instruction stem from what they perceive as a "humanistic" position as opposed to a "technological" stance. But why should the two be dicodomized? If there are instructor expectations other than those outlined in a textbook or a syllabus, why are they not displayed as objectives of the course? A cult of personality pervades the schools. Students seek information about the instructor's personality when scheduling classes as well as the course content.

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[24]D. E. Super and P. B. Bachrach, Scientific Careers and Vocational Development Theory (New York: Bureau of Publications, Teachers College, Columbia University, 1957).

According to Cohen:[25]

> The value that might be ascribed to contact with a faculty member may well be the most important thing the college has to offer. That point is not a contention. What is unfortunate is that the "looking inward" on the part of each instructor stands in the way of genuine assessment of this effect on the students. Who can attempt to measure his own impact, let alone the impact of his college? Many instructors see themselves as the raison d' etre for institutional existence. The fact that instructors fail to perceive the usefulness of objectives even in the colleges where they have been writing them for years may relate to their feelings of self-centeredness. A full commitment to the use of objectives demands that the faculty attend to student learning as its prime consideration.

Inservice training sessions for instructors can provide awareness of personal biases or "self-centeredness" and its influence on the potential learning success of students. Cohen continues:[26]

> Instructors must be made aware of the influence of their unstated objectives on the learning achievements of their students.

Studies of teacher behavior have undeniable value in the design of teacher-training, inservice training, curriculum development and program evaluation.

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[25]Arthur M. Cohen, "Technology: Thee or Me? Behavioral Objectives and the College Teacher." Educational Technology, November 1970.

[26]Ibid.

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In a study by Cohen,[27] she states:

> Researchers of teaching effectiveness need to make attempts to control the effects of key factors which also affect learning; also they need to cut down on teacher variability due to idiosyncratic differences in style. I should turn at this point and make a plea for brilliant new theory capable of accouting for all the psychological and social complexities of the classroom--the long awaited theory of teaching. There are people who think such theories can be created, but I am not one of them. Teaching desperately needs analysis into more abstract components and so do teaching tasks. We need theories which are sufficiently simple so that ideas for manipulation of features of the classroom are actually derivable from the basic propositions.

This researcher feels that the identification of a curriculum prototype exemplifying the teacher expectations could provide positive manipulation of the classroom environment. Educators could use "expectation" training to manipulate the prototype expectations and actual student characteristics. Instructors could redesign the task or objectives of the classroom so that students could display a broader range of talent for evaluation and demonstrate appropriate prototype characteristics.

In summary, the significance of this study lies in its attempt to explore the factors within the educational environment that have a bearing upon the development of vocational attitudes and successful completion of vocational programs. Factors such as these have implications for counseling, instruction, and administration.

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[27]Elizabeth G. Cohen, "Sociology and the Classroom: Setting the Conditions for Teacher-Student Interaction." Review of Educational Research. Fall, 1972.

QUESTIONS TO BE ANSWERED

The purpose of this study will be realized by seeking answers to the following general questions.

1. What cognitive style elements are common to the groups of theoretical ideal, selected ideal and selected non-ideal Business Administration students? What elements are unique to each of these respective groups?

2. What cognitive style elements are common to the groups of theoretical ideal, selected ideal and selected non-ideal Law Enforcement students? What elements are unique to each of these respective groups?

3. What cognitive style elements are common to the groups of theoretical ideal, selected ideal and selected non-ideal Cosmetology students? What elements are unique for these students?

4. Will the differences judged by the instructors between ideal and non-ideal students be reflected in the differences in the collective cognitive styles of those students?

5. Considered in the context of the collective cognitive styles of groups of students selected on the bases of instructor ratings, and in terms of student performance, can grade point averages be used as forms of reliability and validity verifiers of these student selection procedures within selected vocational curricula areas?

ASSUMPTIONS UNDERLYING THE STUDY

1. The reliability and validity factors of the Oakland Community College Cognitive Style test battery are sufficient to the purpose of the present exploratory study effort.

2. Expressed opinions are held opinions.

3. The following assumptions are essential to the conceptual framework for education called the Educational Sciences:

   a. Education is the process of searching for meaning.

   b. Thought is different from language.

   c. Man is a social creature with an unique capacity for deriving meaning from his environment and personal experiences through the creation and use of symbols.

   d. Not content with biological satisfaction alone, man continually seek meaning.

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DEFINITIONS OF KEY TERMS

Educational Sciences--A conceptual framework for education composed of the study of (a) symbols and their meanings (b) cultural determinants (c) modalities of inference (d) electrophysiology and biochemistry of the memory function (e) cognitive style (f) teaching style, counseling style, administration style (g) systemic analysis and decision-making.

Cognitive Style--A cartesian product G, composed of three sets, S, E, and H, where S denotes the set of elements defining symbolic orientation, E indicates the set of cultural determinants of the meaning of symbols, and H, designates the set of modalities of inference.

Collective Cognitive Style--A collection of cognitive styles identified with a particular group, i. e., math students, administrators, etc.

Prototype - Theoretical Ideal Student--These terms used interchangeable refer to a collection of cognitive style symbols that characterize a hypothetical ideal student as judged by instructor-raters.

Cognitive Style--A student's cognitive style is determined by the way he takes notice of his total surroundings--how he seeks meaning--how he becomes informed. Is he a listener or a reader? Is he concerned only with his own point of view or is he influenced in decision-making by his family or by his group associates? Does he reason more like a mathematician or social scientist?

Cognitive Style Map--A picture of the way a student derives meaning from his environment and personal experiences. Each map, like each student is different.

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Theoretical Symbols--Symbols that present to the awareness of the individual something different from that which the symbols are. Words and numbers are examples of theoretical symbols. There are four theoretical symbols on a cognitive style map:

1. Theoretical Auditory Linguistic--Ability to acquire meaning from the spoken word.
2. Theoretical Auditory Quantitative--Ability to find meaning from spoken symbols and math relationships.
3. Theoretical Visual Linguistic--Ability to find meaning from the printed word with comprehension and an understanding of grammatical usage.
4. Theoretical Visual Quantitative--Ability to acquire meaning from printed symbols and math relationships.

Qualitative Symbols--Those symbols which present and then represent to the awareness of the individual that which the symbol is. Feelings, commitments and values are some examples of the meanings conveyed by the qualitative symbols. The following are qualitative symbols:

Code Empathetic--sensitivity to the feelings of others; ability to put yourself in another's place and see things from his point of view.

Code Esthetic--ability to enjoy the beauty of an object or the pureness of an idea.

Code Ethic--commitment to a set of values, a group of principles, obligations and/or duties. This commitment need not imply morality. Both a priest and a criminal may be committed to a set of values although the "values" may be decidedly different.

Code Histrionic--ability to exhibit a deliberate behavior, or play a role to produce some particular effect on other persons. This type of person knows how to fulfill role expectations.

Code Kinesics--ability to understand and to communicate by non-linguistic functions such as facial expressions and motions of the body (e. g., smiles and gestures).

Code Kinesthetic--ability to perform motor skills, or effect muscular coordination according to a recommended or acceptable form (e. g., bowling according to form, or golfing).

Code Proxemics--ability to judge the physical and social distance that the other person would permit, between oneself and that other person.

Code Synoetics--a "realistic" personal knowledge of oneself.

Code Transactional--ability to maintain a positive communicative interaction which significantly influences the goals of the persons involved so that there are positive outcomes for both.

Code Temporal--ability to respond or behave according to time expectations imposed on an activity by members in the role-set associated with that activity.

Cultural Determinants--The following three statements indicate the degree of the influence on the meaning of symbols mediated by an individual.

Family--indicates a major family influence, or an extremely close friend.

Associates--indicates influence by colleagues, friends or persons other than those qualifying as family.

Individuality--the need of the individual to influence the meaning of symbols with his own interpretation.

Modalities of Inference--The following five statements indicate the form of inference which the person employs.

Magnitude--a form of "categorical reasoning" that utilizes norms or categorical classifications as the basis for accepting or rejecting a decision or opinion. Persons who need to define things in order to understand them reflect this form of inference.

Difference--This pattern suggests a tendency to reason in terms of one-to-one contrasts or comparisons of selected characteristics or measurements. Artists often possess this modality as to creative writers and musicians.

Relationship--This modality indicates the ability to synthesize a number of dimensions or incidents into a unified meaning, or through analysis of a situation to discover its component parts. Psychiatrists frequently employ the modality of relationships in the process of psychoanalyzing a client.

Appraisal--Is the modality of inference employed by an individual who uses all three of the modalities noted above (M. D. and R.) giving equal weight to each in his reasoning process. Individuals who employ this modality tend to analyze, question, or in effect, appraise that which is under consideration in the process of drawing a probability conclusion.

Deductive--Indicates deductive reasoning or the form of logical analysis requiring premises and a conclusion that is a necessary consequence of the process employed.

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RELATED LITERATURE

The fact that the present study focuses on exploring the relationships between instructor expectations and academic success in vocational curricula has resulted in consideration of a variety of literature. The following areas will be discussed in order to provide the informed reader an orientation to the focus of the study; (1) identity and self-concept development; (2) vocational choice; (3) classroom expectations and their impact and (4) cognitive style.

IDENTITY AND SELF-CONCEPT DEVELOPMENT

Among the problems of concern to many community college students are the decisions they must make concerning their career plans and eventual entry into the world of work. They are faced with the problem of selecting (1) a field of occupation, (2) an educational program that will prepare them for their field, and (3) an institution that will provide the opportunity for them to achieve the necessary education.

Super[1] has suggested that occupational choices are implementations of the self-concept. He postulated that the self-concept is the product of interacting heredity, physical factors, opportunity for various roles, and the extent of approval from superiors and peers. Compromises between the individual and his self-concept are made through role-playing opportunities in fantasy, counseling, school, or work.

Recent studies on the self-concept have yielded some evidence to indicate there is a positive relationship between the congruency of self and ideal-self and the achievement of successful adjustment. (Calvin and Holtzman,[2] Hanlon,[3] Holt,[4] Levy,[5] Strong and Feder[6]). These studies indicated that a high correlation between a person's appraised self and ideal-self is concomitant with successful school adjustment, successful adjustment resulting from psychotherapy, acceptance of others, and acceptance by others.

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[1]D. E. Super, "Vocational Adjustment Implementing a Self-Concept." Occupations, 1951, 30, 88-92.

[2]A. D. Calvin & W. H. Holtzman, "Adjustment and the Discrepancy Between Self-Concept and Inferred Self." J. Consult. Psychol., 1953, 17, 39-44.

[3]T. E. Hanlon, "Congruence of Self and Ideal-Self in Relation to Personality Adjustment." J. Consult. Psychol., 1954, 18, 215-218.

[4]R. R. Holt, "Accuracy of Self-Evaluation: Its Measurement and Some of Its Personalogical Correlates." J. Consult. Psychol., 1951, 15, 95-101.

[5]L. H. Levy, "The Meaning and Generality of Perceived Actual-Ideal Discrepancies." J. Consult. Psychol., 1956, 20, 396-398.

[6]D. J. Strong & D. D. Feder, "Measurements of the Self-Concept: A Critique of the Literature." J. Consult. Psychol., 1961, 8, 170-177.

A study by Anderson and Olsen[7] attempted to determine the relationship between congruence of self and ideal-self and occupational choices made by potential four-year college students and potential junior-college terminal students.

Results of this study indicated that a greater number of subjects showed a tendency to choose occupational goals above their aptitude level and in inappropriate occupational areas than the number of subjects who chose occupations below their aptitude level.

> The tendency on the part of subjects to choose occupations above their aptitude levels may be the result of the influence of their culture in which a great emphasis has been placed on the prestige and value of occupations that require college training. The tendency on the part of a number of subjects to choose occupations above their aptitude level or inappropriate occupational areas may be a result of the subjects perceptions of self. The inability of these subjects to realistically appraise their aptitudes and successfully relate them to the critical job tasks of occupations may contribute to the tendency to make inappropriate choices.

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[7] Thomas B. Anderson and LeRoy C. Olsen, "Congruence of Self and Ideal-Self and Occupational Choices." Readings in Theory and Research: The Psychology and Vocational Development, ed. by Robert M. Roth, David B. Hershenson, and Thomas Hilliard (Boston: Allyn and Bacon, Inc., 1970).

Super and Bachrach[8] also states that interests, values and capacities are integrated and attain vocational meaning through the development and reality-testing of the self-concept; that the desire to play a socially approved role which has an adequate occupational equivalent is an essential aspect of job satisfaction.

Blau, Gustand[9] and others provide the following relevant concepts:

> Choice reflects a compromise between the individual's preferences and expectations (an attempt to maximize expected value); value orientations determine the relative significance of different kinds of rewards and indeed determine what employment conditions constitute rewards; the relative significance of various choice determinants changes with successive states in the individual's life history, but also in degree of rationality and degree of discrimination in weighing alternatives pose limiting conditions on choice; and that there are inter-occupation as well as inter-individual variations in the relative significance of determinants of occupational selection.

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[8]Donald E. Super, & Paul B. Bachrach, "Scientific Careers and Vocational Development Theory." (New York: Bureau of Publications, Teachers College, Columbia University, 1957).

[9]Peter M. Blau, John W. Gustand, Richard Jessor, Herbert S. Parnes & Richard C. Wilcock, "Occupational Choice: A Conceptual Framework." Industrial Lab. Relat. Rev., 1956, 9 (4) 531-543.

In discussing adolescent vocational development, Erik Erickson[10] propounded the thesis that societies provide particular processes and mechanisms which, when adopted by their constituent members, allow these individuals to cope successfully with the problems and tasks presented by each successive stage of maturational development. According to Erickson's developmental schema, the principal task of the adolescent period is the formulation of an identity. While Erickson offered no single definitive statement as to the meaning of "an identity," a review of his writings on this subject indicates that he took it to include the attainment of (a) stability, (b) integration, and (c) recognizability (both to oneself and to others) of one's selfhood. He described the socially provided process leading to the formation of an identity as:

> Adolescents are primarily concerned with what they appear to be in the eyes of others as compared with what they feel they are, and with the question of how to connect the roles and skills cultivated earlier with the occupational prototypes of the day... The sense of ego identity, then, is the accrued confidence that the inner sameness and continuity prepared in the past are matched by the sameness and continuity of one's meaning for others, as evidenced in the tangible promise of a "career."

Thus Erickson appears to be stating that out of the experiences leading to the development of a "sense of identity" (i.e. a perception of congruency between one's self-image and the image of oneself one sees others as holding) and to the attainment of an ego syntonic occupational role, the individual moves toward that stability, integration, and recognizability of selfhood which he has called identity. Further,

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[10]E. H. Erickson, "The Problem of Ego Identity." Journal of American Psychoanalytic Association, 1956, 4, 56-121.

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the development of the sense of identity and the location of a fitting occupational role are the specific, interrelated processes provided by society which are calculated to promote identity formation during adolescence.

One assumption which is logically implicit throughout Erickson's formulation is that the individual must have adopted his society's patterns and processes before he can avail himself of them in promoting his own development. These processes, while potentially available within the societal structure, can only be of benefit to the individual if taken up and used by him, and then only within their own context. Bushnell has proposed the term "enculturation" for the process of acquiring one's own culture (out of which, in turn, one may come to possess the socially provided mechanisms Erickson cites). The following predictions about the behaviors attendant on the process of identity formation were made by Bushnell:[11]

1. The sense of identity (as defined by Erickson) achieved by adolescents will be positively related to the extent to which they perceive themselves as fitting into an anticipated occupational role.

2. The sense of identity achieved by adolescents will be positively related to their degree of enculturation.

3. The degree to which adolescents perceive themselves as fitting into an anticipated occupational role will be positively related to their degree of enculturation.

J. H. Bushnell, "Student Culture at Vassar," in The American College, ed. by N. Sanford (New York: Wiley, 1962), pp. 489-514.

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Sarbin[12] refers to this enculturation process as "conformance." He defines conformance as the modal perceptual response to a social stimulus object. When a social object elicits qualitative perceptual responses from members of a specified subculture, a relatively large proportion of the reference population will agree on the quality represented by the object; a small number will differ from the majority but will agree among themselves; and a few will agree with virtually no one. Adding to this, Feldman[13] states;

> Students also learn a number of organization skills attitudes and motivations that are necessary for success in the typical middle-class and upper middle-class occupational world, including the general abilities and motivations needed to meet deadlines, start and finish tasks, juggle several things at once and keep them straight, and budget one's time and energy.

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[12]Theodore R. Sarbin, Studies in Behavior Pathology, Holt Rinehart and Winston. New York, 1961.

[13]Kenneth A. Feldman, "Some Theoretical Approaches to the Study of Change and Stability of College Students," Review of Educational Research, Winter, 1972, Vol. 42, No. 1.

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At the same time, Becker[14] makes the further intriguing suggestion that the college student as a recruit into the middle-class world, must even learn to attach his own desires to the requirements of the organization in which he becomes involved. He must learn, in short, "institutional motivation" wanting things simply and only because the institution in which he participates says these are the things to want. Becker contends that the college experience provides much practice in this linking of personal and institutional desires. It would appear that as the student progresses through college, those around him, define and label him according to the positions he hopes to occupy when he leaves college.

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[14] H. S. Becker, "What do they Really Learn at College?" Trans-Action, 1964 1, 14-17.

Further discussion of the influence of the environment on self-concept is provided by Sarbin[15] in his definition of the interaction of self and role;

> Self consists of ideas the individual has of himself which he has learned in relationship with others, and role as organization actions of a person coordinated with a given position or status. Self and role interact since the self strives for consistency and selects those roles compatible with the self-concept, and these role experiences, in turn, either do or do not reinforce the concept of self. When the self-concept and the role are incompatible, conflict arises. The self-concept is not only, in part a product of social roles, but also seems to be a major determinant of occupational role taking, that is, of occupational choice. People tend to view a vocation as favorable or unfavorable for them because their ideas of that occupation either do or do not fit into their concept of themselves.

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[15]T. R. Sarbin, "Role Theory." In Handbook of Social Psychology, ed. by Gardner Lindzey, Cambridge, Mass. Addison-Wesley Publishing Co. 1954, Vol. 1, pp. 223-258.

Before discussing vocational choice theory, we must consider that current vocational choice theory has as its general framework, the supposition that the choosing of an occupation should be viewed within context of the general personality development of the individual as he comes to view himself and the world around him (Holland,[16] Siegelman & Peck,[17] Super).[18] More particularly, it postulates that the choosing of a certain set of social roles, such as that involved in vocational choice, and the rejecting of others is dependent on the characteristics which one attributes to oneself, on either a conscious or unconscious level, and the characteristics which are attributed to performance in the various social roles. The choice is then made on the basis of the extent to which an individual "sees himself in the role" or the role as befitting himself.

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[16]J. L. Holland, "Explorations of a Theory of Vocational Choice and Achievement: 11. A Four Year Prediction Study." Psychological Reports, 1963, 12, 547-594.

[17]M. Siegelman, M. & R. F. Peck, "Personality Patterns Related to Occupation Rates." Genetic Psychology Monographs, 1960, 61, 291-349.

[18]E. E. Super, "A Theory of Vocational Development." American Psychologist, 1953, 8, 185-190.

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VOCATIONAL CHOICE

Tiedeman's[19] four stages of vocational decision-making provides a theoretical background for vocational choice and relevancy to the classroom impact researched in this study. Tiedeman states that there are four stages in vocational decision-making:

> Exploration. This stage is marked by random, exploratory considerations. It is characterized by generalized, vague concern with little or no apparent progress toward choice. Knowledge of self and occupational world is a felt need, but the individual has developed no strategy or plan of action for satisfying this need. There is an absence or near absence of definite negative choices (exclusions from the range of possibilities). This is accompanied by vague anxieties and doubts about the future.
>
> Crystallization. This stage represents progress toward, but not attainment of choice. The individual recognizes alternative possible choices and at least some of the consequences of these alternatives. Conflicts are recognized; advantages and disadvantages are weighed; the bases for a decision are being developed at least implicity. The process for narrowing down the range of possibilities through negative choices is operating. False steps and inappropriate earlier decisions are recognized and used as bases for future decision.
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> Choice. This stage represents a definite commitment with some degree of certainty to a particular goal. It is accompanied by expressions of satisfaction and relief for having made the commitment. The individual may focus on aspects or characteristics of self which are evidence to him that he has made an appropriate decision. This stage further represents a swing from the pessimism characteristic of the exploratory stage to a kind of naive optimism about the future. The individual usually expresses a singleness of purpose and an unswerving attitude of goal direction as well as eagerness and impatience to reach the goal. Focus upon the consequences of the decision and further planning are not yet in evidence.

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[19]D. V. Tiedeman, "Decision and Vocational Development: A Paradigm and Its Implication." Personnel Guidance Journal. 1961, 40, 15-21.

> Clarification. This stage represents a process of closure in which the individual is involved in clarification and elaboration of the consequences of his commitment, as well as in planning the details and next steps to be taken to follow through on the commitment. (Some of these consequences of commitment may well have been considered prior to commitment in the crystallization stage; yet, in this stage these considerations are more imminent and personally relevant, whereas earlier they were more distant and hypothetical). In addition, the individual is usually engaged in a process of elaboration and perfection of his self-image and his image of the future. Although planning the overt action itself may be delayed until the environmental conditions are appropriate for action.

Super[20] approaches the clarification of occupational roles in his definition of the five stages of vocational development: growth, exploration, establishment, (implementation) maintenance, and decline. Within the implementation stage the following activities are enumerated:

(a) confirmation and verification of choice
(b) professional identification
(c) knowledge of self and role requirements

In this process, self concepts are continually modified as new experiences are incorporated and assimilated into the individual's cognitive structure.

The community college experience provides opportunity for confirmation and verification of choice by contributing vocationally relevant experiences within its occupational curricula. Since occupational training provides a taste of an occupation, it can allow the student to test his choice, gain professional identification and assimilate

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[20]Super, Op. Cit.

knowledge of himself as well as the role requirements of his occupation to be.

In a study of Edwards and Tuckman,[21] they found that the community college experience leads to an "intensification of appropriate occupational identification among students enrolled in occupationally oriented programs" (thus playing a role in career development as described by Super). The study in its comparison to the students in the university setting, found that the first two years of the university produced no noticeable shift in terms of occupational identification.

The perceptions which an adolescent has of the roles played by the members of the various occupations have an important influence on his career choice. Dipboye and Anderson[22] contend that these perceptions may be thought of as role expectations:

> When an individual is at some choice point in his career development and he must arrive at some sort of decision, he uses, among other things, ideas and feelings about people who work in the occupations which he is considering. These ideas and feelings include his perceptions or expectations of the occupational role.

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[21] Keith J. Edwards and Bruce W. Tuckman, "Effect of Differential College Experiences in Developing the Students' Self and Occupational Concepts." Journal of Educational Psychology, Dec. 1972, pp. 563-580.

[22] W. J. Dipboye and W. F. Anderson, "Occupational Stereotypes and Manifest Needs of High School Students," in The Psychology of Vocational Development, ed. by Robert M. Roth, David B. Hershenson, and Thomas Hilliard (Boston: Allyn and Bacon, Inc. 1970).

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A study of Davis[23] regarding self-concept and occupational role expectations in nursing and social work provided additional supportive data for the theory that people tend to view an occupational role as favorable or unfavorable for them because their ideas of that occupation either do or do not fit into their self-concept.

In Chapter I, it was suggested that although a student had made a vocational choice, this choice could be "aborted" by negative classroom expectations, or expectations that the student did not or could not fulfill. The potential impact of these classroom expectations and teacher "style" will be discussed further.

CLASSROOM EXPECTATIONS AND THEIR IMPACT

The characteristic way in which an instructor teaches his classes can have important consequences for his students' learning satisfaction, and development. His teaching style reflects his educational values as well as the goals he hopes his students will attain. Researchers have attempted to describe these teaching styles by such varied methods as systematic observations, Medley and Mitzel,[24] rating methods, Remmers,[25] and measures of social interaction, Withal and Lewis.[26]

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[23]Anne J. Davis, "Self-Concept, Occupational Role Expectations, and Occupational Choice in Nursing and Social Work." Nursing Research, Jan., Feb., 1969, Vol. 18, No. 1.

[24]D. M. Medley & H. E. Mitzel, "Measuring Classroom Behavior by Systematic Observation," in Handbook of Research on Teaching, ed. by N. L. Gage (Chicago: Rand McNally, 1963).

[25]H. H. Remmers, "Rating Methods in Research on Teacher," in Handbook of Research on Teaching, ed. by N. L. Gage (Chicago: Rand McNally, 1963).

[26]J. Withal & W. W. Lewis, "Social Interaction in the Classroom," in Handbook of Research on Teaching, ed. by N. L. Gage (Chicago: Rand McNally, 1963).

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More recently, researchers have approached the classroom environment through the use of questionnaires that ask students for their perceptions of classroom procedures and behaviors. In a recent study, Baird[27] attempted to appraise teaching styles through students' perceptions. The results indicated that perceived ambiguity on the part of instructors by the students consistently related to students' feelings that they had received poor teaching. Similar results have been found among employees in large organizations, Kahn, Wolfe, Quinn, Snoeck, and Rosenthal[28] and among graduate students, Baird.[29] In those studies ambiguity was positively related to psychological withdrawal and feelings of stress. The results from relating the indices to grades also suggest that teaching styles may be an important variable in elevating or depressing student achievement, possibly through their power to involve the student.

Although research results indicate that teaching styles have considerable educational importance, psychologists and behavioral scientists are unaware of the specific mechanisms--conscious and unconscious, intentional and unintentional--that affect success or failure in directions expected. If there is a consistent phenomenon of "self-fulfilling prophecy, how does it operate in the schools? Studies have identified certain obvious factors.

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[27]Leonard L. Baird, "Teaching Styles: An Exploratory Study of Dimensions and Effects," Journal of Educational Psychology.

[28]R. L. Kahn, D. M. Wolfe, R. P. Quinn, J. D. Snoeck, and R. A. Rosenthal, "Organization Stress: Studies in Role Conflict and Ambiguity." (New York: Wiley, 1964).

[29]Leonard L. Baird, "A Study of the Role Relations of Graduate Students." Journal of Educational Psychology, 1969, 60, 15-21.

Rosenthal[30] observed differential cues presented to students by teachers. Instructors allowed more time for "bright" students to answer questions and displayed facial expressions indicating obvious displeasure at remarks made by "dull" students.

Through both its curricula and its related activities, the community college environment provides role models for the student. Patterning his behavior after some of these new models, the student finds his attempts accordingly approved or disapproved by these educational key figures. He finds that playing these roles gratified or frustrates his vocational choice verification. His original behavior, a product of his home environment, is now modified and developed by forces from the broader social environment of the community college, and specifically; the classroom.

Almost every book on education refers to the idea of the teacher as model. Yet there is no one theory of modeling, no one generally accepted definition of the term. We actually know little about the prototype teacher, the perceptions held by students of their teachers, or the long-term effects of teachers on students, all elements of modeling. As Adelson,[31] so perceptively points out, theories of education often include views of modeling that are "implicit, unacknowledged, and unexamined."

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[30]Robert Rosenthal, "Self-Fulfilling Prophecy," Psychology Today (September), 1968.

[31]Joseph Adelson, "The Teacher as a Model," The American College, edited by N. Sanford. (New York: John Wiley, 1962).

According to Cohen and Brawer,[32] we can conceive of model elements rather than model wholes. Further, we think of some model elements as positive and others as negative. Each component is able to affect the other, and thereby to mandate the general impression gained by observers. Accordingly, a model can have either a positive or negative effect--students can assume the weaknesses and ignorances of a teacher model just as they can gain strength and wisdom from him. When the positive side of a person dominates the model is presumed to have a "good" effect. When negative elements stand out, the model is perceived as a debilitating force. The teacher who is aware of the many features he may project as model may also become more aware of his own many facets. He can then become conscious of those dimensions that he would want to incorporate and to project to others and of those that he would reject.

Although self-concept development, vocational choice and modeling all have been investigated in the educational context, curriculum role expectations have been minimally researched. However, a study of Eisenman[33] investigated the creativity change in student nurses during their period of training. Using the Personal Opinion Survey which is a 30 item true false, paper and pencil personality measure of creativity developed by Eisenman, the results indicated there appeared to be a tendency for creativity to decline with increasing nursing education. It seems that subjects in the study were socialized into a less original orientation. Such a lessoning of original behavior is consistent with

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[32]Arthur M. Cohen & Florence B. Brawer, Confronting Identity, Prentice Hall, Englewood Cliffs, New Jersey, 1972.

[33]Russell Eisenman, "Creativity Change in Student Nurses: A Cross Sectional and Longitudinal Study," Developmental Psychology, Nov. 1970, pp. 320-325

some of the roles which the professional nurse has to assume. As manager of a hospital ward and as a subordinate to the physicians, the nurse is usually expected to follow rules and routine, and is not expected to be innovative. There appeared to be a conformity behavior elicited by the role expectations of the instructors in the nursing schools.

In an effort to examine the assumption that humaneness and cognitive growth are antithetical, or "Its nice to be nice, but you've got to teach them something," Aspy and Roebuck[34] investigated the relationship between teachers' classroom behavior and their students' levels of cognitive functioning. Cognitive functioning was measured as a process variable and the focus was on the differential contributions of the various teacher behaviors to the attainment of levels of cognition beyond memory and recognition. The results of the study indicated that once the cognitive processes move beyond memory and recognition, positive regard is more directly facilitative of cognitive functioning or "thinking" as a process within the instructional situation.

The effect of classroom expectations and behavior on attrition has been the expressed concern of many researchers. Jane Matson[35] has stated, "The student who withdraws from junior college may lack a sense of belonging or identification with the college environment."

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[34]David N. Aspy and Flora N. Roebuck, "An Investigation of the Relationship Between Student Levels of Cognitive Functioning and the Teacher's Classroom Behavior." The Journal of Educational Research, April, 1972.

[35]Jane Matson, "Community College Students," Speech given to the Illinois Association of Community and Junior Colleges, Chicago, Illinois, March 22, 1968.

A follow-up study by Bossen and Burnett[36] of community college "persisters" and community college withdrawals indicated the following results. Ninety-six percent of the persisters reported that generally their teachers performance in the classroom was excellent or very good. Only fifty-two percent of the withdrawal group chose superlatives in describing their teachers. Undoubtedly this judgment by the withdrawal group is colored by their perceived inadequate response to the academic environment of the college.

COGNITIVE STYLE

Educational research for some time has attempted to focus on how individuals learn and how instruction can be personalized. Out of these efforts there has resulted a body of knowledge dealing with individual differences. Some of this research has dealt with how individuals perceive and interpret their environment, and the word "cognition" has been applied to this process.

Cognition when defined as the act or process of knowing, is closely related to perception. Carried a step farther, if an individual perceives and derives meaning from his environment by frequently employing the same process, this process can be labeled his cognitive style.

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[36]Doris Bossen and Collins W. Burnett, "What Happens to the Withdrawal?" Junior College Journal, June 1970.

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28, 1960, pp.

Allport[37] appears to have applied the above definition when he stated that each individual develops a cognitive style. According to Allport, each individual is unique in the way he blends veridicality, culture, and his own personal existence. According to Allport:

> . . . it would make no sense at all if we had to start every day building on a new and veridical cognition of the world we live in. It is far more efficient to make new experiences and dissolve them into our old experience. We do not cognize them afresh but recognize them in terms of our own past history, interests, and habitual sets.

Broverman[38] held that cognitive styles are manifestations of different response probabilities or response strengths in certain types or classes of behavior. He held that cognitive style is a directive influence on behavior. Broverman labeled one cognitive style "conceptual versus perceptual-motor dominance" and applied it to tasks which are novel, difficult, or demanding of concentration. He labeled another cognitive style "strong versus weak automazation." This cognitive style is involved in simple, highly practiced tasks which may be conceptual or perceptual-motor in nature.

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[37]Gordon Allport, Pattern and Growth in Personality (New York: Holt, Rinehart, and Winston, 1937), p. 262.

[38]D. M. Broverman, "Cognitive Styles and Intra-Individual Variations in Abilities, and Dimensions of Cognitive Style," Journal of Personality, 28, 1960, pp. 240-256.

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Ausubel and Fitzgerald[39] view cognitive style in relation to cognitive organization. To them cognitive style is self-consistent and endures individual differences in cognitive organizations.

> Cognitive style refers both to individual differences in general principles of cognitive organization (e. g. simplification and consistency trends) and to self-consistent idiosyncratic tendencies that are not reflective of human cognitive functioning in general (i. e., intolerance for ambiguity, memory for particular kinds of experience). It reflects differences in personality organization as well as genetically and experientially determined differences in cognitive capacity and functioning.

Various theoretical bases of cognitive style have been discussed in the psychological literature through the years. Kagan, Moss and Sigel[40] also have explored cognitive style as a preferential mode of categorization where alternatives are possible. These investigators have identified three styles of categorization where subjects are faced with sorting an array of visual representations.

The first style of categorization is descriptive and the criteria utilized for grouping are manifest, objective, physical attributes. The second style is called relational-contextual. Here the responses indicated interdependence in a particular situation and are expressed in functional terms. The third style is called categorical-inferential which means that classification depends on inferred characteristics.

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[39]David P. Ausubel and Donald Fitzgerald, "Meaningful Learning and Retention: Intra-Personal Cognitive Variables," Review of Educational Research, 31, 1961, pp. 500-510.

[40]Irving Sigel, et. al. Styles of Categorization and Their Intellectual and Personality Correlates in Young Children. (Merrill-Palmer Institute, Detroit, not dated).

> In the 1940's, Allport[41] suggested the concept of "style," which he defined as the consistency and pattern of expressive behaviors that individuals manifest in performing various types of activities. In Allport's definition of style, the term is somewhat similar to its common use in such expressions as: an individual's way (style) of living, a style of speaking, a writing style, or style of dress. This orientation allows the utilization of the term "style" to denote an entire pattern of responses, i. e., it can refer to not only a particular way of life, but to a particular class of events (e. g. style of speaking). In this context, the term "style" is both general and relatively specific, i. e., all it is not limited to a particular denotation (e. g., all aspects of response patterns).

In discussing cognitive style investigations in psychology, Hill[42] reaches the following conclusion:

> In essence, then, the contemporary studies of cognitive style involve the investigation of cognitive processes in the context of personality and defined social variables. These approaches indicate the recognition on the part of certain psychologists (e. g., Broverman, Gardner, Kagan, Moss, Sigel, Witkin) that cognitive behaviors form a fundamental part of a socio-personal matrix, and that the employment of certain classes of behavior called "cognitive" have consistent qualities which justify their being defined as stylistic.

The educational sciences and the concept of cognitive style as identified in Chapter I has provided a vehicle for several studies on classroom behavior.

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[41] Joseph E. Hill, "Cognitive Style as an Educational Science" (unpublished manuscript, Detroit, Michigan, 1968), p. 1.

[42] Ibid.

A study conducted by Joseph DeLoach[43] analyzed cognitive and teaching style disparity as an antecedent of cognitive dissonance in instructional evaluation. A number of other studies completed in the educational sciences have investigated the relationship of cognitive style to other areas of education. Lawrence Wasser[44] and Arlan Schroeder[45] used the educational sciences construct of cognitive style to investigate teacher evaluation of student achievement. Both found that students with cognitive styles similar to the teacher's cognitive style received a significantly greater number of high-letter grades (A's and B's) than those whose cognitive styles were "different" from their teacher's style. Schroeder also found that students possessing cognitive styles similar to that of the teachers, to a significant degree evaluate the teacher as being more effective than do students with cognitive styles disjunct with the style of the teacher. Wasser worked with thirty sixth grade pupils and their teachers. Schroeder worked with one hundred eighteen ninth grade students and one teacher.

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[43]Joseph DeLoach, "An Analysis of Cognitive Style: Disparity as an Antecedent of Cognitive Dissonance in Instructional Evaluation: An Exploratory Study in the Educational Sciences". (Unpublished doctoral dissertation, Wayne State University, 1969).

[44]Laurence Wasser, "An Investigation into Cognitive Style as a Facet of Teachers Systems of Student Appraisal," (Unpublished doctoral dissertation, The University of Michigan, 1969).

[45]Arlan Schroeder, "A Study of the Relationship Between Student and Teacher Cognitive Style and Student Derived Teacher Evaluations", (Unpublished doctoral dissertation, Wayne State University, 1969).

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Marvin Fragale[46] found similar results in studying thirty-two students and two instructors in a community college. Fragale was able to identify a collective cognitive style for industrial technology teachers and for industrial technology students.

Another group of studies completed in the educational sciences related to the educational science of cognitive style to curriculum and student performance in certain disciplines. For example, Keith Shuert[47] was able to identify the elements of cognitive style held in common by successful math students, those elements held in common by unsuccessful math students, those elements unique to the successful math students, and those elements unique to the unsuccessful math students. James Blanzy[48] was able to identify distinct collective cognitive styles for: (1) students whose achievement of performance goals placed them in the upper or lower 27% of the class, (2) students who withdrew, and (3) students with the most positive or least positive attitude toward mathematics. The results of a study by James Warner implied that among a group of sixty-seven college freshman in a life science course divided into an experimental group using a self-instructional multi-media approach and a control group taught by the lecture-discussion method,

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[46]Marvin J. Fragale, "A Pilot Study of Cognitive Styles of Selected Faculty Members and Students in a Community College Setting," (unpublished doctoral dissertation, Wayne State University, 1970).

[47]Keith L. Shuert, "A Study to Determine Whether a Selected Type of Cognitive Style Predisposes One to Do Well in Mathematics," (unpublished doctoral dissertation, Wayne State University, 1970).

[48]James J. Blanzy, "Cognitive Style as an Input to a Mathematics Curriculum System: An Exploratory Study in the Educational Sciences," (unpublished doctoral dissertation, Wayne State University, 1970).

certain elements of cognitive style appear to be amenable to instruction by a self-instructional, multi-media approach, while others seem more responsive to the lecture discussion method. Warner[49] was also able to identify predominant elements of cognitive style demonstrated by successful and unsuccessful students in both groups.

Vaughn Hoogasian[50] identified collective cognitive styles for four hundred seventy-two students who earned various letter grades in a two-course sequence in English, but the collective style did not prove to be a definitive predictor of final letter grades in the courses when applied to the individual student who approximated one of the collective cognitive styles for any of the letter grades. A recent study by Glenn McAdam[51] found that in a class of fifteen community college students, those students with a cognitive style "match" with the teacher's expressed a positive attitude about their instructional experience activities in the class. Those students with a negligible match with the teacher expressed a lack of high interest in the class activities.

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[49]James L. Warner, "An Analysis of the Cognitive Style of Community College Freshman Enrolled in a Life Science Course," (unpublished doctoral dissertation, Wayne State University, 1970).

[50]Vaughn Hoogasian, "An Examination of Cognitive Style Profiles as Indicators of Performance with a Selected Discipline," (unpublished doctoral dissertation, Wayne State University, 1970).

[51]Glenn F. McAdam, "Personalizing Instruction through the Educational Sciences of Cognitive Style and Teaching Style," (unpublished doctoral dissertation, 1971).

The studies reviewed above are all related to the present study by virtue of their application of the educational science construct; cognitive style, to the analysis of various problems in education. They have contributed to the refinement of instrumentation for gathering data relative to the various educational sciences and at the same time have suggested the broad range of educational problems that lend themselves to analysis within the framework of the educational sciences.

SUMMARY

In this chapter, a presentation has been made of the relevant literature concerning (1) identity and self-concept development; (2) vocational choice; (3) classroom expectations and impact and (4) cognitive style.

The review of the literature in conjunction with the presentation of the design of the study in the following chapter provides the foundational context necessary for the analysis of the data and findings presented in Chapter IV.

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"CHAPTER III"

DESIGN OF THE STUDY

In the two preceding chapters, the background of the present study and a review of the related literature were presented. This chapter is concerned with; (1) the source of data, (2) the sample employed in the study, and (3) the instrumentalities and procedures used in collecting the data.

It should be noted again that the present study is not designed as an hypothesis testing effort, but is designed to provide answers to general questions which may generate hypotheses to be tested in subsequent studies. These questions, deal with the relationship between instructor Theoretical Ideal expectations and the actual cognitive style of Selected "ideal" and "non-ideal" students within each curriculum.

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SOURCE OF DATA

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The defined population for the study was composed of instructors and second year students within the Business, Law Enforcement and Cosmetology curricula at Oakland Community College. Oakland Community College is a comprehensive, multi-campus community college located in the Metropolitan Detroit area of Michigan. The college is a public, post-secondary institution whose degree and program offerings are below the bacculaureate level. The college presently has four campuses in operation and is contemplating a fifth to be developed at a later date.

The Oakland Community College District was established by the electorate of Oakland County, Michigan, on June 8, 1964. The district served includes approximately 900 square miles and contains twenty-eight public school districts with thirty-nine public high schools. In addition, there are twenty-two non-public high school in the district. The enrollment of the college has risen from a record community college opening enrollment of 3,860 students in September, 1965, to approximately 15,000 at the present time.

To meet the heterogeneous needs of the community, Oakland Community College offers six major types of educational services: Transfer Programs, Technical and Vocational Programs, Developmental Programs, General Education, Community Services, and Counseling and Guidance. All students enrolled for six or more credit hours are required to take the Cognitive Style Test Battery. The results, called "maps" are sent to the Counseling Departments on each campus where the particular students are enrolled and assigned to counselors.

SAMPLES EMPLOYED IN THE STUDY

Since it was impossible to employ all the students included in the defined population of the study, due to time schedules, limited personnel, and financial limitations, a sampling procedure was employed.

All instructors from each of the following three curricula participated in the study; Law Enforcement, Business Administration, and Cosmetology. The three curricula were selected on the basis of a judgment-purposive sampling technique[1] described by William Deming as follows:

> The results from a judgment-sample are obtained by procedures which depend to some appreciable portion on (1) a judgment selection of 'typical' or 'representative' counties, cities, road segments blocks, individual people, households, firms, articles or packages concerning which information is to be obtained: or (2) weighing factors that are prescribed arbitrarily.

Sample selection based on this technique, according to Hill and Kerber,[2] ". . . is determined on the basis of what the research worker might consider from his experience to be typical, or representative, sampling units."

Based upon such factors as: (1) the student identifying with his curriculum area, (2) the potentiality of the faculty member having a relatively high degree of knowledge of students "majoring" in the curriculum, and (3) well defined student characteristics, goals and objectives, the judgment was made that these three curricula would not

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[1]William E. Deming, Some Theory of Sampling (New York: John Wiley and Sons, Inc. 1950), p. 11.

[2]Joseph E. Hill and August Kerber, Models, Methods, and Analytical Procedures in Education Research (Detroit: Wayne State University Press, 1967), p. 43.

only satisfy the mandates associated with designing a judgment-purposive sample of students, but would also provide a high degree of representativeness of the vocational curricula.

HOW SELECTED

Class lists of all students enrolled in the given curricula within the fall-winter, 1972-1973 academic year having accumulated 30 credits or more constituted the total student population used in the study. The enrollment identified is as follows:

Law Enforcement. . . . . .320 students
Business Administration. .364 students
Cosmetology . . . . . 49 students

Those students that were identified by instructors using a card sort technique provided the sample of students employed. An additional refining of the sampling process will be provided and identified in PROCEDURES.

The judgments made regarding selection of curricula for analysis and the student population to be studied were made in collaboration with the following staff members of Oakland Community College:

Dr. Joseph E. Hill . . . .President
Dr. Derek Nunney . . . . .Vice President for Academic Affairs
Dr. Virginia Svagr . . . .Director of Testing
Mr. Bruce Martin . . . . .Director of Data Processing
Dr. George Mitchell. . . .Counselor

It should be noted that all the instructors included in the defined population participated in the study. Under these circumstances, a sample of instructors was not drawn. In other words, the total defined

population of instructors was employed. The defined population of instructors was as follows:

Law Enforcement . . . . . .four instructors
Cosmetology . . . . . .six instructors
Business Administration . .three instructors

REPRESENTATIVENESS

The representativeness of the samples of the defined populations which they are to represent will be determined on the basis of such factors for students as: (1) Male-Female distribution in sample compared with total population, and (2) Grade Point Average mean in sample as compared with total population.

ADEQUACY OF THE SAMPLE

Since the present study is exploratory in nature, and is thus not concerned with collecting a large number of cases for purposes of statistical validation, the size of the sample employed can be relatively small.[3] In order to provide answers to the questions in Chapter I, a sample size of $n=\pm 30$ would be sufficient for the purposes of the study.

DATA COLLECTION

Data collection is described in terms of (1) the instrumentalities, i. e., the instruments and techniques employed to collect the data, and the procedures that were employed.

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[3] Ibid.

INSTRUMENTALITIES

The instrumentalities employed in the study included, (a) the instruments associated with cognitive style testing, and the survey of instructor identification of students; (See Appendix A and B) and (b) the techniques of informal interviewing associated with explaining and clarifying the performance requested of the instructors regarding the defining of an "ideal" student, and the identification of actually enrolled students as "ideal" or "non-ideal" types, respectively.

INSTRUMENTS

In an attempt to find a means to identify the vocational prototype within each curriculum, two methods were considered: (1) the conducting of interviews and (2) a paper-pencil survey. It was decided that a written survey would provide a more precise method of determining level of consensus among faculty as indicated in the QUESTIONS TO BE ANSWERED, Chapter I. As a result, the COLLECTIVE COGNITIVE STYLE SURVEY was developed. Cognitive style constructs and definitions were itemized and phrased in such a way that a scale could be affixed.

The Likert[4] 5-point scale seemed most precise for this type of instrument. The following are examples from the survey:

1. Theoretical Visual Linguistic--ability to find meaning from the printed word. A rating of 3 or higher indicates a student who reads with a better than average degree of comprehension and one who exhibits a better than average understanding of grammatical structure.

   1_____ 2 _____ 3 _____ 4 _____ 5_____

2. Qualitative Code Esthetic--ability to enjoy the beauty of an object or the pureness of an idea.

   1_____ 2 _____ 3 _____ 4 _____ 5_____

3. Qualitative Code Histrionic--ability to exhibit a deliberate behavior or play a role to produce some particular effect on other persons.

   1_____ 2_____ 3_____ 4 _____ 5_____

It was determined that a value of 5 on the scale would indicate a most desirable characteristic for the prototype in the curriculum and a value of 1, the least desirable for success.

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[4]Rensis Likert, "A Technique for the Measurement of Attitudes," Columbia University, The Archives of Psychology-140, (New York: The University, 1932).

The Oakland Community College Cognitive Test Battery from which the Cognitive Style map is developed was employed to determine the cognitive style characteristics of students within the defined curricula and provide a comparison with the Collective Cognitive Style Survey. The following are sample questions employed in the test battery and the characteristic that they measure:

"I can make more sense out of what a person means when he speaks to me rather than if he writes to me."	-	Theoretical Auditory Linguistic
"I find it comfortable to add spoken or dictated numbers mentally."	-	Theoretical Auditory Quantitative
"After I dictate a letter, I read it to be certain it is correct."	-	Theoretical Visual Linguistic
"I solve mathematical problems more rapidly if they were written."	-	Theoretical Visual Quantitative
"My friends tell me that I am understanding."	-	Qualitative Code Empathetic
"I require beauty in my surroundings outside as well as inside buildings."	-	Qualitative Code Aesthetic
"I direct my life according to moral values."	-	Qualitative Code Ethic
"I can act friendly and accepting in order to acquire favors."	-	Qualitative Code Histrionic
"I use facial expressions to communicate emotions."	-	Qualitative Code Kinesics
"I have enjoyed acquiring good motor skills so that I compete successfully in sports."	-	Qualitative Code Kinesthetic

"I know which strangers enjoy a pat on the back if I have an occasion to congratulate them."	-	Qualitative Code Proxemics
"I know my strengths and weaknesses."	-	Qualitative Code Synoetics
"I am able to persuade people involved in disagreements to strive for agreement."	-	Qualitative Code Transactional
"I learn a subject better when I can discuss it with my associates."	-	Cultural Determinant-Associate
"Family values should have lasting effects on each of us."	-	Cultural Determinant-Family
"I do not need others to help me make decisions."	-	Cultural Determinant-Individuality
"I 'play the devil's advocate' with people to force them to look at another point of view."	-	Modality of Inference-Difference
"Information should be analyzed in a number of ways before a conclusion is reached."	-	Modality of Inference-Appraisal
"Life is simple if you go by the rules."	-	Modality of Inference-Magnitude
"I have no difficulty in understanding how to put puzzles together."	-	Modality of Inference-Relatioship
"I find the type of reasoning demanded by the rules of mathematics suits my mode of thinking."	-	Deductive Reasoning

PILOT STUDY

A pilot study was conducted to test the adequacy of the survey instrument. Two instructors from the Executive Secretary curriculum along with a defined population of 62 students were included in the pilot study. The instructors were asked to fill out the survey and react to any lack of clarity within the instrument.

As a result of their suggestions, refinements were made in the instrument. In the analysis of instructor responses, it was noted that the ratings tended to be consistently high or low and discrimination was slight. Therefore, it was decided that the total study must include procedures for scaling in judgments. (See Appendix C), (See Chapter IV)--Analytical Techniques).

PROCEDURES

The following procedures were employed in the process of collecting data for the study:

1. Each instructor was asked to fill out the Collective Cognitive Style Survey (See Appendix B) to identify a curriculum prototype or ideal student from which a composite profile was to be constructed.

2. A consensus prototype was identified from the data collected by the survey.

3. Each instructor was given 3 x 5 cards identifying the second year students within the instructor's curriculum.

4. Each instructor was asked to categorize students using the card sort technique into four groups:

    a. the ideal student in the curriculum
    b. the non-ideal student in the curriculum
    c. the uncertain (instructor is unable to categorize ideal or non-ideal)
    d. the "don't know" (instructor does not recognize student's name).

In the determination of their categories, instructors were asked to consider if they would recommend the student for employment upon completion of the curriculum program.

5. Students that were classified into the instructor consensus ideal or non-ideal category were employed as the samples in the study. (Consensus was determined by fifty percent or more agreement by instructors).

TECHNIQUES

Data were collected for the present study in the manner and sequence that follows:

Once the instructors to be included in the study were identified, individual appointments were made. At the onset of each appointment, the instructors were informed of the purpose of the study and what would be expected of them in terms of activity and time. The Cognitive Style Survey and the card sort was administered to all of the instructors in the study. The directions for the instrument and the card sort technique were made explicit and carefully explained by this researcher. Each appointment was held in the instructor's office or the office of the researcher. The rooms were air-conditioned, well-lighted and relatively quiet. Sufficient time was allowed for each instructor to complete the data requested. Each instructor was given an opportunity to raise any questions he wished regarding the study or the instrument and techniques. Most instructors were extremely cooperative. One instructor was hesitant to participate due to a personal concern about the potential implications for his teaching style. Once reassured that the individual responses would remain confidential, he agreed to participate. Several instructors were out of town and it was necessary to wait until they returned.

SUMMARY

The purpose of this chapter has been to describe the design of the study in terms of the source of data, the sample employed in the study, its selection, representativeness, and adequacy, and the methods and procedures of data collection.

In the next chapter, the analytical techniques employed in the study and the findings of the study will be presented. The fifth and final chapter will present the conclusions, implications and recommendations emanating from the study.

"CHAPTER IV"

ANALYTICAL TECHNIQUES DATA AND FINDINGS

The three previous chapters have been assigned to cover the background of the study, its purpose, a review of the latest literature and the design of the study expressed in the (1) source of data, (2) samples employed, and (3) the instrumentalities and procedures of data collection.

The purpose of this chapter is to: (1) present the analytical techniques that were employed and (2) to present the findings.

ANALYTICAL TECHNIQUES

The following operations were the analytical techniques employed in the study:

1. Cognitive Style Mapping
2. a. Determination of the collective cognitive style of the theoretical ideal student group.
   b. Scaling procedures for interpreting the ratings of different raters employed to determine the Collective Cognitive Style of the theoretical ideal student group for a given curriculum.
3. Determination of the collective cognitive style of the selected ideal student group.
4. Determination of the collective cognitive style of the selected non-ideal student group.
5. Analyses of the respective styles to determine similarities and differences between them.

Due to the exploratory nature of the study, no attempt has been made to submit hypotheses to test, but the main emphasis has been placed on seeking answers to general questions. This procedure lends the study an hypothesis generating flavor, and adds significance to implications emanating from the effort.

COGNITIVE STYLE MAPPING

The concept of cognitive style as defined in the educational sciences, as stated in Chapter III, is different from those defined and described in the discipline of psychology. The construct of cognitive style as defined in terms of the educational sciences is a Cartesian product, G, composed on three sets:

$$G = \{S\} \quad \{E\} \quad \{H\}$$

Where S denotes the set of symbols and their meanings, E designates the set of cultural determinants of the meaning of symbols, and H indicates the set of modalities of inference. The cognitive style of an individual is mapped by determining appropropriate orientations of elements associated with each of the three sets comprising the "style product." These elements are combined into profiles ranging over the three sets, i. e., "symbols," "determinants," and "modalities of inferences." This collection of profiles forms the cognitive style of the individual. For complete definitions of the "style" elements, the reader is referred to the Definition of Terms in Chapter I, as well as information included in Appendix B the Collective Cognitive Style Survey instrument.

MAPPING

The concept of set is of considerable importance to the process called "mapping." A mathematical set is a carefully defined collection of discrete elements. An element is a fundamental constituency of a set. A set may include a finite number of elements, an infinite number or no elements at all. The elements contained in each set may be defined empirically or mathematically.

MATHEMATICAL MAPPING

Mathematical mapping employs the use of functions and equations to effect the mapping process. For example, this function Y=2X=1, may be used as an operator to map the set of all the positive integers from 1 through 100 inclusively into A set B, composed of two subsets, i. e., y and y^n (not y), of all the odd positive integers (subset y) and all the even positive integers (subset y^n). This type of mapping is performed as a binary operation. To illustrate how mathematical mapping might be employed with cognitive style, each element is considered in terms of two classes, (binary), the class of the element sought, and the class of all other elements.

For example, if the operator were composed of cut-off scores regarding the element of Theoretical Visual Linquistic in the set called "Symbols and their Meanings," all elements to be considered would be divided into two parts; (1) those forming the theoretical linquistic elements, and all those not considered linquistic elements. When the major or minor orientation has been determined for the element T(VL), it is considered to have been "mapped" in the set dealing with symbols and their meanings.

Mapping is therefore nothing more than taking a "set" and coming up with a new set in which the element you are looking for is isolated from the rest of the elements. In mathematical mapping, a mathematical operator is utilized to develop cut-off scores. In the process of empirical mapping, the "defined elements" are identified through the use of empirical observation, and their orientations are determined on the basis of a "makes sense" or "does not make sense" decision rendered by the "mapper."

EMPIRICAL MAPPING

The process of empirical mapping as described by Hill[1] (see Appendix D) can be defined as a teacher or counselor diagnosing (mapping) selected elements (variables or characteristics) of the cognitive style of an individual on the basis of test scores, inventory scores, observed behaviors, reported behaviors and other information pertaining to the individual whose "style" is being "mapped." Essentially, the empirical mapping of an individual's cognitive style calls for decision-making by a diagnostician regarding which elements, of all those included in the sets, S, E, and H, respectively, to include in the individual's map.

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[1] Joseph E. Hill, "Problem Set on Objectivity of Process of Mapping Styles" (unpublished manuscript, Oakland Community College, 1973), p. 1.

According to Hill,[2]

> In addition to any limitations imposed by measuring instrumentalities, empirical mapping of cognitive style is also limited by the abilities and characteristics of the human diagnostician. Not all persons will be good diagnosticians. Some will be better than others. Under these circumstances, it is necessary not only to understand the concepts of reliability, validity, objectivity, and discrimination as they apply to instrumentalities, but to understand how they are affected by the process of empirical mapping.

In order to complete the mapping process, it is necessary to understand how major, minor and negligible orientations, respectively, in the elements of the sets comprising cognitive style, are determined. The following principles which are modifications of Flanagan's[3] technique are applied in "mapping."

Principle 1. If the individual whose style is being mapped demonstrates by test or inventory scores, ratings by observers, or other forms of assessments, an ability or tendency in the cognitive style element under consideration that would place his performance, in the judgment of the diagnostician, truly in the range of the fiftieth through the ninety-ninth (50-99) percentiles of a population, or set populations, of scores, ratings, or assessments of that ability or tendency, then a major orientation in that element is assigned to the individual.

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[2] Ibid.

[3] John C. Flanagan, "General Considerations in the Selection of Test Items and a Short Method of Estimating the Product-Moment from the Data at the Tails of the Distribution," Journal of Educational Psychology, XXXII (December, 1939), pp. 674-80.

Principle II. If the individual whose style is being mapped demonstrates by test or inventory scores, ratings by observers, or other forms of assessments, an ability or tendency in the cognitive style element under consideration that would place his performance, in the judgment of the diagnostician, truly in the range of the twenty-sixth through the forty-ninth (26-49) percentiles of a population, or set of populations, of scores, ratings, or assessments of that ability or tendency, then a minor orientation in that element is assigned to the individual.

Principle III. If the individual whose style is being mapped demonstrates by test or inventory scores, ratings by observers, or other forms of assessments, an ability or tendency in the cognitive style element under consideration that would place his performance, in the judgment of the diagnostician, truly in the range of the zero through twenty-fifth (0-25) percentiles of a population, or set of populations, of scores, ratings, or assessments of that ability or tendency, then a negligible orientation in that element is assigned to the individual.

Major orientations are shown in the map by capital letters. For example a major orientation in theoretical visual linquistic ability would appear as, T(VL). Minor orientations are indicated by the insertion of a prime, ('). For example, a minor orientation in theoretical auditory linquistic ability would appear as, T'(al), or in the case of the "associates" element in the "cultural determinants" set of an individual's "style," a minor orientation would be indicated by, A'. Negligible orientations are indicated by the omission of the element from the map.

For more definitive information about cognitive style "mapping" the reader is referred to Dr. Joseph E. Hill, Oakland Community College, Bloomfield Hills, Michigan.

DETERMINATION OF THE COLLECTIVE THEORETICAL IDEAL

The procedure that was used to identify the elements that comprised the "map" or composite profile of the theoretical ideal student group within the respective curricula, employed the scaling of the rankings of the instructors by means of T-scores. Since T-scores are normalized z-scores (standard scores), their percentile rankings associated with the normal distribution can be determined. Since these percentiles are determined from the same distribution, i.e., the theoretical normal distribution, they can be averaged.

Once the rankings of the instructors had been scaled, it was possible to determine the level of the rank accorded a particular element by a given rater. With this information known for each element, and for each rater, it was possible to determine the orientation of the element and to "map" it accordingly. For example, on the line below are the "ranks," the T-score scaling equivalents, and their respective percentile ranks read from the normal distribution:

Element	instructors 1			2			3			Avg. %tile	
	Rank	T	%tile	Rank	T	%tile	Rank	T	%tile	Rank	Orientation
T(VL)	5	61	86	5	63	90	5	57	76	84	T(VL)
T(AQ)	3	46	36	3	43	25	3	45	32	31	T'(aq)
Q(CKH)	2	38	11	2	37	10	2	41	19	13	Neg.

The reader is referred to Appendix E for a complete display of instructor ratings and responses.

DETERMINATION OF THE SELECTED IDEAL STUDENT

In order to determine the collective cognitive style of the selected ideal student group, Flanagan's modifications were employed. For example, the following computer print-out was associated with T(AL):

Classification of Responses

Key to Categories

1 = Negligible (scores from 0 to 25 percentile)

2 = Minor (scores from 26 percentile to 49 percentile)

3 = Major (scores from 50 percentile to 99 percentile)

Element T(AL)

Category	Number of Scores	Percent	Total
Negligible rating	0	0	0
Minor	36	77	100
Major	11	23	23
Total	47	100%	

This information indicates that at least a minor orientation in T(AL) existed, i.e., T'(al) for 100% of the selected ideal Business Administration student group, noting that 77 percent of the group showed T'(al) and that 23 percent showed T(AL) major. Since the major T(AL) would certainly include a minor orientation, then 100 percent of the group must possess, at least a minor orientation in theoretical auditory linquistic capability. Under these circumstances, T'(al) would be included in the collective cognitive style map of this group.

In similar fashion, Q(CEM), qualitative code empathetic, the print-out indicated:

Element Q(CEM)

Category	Number of Scores	Percent	Total
Negligible rating	0	0	0
Minor	4	8.5	8.5
Major	43	91.5	100
Total	47	100%	

Since the display showed that, a major orientation, Q(CEM) existed in 91.5 percent of the cases, a Q(CEM) indicator would be included in the collective cognitive style of the group. This result and others are shown in the display map of this group's map under the findings section of this chapter. In addition, a copy of the complete computer print-out can be found in Appendix F.

DETERMINATION OF THE SELECTED NON-IDEAL STUDENT

The analytical technique employed in this category was identical to that employed with the selected ideal student group.

ANALYSES OF THE DETERMINATION OF SIMILARITIES AND DIFFERENCES OF THE RESPECTIVE STYLES

The technique employed to conduct an analysis of elements common to the respective styles, and of those that were unique to each of the respective collective cognitive styles; (theoretical ideal, selected ideal, selected non-ideal) was one of visual inspection. Therefore, each element was analyzed by visual inspection to determine if that element was, or was not, present in each of the cognitive style maps for the respective groups. In order to perform a thorough analysis, and to

obtain findings that provided a multi-dimensional view of the matter under consideration, elements found to be "different," and those found to be "unique" were classified according to each of the collective "styles." For example, the elements in one group's style found to be "different" from that of the groups' to which they were being compared, were shown in reference to the first group. Then this procedure was employed to show the elements of the second group's "style" that was different from the first group's elements.

FINDINGS

Findings include data pertaining to the collective cognitive style maps of the respective groups showing elements "different" from those found in the collective style maps of other groups, those maps showing elements "unique" to the collective "style" of each group, and the curricular areas with which these groups were associated; Business Administration, Law Enforcement, and Cosmetology. In addition, the findings also include grade point averages of the Business Administration and Law Enforcement groups. Grades were not available for the Cosmetology student group.

TABLE I

SAMPLE POPULATION

Curriculum	Ideal	% of n	Non-Ideal	% of n	Total n	Total %
Business Administration	47	66	24	34	71	100
Cosmetology	14	78	4	22	18	100
Law Enforcement	17	74	6	26	23	100

TABLE 2

INFORMATION REGARDING
GRADE POINT AVERAGES OF RESPECTIVE GROUPS

Total Population		Male	Female	Mean Grade Point Average
Business Administration	N=364	289	75	2.52
Law Enforcement	N=320	299	21	2.93
Cosmetology	N= 49	1	48	Not Available
Sample				
Business Administration				
Selected Ideal	n=47	39	8	2.70
Selected Non-Ideal	n=24	21	3	2.15
Law Enforcement				
Selected Ideal	n=17	17	0	3.04
Selected Non-Ideal	n= 6	5	1	2.67
Cosmetology				
Selected Ideal	n=14	1	13	Not Available
Selected Non-Ideal	n= 4	0	4	

Business Administration --
A null hypothesis can be rejected at the .05 level of significance.

Law Enforcement --
A null hypothesis cannot be rejected at the .05 level, but it is significant at the .10 level.

COLLECTIVE COGNITIVE STYLE MAPS

In this section, the data consist of the collective cognitive style maps for the theoretical ideal, the selected ideal and the selected non-ideal student groups within each curriculum; Business Administration, Law Enforcement and Cosmetology. They are presented in Tables 3-11. Tables 12-14 indicate the elements found to be common to the respective groups' collective "styles" within each curriculum. Finally, Tables 15-23 indicate those elements that were found to be unique to each of the collective cognitive styles of the respective groups within each curriculum area.

TABLE 3

BUSINESS ADMINISTRATION

The composite map of the Theoretical Ideal student group as determined by the collective raters in the curriculum of business administration is shown below:

$$g = \left\{ \begin{array}{l} T(VL)T(AL)T(VQ)T'(AQ) \\ Q(CEM) \\ Q(CET) \\ Q(CS) \\ Q(CT) \\ Q'(ch) \\ Q'(cp) \\ Q'(ck) \end{array} \right\} X \left\{ \begin{array}{l} I \\ A' \end{array} \right\} X \left\{ \begin{array}{l} R, L \\ M' (K) \end{array} \right\}$$

To provide the reader with a sense of the meaning of this collective cognitive style for the theoretical ideal student group, it should be noted that the T(VL), T(AL), T(VQ), and T'(aq) are combined with <u>each</u> of the qualitative symbolic elements shown. For example, [T(VL)-Q(CEM)], [(VL)-Q(CET)], [T(VL)-Q'(CK)] are some of the binomial elements emanating from the combination of T(VL) with the qualitative symbols. In similar

fashion, such binomial elements as: [T(AL)-Q(CT)], [T(VQ)-Q'(ch)], and [T'(aq)-Q'(cp)] also occur.

The binomial elements are linked with such elements as: (I-A'), from the second set, and, say, (R-M') from the third set, to form profiles <u>over</u> the "product style." An example of <u>one</u> such profile would be:

[T(VL)-Q(CS)] X [I] X [R-M']

Another profile would be:

[T(AL)-Q(CEM)] X [I-A'] X [L]

These profiles and others are given behavior interpretations in Chapter V in the section dealing with the conclusions of the study.

TABLE 4

BUSINESS ADMINISTRATION

The composite map of the selected ideal student as determined by the computer print-out. (See Appendix F) and empirical mapping.

$$g = \begin{pmatrix} T'(aq)T'(al)T'(vl) \\ Q(CEM) \\ Q(CS) \\ Q(CET) \\ Q'(cp) \\ Q'(ct) \\ Q'(ckh) \\ Q'(ces) \\ Q'(ck) \end{pmatrix} \quad \begin{pmatrix} I, I \\ F' \end{pmatrix} \quad \begin{pmatrix} L \end{pmatrix}$$

TABLE 5

BUSINESS ADMINISTRATION

The composite map of the selected non-ideal student as determined by the computer print-out. (See Appendix F) and empirical mapping.

$$g = \left\{ \begin{array}{l} T'(aq)T'(vq) \\ Q(CEM) \\ Q(CS) \\ Q'(cet) \\ Q'(ckh) \\ Q'(cp) \\ Q'(ct) \\ Q'(ck) \end{array} \right\} \left\{ A, I \right\} \left\{ L \right\}$$

You will note that the selected non-ideal student composite display a major Associate in the second set, whereas the theoretical ideal and selected ideal do not.

TABLE 6

COSMETOLOGY

The composite map of the Theoretical Ideal Student as determined by the Collective Raters.

$$g = \begin{Bmatrix} T'(al)T'(aq) \\ Q(CEM) \\ Q(CES) \\ Q(CET) \\ Q(CKH) \\ Q(CS) \\ Q(CT) \\ Q'(ck) \\ Q'(ch) \\ Q'cp) \end{Bmatrix} X \begin{Bmatrix} I \\ F' \end{Bmatrix} X \begin{Bmatrix} D, L \\ M'R' \end{Bmatrix}$$

You will note that no major theoretical symbols are present.

TABLE 7

COSMETOLOGY

The composite map of the Selected Ideal Student as determined by the computer print-out. (See Appendix F) and empirical mapping.

$$g = \begin{Bmatrix} T'(al)T'(aq)T'(vl)T'(vq) \\ Q(CEM) \\ Q(CES) \\ Q(CS) \\ Q(CP) \\ Q(CET) \\ Q(CKH) \\ Q'(ck) \\ Q'(ct) \\ Q'(ch) \end{Bmatrix} X \begin{Bmatrix} I, F \\ A' \end{Bmatrix} X \begin{Bmatrix} R \quad L \\ D' \\ M' \end{Bmatrix}$$

TABLE 8

COSMETOLOGY

The composite map of the Selected Non-Ideal Student as determined by the computer print out. (See Appendix F) and empirical mapping.

$$g = \begin{pmatrix} T'(al)T'(aq)T'(vl)T'(vq) \\ Q(CEM) \\ Q(CS) \\ Q(CES) \\ Q(CK) \\ Q(CP) \\ Q'(ct) \\ Q'(ch) \\ Q'(ckh) \\ Q'(cet) \end{pmatrix} X \begin{pmatrix} I \\ F' \end{pmatrix} \begin{pmatrix} \\ L \end{pmatrix}$$

TABLE 9

LAW ENFORCEMENT

The composite map of the Theoretical Ideal Student as determined by the Collective Raters.

$$g= \left\{ \begin{array}{l} T(VL)T(AL) \\ \\ Q(CET \\ Q(CEM) \\ Q(CS) \\ Q(CK) \\ Q(CKH) \\ Q(CT) \\ Q'(cp) \\ Q'(ch) \end{array} \right\} X \left\{ \begin{array}{c} I, F \\ \\ A' \end{array} \right\} X \left\{ \begin{array}{l} R \\ L' \\ \\ \\ \\ \\ \\ (K) \end{array} \right\}$$

You will note that Q(CET) qualitative code ethic is the highest ranking element.

TABLE 10

LAW ENFORCEMENT

The composite map of the Selected Ideal Student as determined by the computer print-out. (See Appendix F) and empirical mapping.

$$g = \left\{ \begin{array}{l} T'(al)T'(vl)T'(aq)T'(vq) \\ Q(CS) \\ Q(CEM) \\ Q(CET) \\ Q(CP) \\ Q'(ckh) \\ Q'(ct) \\ Q'(ck) \end{array} \right\} \times \left\{ A, I \right\} \times \left\{ \begin{array}{l} L \\ R' \end{array} \right\}$$

TABLE 11

LAW ENFORCEMENT

The composite map of the Selected Non-Ideal Student as determined by the computer print-out. (See Appendix F) and empirical mapping.

$$g= \begin{Bmatrix} T'(vq) \\ Q(CEM) \\ Q(CS) \\ Q(CP) \\ Q(CT) \\ Q'(ck) \\ Q'(ckh) \\ Q'(cet) \\ Q'(ch) \\ Q'(ces) \end{Bmatrix} X \begin{Bmatrix} A \\ I' \end{Bmatrix} X \begin{Bmatrix} R & \\ D' & L' \end{Bmatrix}$$

You will note that the Selected Non-Ideal Student does not display the theoretical visual linquistic or theoretical auditory linquistic at at either the major or minor orientation as does the theoretical ideal and selected ideal.

The following findings indicate composite maps of the commonalities between the various student composites within each curriculum.

Common elements are defined as elements present as well as common major or minor determination.

TABLE 12

BUSINESS ADMINISTRATION

Elements held <u>in common</u> by the Theoretical Ideal and Selected Ideal.

$$\left\{\begin{array}{l} T'(aq) \\ \\ Q(CS) \\ Q(CEM) \\ Q(CET) \\ Q'(ct) \\ Q'(cp) \\ Q'(ck) \end{array}\right\} \times \left\{ I \right\} \times \left\{ L \right\}$$

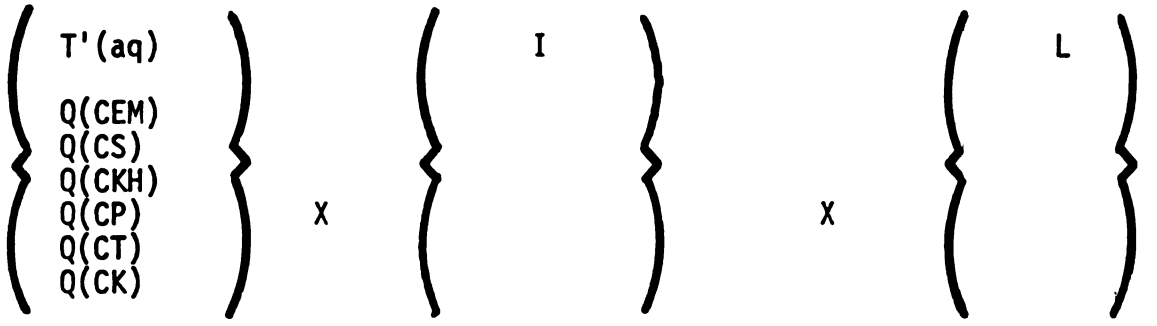
(L - Appraisal is said to be held in common since the appraisal modality of inference contains within it all the modalities).

Elements held in common between the Theoretical Ideal and Selected Non-Ideal.

$$\left\{\begin{array}{l} T'(aq) \\ \\ Q(CS) \\ Q(CEM) \\ Q'(cp) \\ Q'(ck) \end{array}\right\} \times \left\{ I \right\} \times \left\{ L \right\}$$

TABLE 12--continued

Elements held in common between the Selected Ideal and Selected Non-Ideal.



You will note that more major elements are held in common between the Selected Ideal and Selected Non-Ideal than between the Theoretical Ideal and the Selected Ideal.

TABLE 13

COSMETOLOGY

Elements held in common between the Theoretical Ideal and the Selected Ideal.

T'(al)T'(aq) Q(CES) Q(CEM) Q(CET) Q(CKH) Q(CS) Q'(ck) Q'(ch)	X	I	X	L

Elements held in common between the Theoretical Ideal and the Selected Non-Ideal.

T'(al)T'(aq) Q(CEM) Q(CES) Q(CS) Q'(cet) Q'(ch)	X	I	X	L

Elements held in common between the Selected Ideal and the Selected Non-Ideal.

T'(al)T'(aq)T'(vl)T'(vq) Q(CEM) Q(CS) Q(CES) Q(CP) Q'(ct) Q'(ch)	X	I	X	L

You will note that there are five major qualitative codes held in common by the Theoretical Ideal and the Selected Ideal, whereas only three are held in common by the Theoretical Ideal and the Selected Non-Ideal.

TABLE 14

LAW ENFORCEMENT

Elements held in common between the Theoretical Ideal and the Selected Ideal.

Q(CEM) Q(CS) Q(CET)	X	I	X	L

Elements held in common between the Theoretical Ideal and the Selected Non-Ideal

Q(CEM) Q(CS) Q(CT) Q'(ch)	X		X	R

Elements held in common between the Selected Ideal and the Selected Non-Ideal.

T'(vq) Q(CEM) Q(CP) Q'(ckh) Q'(ck)	X	A	X	L

You will note that there are only three common elements held between the Theoretical Ideal and the Selected Ideal in the first set. Whereas there are four common elements between the Theoretical Ideal and the Selected Non-Ideal, and five common elements between the Selected Ideal and the Selected Non-Ideal in the first set.

The following findings indicate composite maps of the differences between the student composites within each curriculum interchanging composites for use as a referent.

TABLE 15

BUSINESS ADMINISTRATION

Using the Theoretical Ideal as referent --

Differences with Selected Ideal

$$\left\{\begin{array}{l} T(VL)T(AL)T(VQ) \\ \\ Q(CT) \\ Q'(ch) \end{array}\right\} \times \left\{\quad\right\} \times \left\{\quad R \quad\right\}_{(K)}$$

Differences with Selected Non-Ideal

$$\left\{\begin{array}{l} T(VL)T(AL)T(VQ) \\ \\ Q(CT) \\ Q(CET) \\ Q'(ch) \end{array}\right\} \times \left\{\quad A' \quad\right\} \times \left\{\quad R \quad\right\}$$

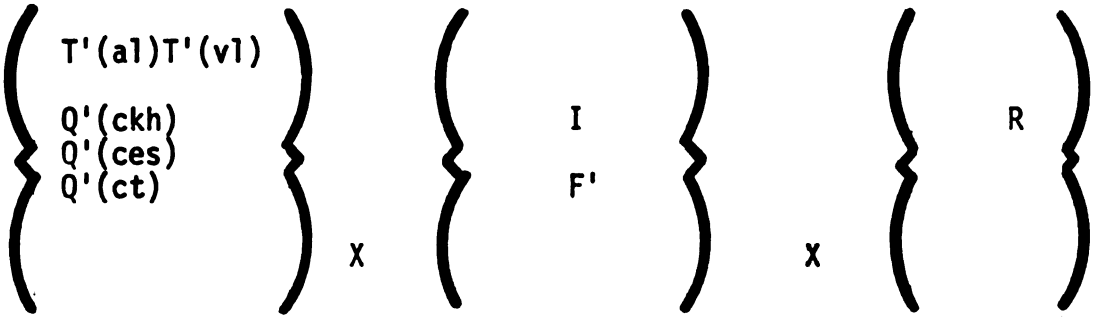
You will note that T(VL), T(AL) and T(VQ) appear as differences with the Selected Ideal as well as the Selected Non-Ideal.

TABLE 16

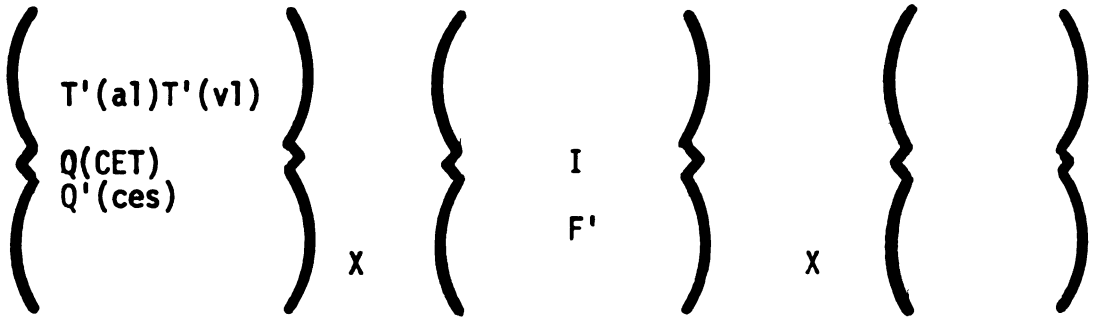
BUSINESS ADMINISTRATION

Using the Selected Ideal student as referent --

Differences with Theoretical



Differences with Selected Non-Ideal



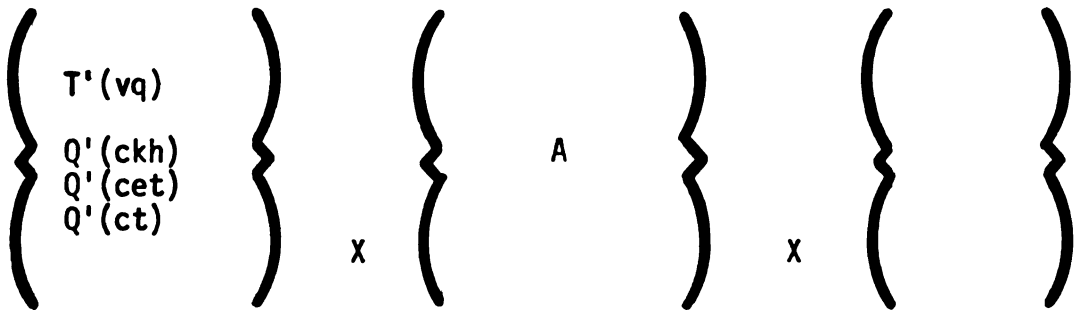
You will note that qualitative code esthetic at the minor orientation appears as a difference with the Theoretical Ideal as well as the Selected Non-Ideal. You can also see that qualitative code ethic at the major orientation is a difference in the Non-Ideal.

TABLE 17

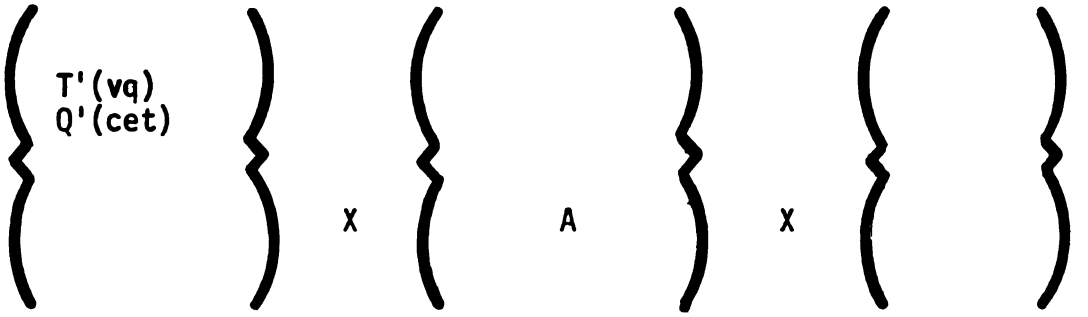
BUSINESS ADMINISTRATION

Using the selected Non-Ideal as referent --

Differences with Theoretical Ideal



Differences with the Selected Ideal



You will note that there are no differences in the third set modalities of inference for either the Theoretical Ideal or Selected Ideal.

TABLE 18

COSMETOLOGY

Using the Theoretical Ideal as referent --

Differences with the Selected Ideal

Q(CT)						
Q'(cet)		I			D	
Q'(cs)						
Q'(cp)	X		X			
		F'			M'	

Differences with the Selected Non-Ideal

Q(CET)						
Q(CT)						
Q(CKH)						
Q'(ck)						
Q'(cp)	X		X			

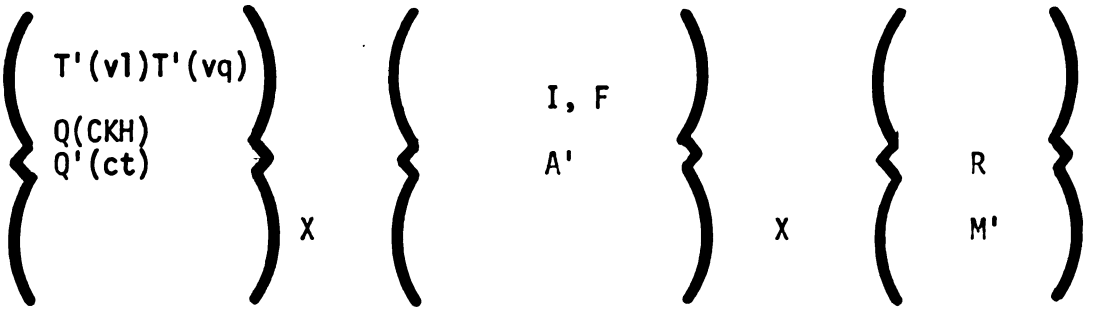
You will note that the differences with the Selected Non-Ideal all appear in the first set and none appear in the second and third set.

TABLE 19

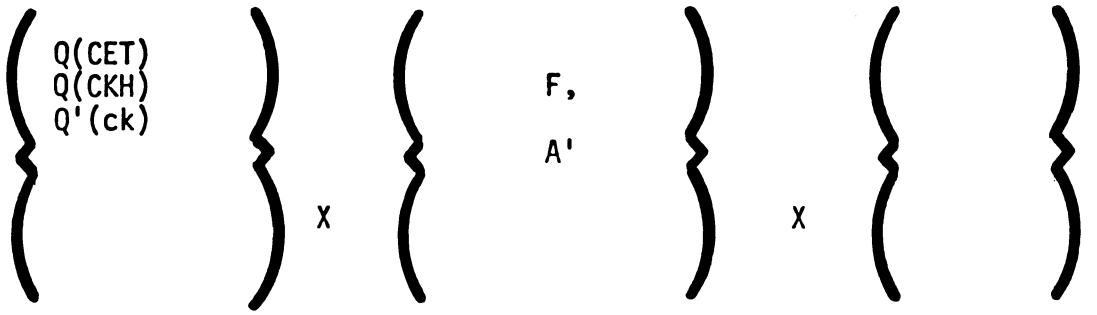
COSMETOLOGY

Using the Selected Ideal as referent --

Differences with Theoretical Ideal



Differences with the Selected Non-Ideal



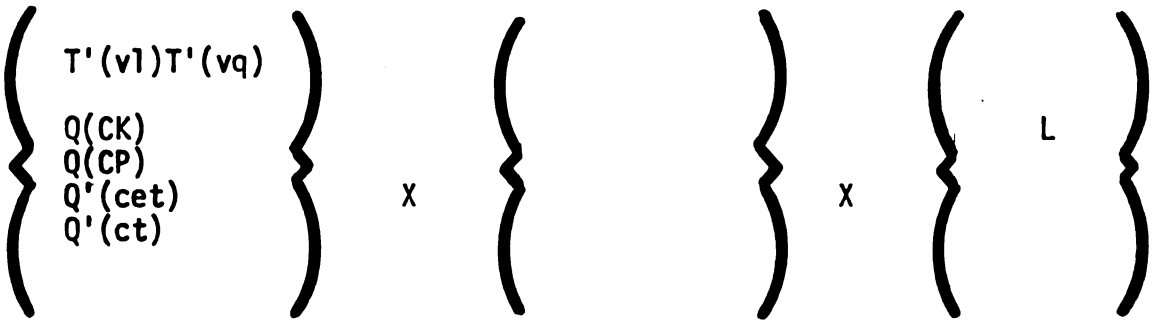
You will note that a major F-family determinant appears as a difference in both the Theoretical Ideal and the Selected Non-Ideal in the second set.

TABLE 20

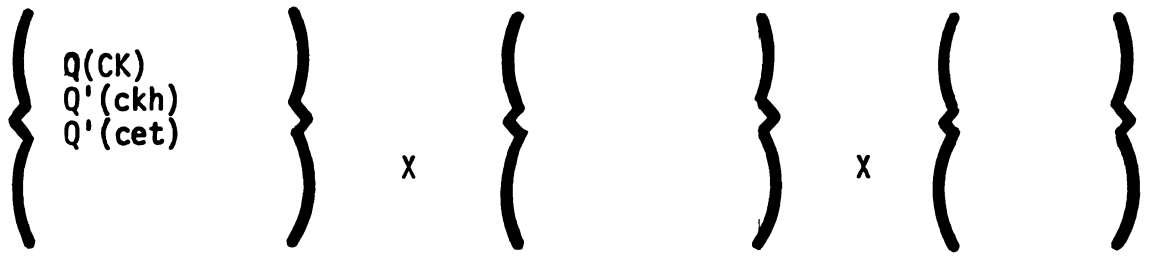
COSMETOLOGY

Using the Selected Non-Ideal as a referent --

Differences with Theoretical Ideal



Differences with Selected Ideal



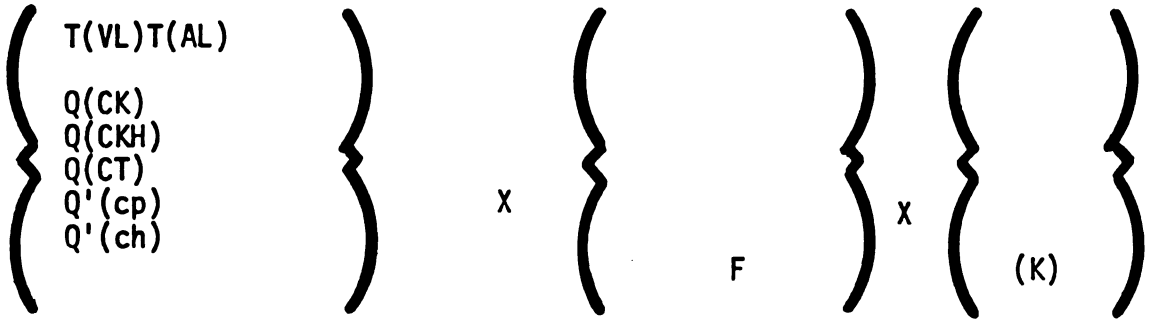
You will note that there are more differences between the Selected Non-Ideal and the Theoretical Ideal than between the Non-Ideal and the Selected Ideal.

TABLE 21

LAW ENFORCEMENT

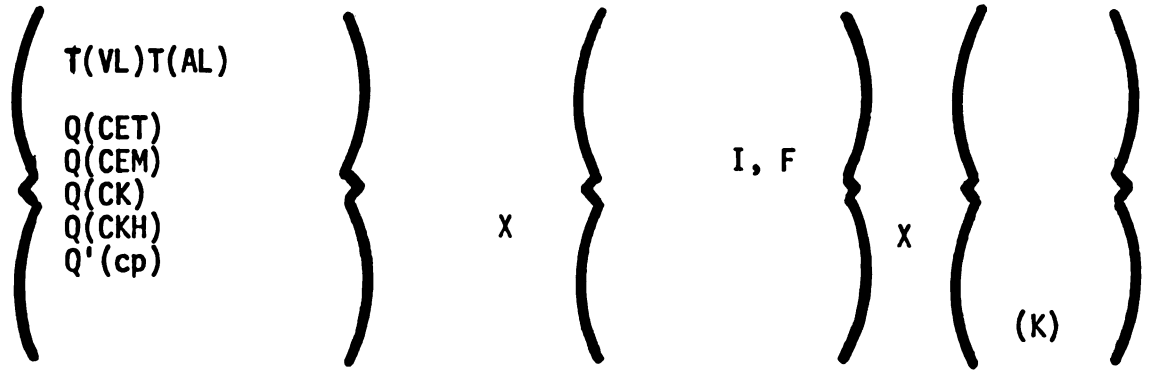
Using the Theoretical Ideal as referent --

Differences with the Selected Ideal



You will note that there are three major qualitative code differences.

Differences with the Selected Non-Ideal



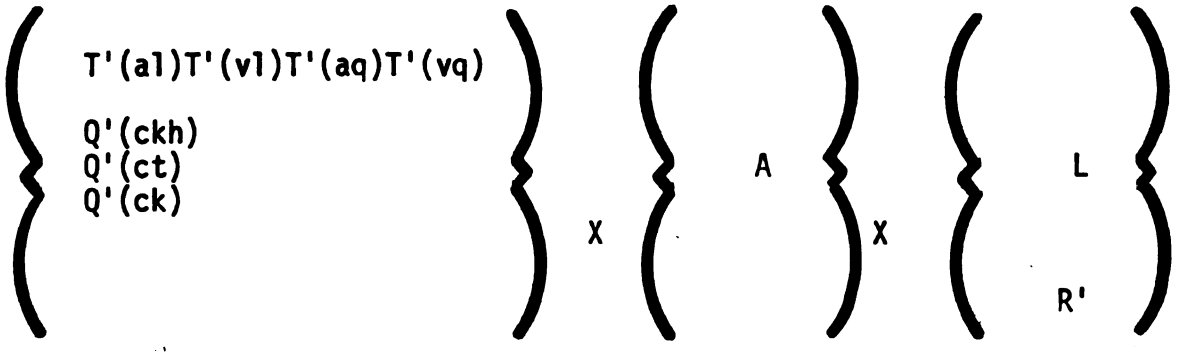
You will note that there are four qualitative code differences, with qualitative code ethic missing in the Selected Non-Ideal profile.

TABLE 22

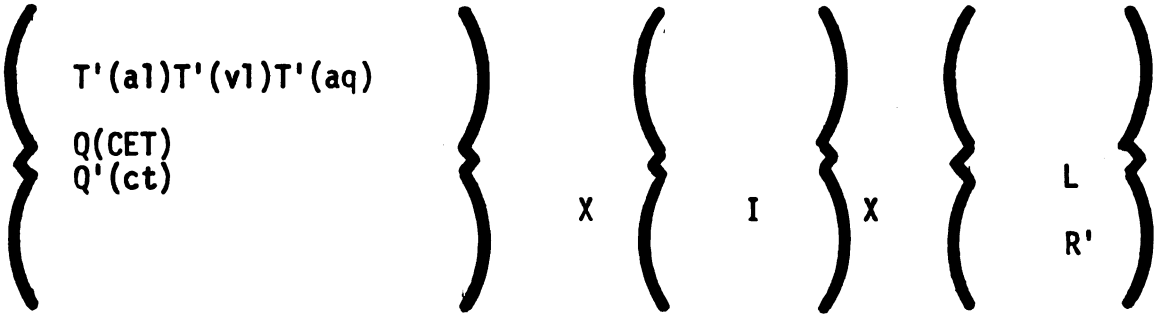
LAW ENFORCEMENT

Using the Selected Ideal as referent --

Differences with Theoretical



Differences with Selected Non-Ideal



You will note that the differences between the Selected Ideal and the Theoretical Ideal are all at the minor level in the first set. A noteworthy difference between the Theoretical Ideal and the Selected Non-Ideal is the absence of the major qualitative code ethic in the Selected Non-Ideal map.

TABLE 23

LAW ENFORCEMENT

Using the Selected Non-Ideal as referent --

Differences with the Selected Ideal

Q(CT)

Q'(cet)
Q'(ch)
Q'(ces)

X

A

I'

X

Differences with the Theoretical Ideal

T'(vq)

Q(CP)
Q'(cet)
Q'(ces)
Q'(ck)
Q'(ckh)

X

A

I'

X

You will note that a difference that appears with both the Selected Ideal and Theoretical Ideal is the presence of cultural determinant A-Associate in the Selected Non-Ideal profile.

SUMMARY

In this chapter, the techniques employed in analyzing the data collected for the study were described. These techniques were discussed as they pertained to the following processes:

(1) Cognitive Style Mapping

(2) a. Determination of the Collective Cognitive Style of the Theoretical Ideal Student Group.

b. Scaling procedures for interpreting the ratings of different raters employed to determine the Cognitive Style of the Theoretical Ideal Student for a given curriculum.

(3) Determination of the Collective Cognitive Style of the Selected Ideal Student Group.

(4) Determination of the Collective Cognitive Style of the Selected Non-Ideal Student Group.

(5) Analyses of the respective styles to determine similarities and differences between them.

In the second major section of this chapter, the findings of the study were presented in the form of (1) Cognitive Styles of the Theoretical Ideal Student Groups, the Selected Ideal Student Groups, and the Selected Non-Ideal Student Groups, (2) Cognitive Styles indicating the differences and similarities between the three types of students within each curriculum.

In the next chapter, the conclusions, implications and recommendations based on the findings of the study are presented.

"CHAPTER V"

CONCLUSIONS AND IMPLICATIONS FOR FUTURE RESEARCH

The four previous chapters have presented the background of the study, a review of the related literature, a description of the design of the study and the analytical techniques employed, and the findings of the study. The final chapter is devoted to conclusions of the study in the form of answers and discussion relevant to the five questions posed in Chapter I. This will be followed by implications for further research in the form of hypotheses as generated from the conclusions.

CONCLUSIONS

The conclusions based on the findings presented in the preceding chapter are presented in the form of answers to the five questions posed in Chapter I. The answers or conclusions to the questions should be viewed as generalizations evolving from this exploratory study, and therefore necessarily subject to further examination in possible subsequent and more comprehensive research studies than the present effort. As an exploratory study, the present study makes no claims to firm and final answers to the questions posed. The generalizations are therefore subject to the limitations inherent in such a study.

QUESTION ONE

What cognitive style elements are common to the group of theoretical ideal, selected ideal and selected non-ideal Business Administration students? What elements are unique to each of these respective groups?

The following elements are those displayed by all three Business Administration student groups in Table 12, Chapter IV and therefore appear to be non-discriminators:

Minor auditory quantitative
Major qualitative code synoetics
Major qualitative code empathy
Major individuality determinant
Major appraisal inferential process

The following elements are those unique to the collective cognitive style of the theoretical ideal Business Administration student group as displayed in Table 15, Chapter IV and therefore appear to discriminate it from the other two student groups:

Major theoretical visual linquistic
Major theoretical auditory linquistic
Major theoretical visual quantitative
Major qualitative code transactional
Minor qualitative code histrionics
Major relationship inferential process
Major deductive inferential process

The following elements are those unique to the collective cognitive style of the selected ideal Business Administration student group as displayed in Table 16, Chapter IV and appear to discriminate it from the theoretical ideal and the selected non-ideal:

Minor theoretical auditory linquistic
Minor theoretical visual linquistic
Minor qualitative code esthetic
Major individuality determinant
Minor family determinant

The following elements are those unique to the collective cognitive style of the selected non-ideal Business Administration student group as displayed in Table 17, Chapter IV and appear to discriminate it from the other two groups:

Minor theoretical visual quantitative
Minor qualitative code ethic
Major associate determinant

DISCUSSION

The following generalizations result from the collective cognitive style of the selected ideal Business Administration student group.[1] The selected ideal Business Administration student with the minor orientation in theoretical auditory linquistic and theoretical visual linquistic would probably have average abilities in subjects requiring extensive reading and writing. He would likely have creative tendencies as manifested by his minor qualitative code esthetic element. This student would probably have the ability to generate new ideas and have an appreciation for beauty helpful to the display and advertising aspects of marketing and retailing. His individuality determinant indicates that he is probably self sufficient and will prefer to act "individually." He would tend to have high drives, authoritarian

[1]The discussion sections will stress consideration of the selected ideal student groups only, in that from a "common sense" point of view, the findings empirically distinquish this group as most representative of each curricula group.

attitudes and leadership qualities. He would likely hold views that are different from the group and would refuse to subordinate himself to common group standards. He probably would suppress family priorities, although he would be aware of them, as witnessed by his minor orientation in his family determinant element; he might place work first and family second.

QUESTION TWO

What cognitive style elements are common to the groups of theoretical ideal, selected ideal and selected non-ideal Law Enforcement students? What elements are unique to each of these respective groups?

The following element is displayed by all three student groups in Table 14, Chapter IV and therefore appear to be non-discriminating:

Major qualitative code empathetic

The following elements are those unique to the collective cognitive style of the theoretical ideal Law Enforcement student group as displayed in Table 21, Chapter IV.

Major theoretical visual linquistic
Major theoretical auditory linquistic
Major qualitative code kinesics
Major qualitative code kinesthetics
Minor qualitative code proxemics

The following elements are those unique to the collective cognitive style of the selected ideal Law Enforcement student group as displayed in Table 22, Chapter IV.

Minor theoretical auditory linquistic
Minor theoretical visual linquistic
Minor qualitative code transactional
Major appraisal inferential process
Minor relationship process

The following elements are those unique to the collective cognitive style of the selected non-ideal Law Enforcement student group as displayed in Table 23, Chapter IV.

Minor qualitative code ethic
Minor qualitative code esthetic
Major associate determinant
Minor individuality determinant

DISCUSSION

It is interesting to note that the element of qualitative code empathetic is present in all three Law Enforcement student groups, but the reader will find that this element is also present in all student groups in the study.

The selected ideal Law Enforcement student would probably possess verbal skills and would use them in a transactional approach to achieving objectives satisfying to himself and others as illustrated by the elements theoretical auditory linquistic, theoretical visual linquistic, and qualitative code transactional. Since the major appraisal inferential process contains all of the inferential processes, he would have the flexibility to selectively draw upon the inferential process situationally appropriate. This would certainly lend itself to reaching fairly rational, effective conclusions and judgments. He would appear to maintain composure and resort less to physical interaction as seems to be demonstrated in the "style" of the theoretical ideal Law Enforcement student. The presence of the minor orientation

relationship process would indicate that he has the ability to see connections or "relationships" and this would obviously be beneficial in "detecting" or deducing from evidence and circumstances. The absence of the deduction inferential process is compensated by the presence of the major appraisal and relationship elements.

Both the theoretical ideal and the selected ideal possessed a major qualitative code ethic, while the selected non-ideal student group possessed a minor qualitative code ethic. It would seem to "make sense" that a potential law enforcement officer should have a commitment to a set of values or a group of rules and regulations. This would appear as a lack in the non-ideal law enforcement students. The presense of the element qualitative code esthetic might not be a necessary characteristic for students in this curriculum. Evidence of this element in a student's cognitive style might indicate other career choices to be more appropriate. The major associate determinant element displayed by the selected non-ideal student group might manifest itself in a reliance on others for help which could prove to be highly dysfunctional in a crisis situation.

QUESTION THREE

What cognitive style elements are common to the groups of theoretical ideal, selected ideal and selected non-ideal Cosmetology students? What elements are unique for these students?

The following elements are those displayed by all three Cosmetology student groups in Table 13, Chapter IV and therefore appear to be non-discriminators:

Minor theoretical auditory linquistic
Minor theoretical auditory quantitative
Major qualitative code esthetic
Major qualitative code synoetics
Minor qualitative code histrionics

The following elements are those unique to the collective cognitive style of the theoretical ideal student group as displayed in Table 18, Chapter IV.

Major qualitative code transactional
Minor qualitative code proxemics

The following elements are those unique to the collective cognitive style of the selected ideal Cosmetology student group as displayed in Table 19, Chapter IV.

Major qualitative code kinesthetic
Major family determinant

The following elements are those unique to the collective cognitive style of the selected non-ideal student group as displayed in Table 20, Chapter IV.

Major qualitative code kinesics
Minor qualitative code kinesthetic
Minor qualitative code ethic

DISCUSSION

Because of the close contact between the cosmetology instructors and their students it had been anticipated that there would be high discrimination between the collective cognitive style student groups. It appears that this is not the case. In exploring the characteristics present in the cognitive style elements of the selected ideal Cosmetology student group, one could speculate that the kinesthetic element and its

associated motor skills provides a dexterity necessary in hairstyling, cosmetic application and manicuring abilities. However, the major family cultural determinant does not appear to be relevant, however, it could merit further exploration.

It would seem that the cosmetology instructors in identifying the theoretical ideal student group, placed emphasis on the interaction between customer and cosmetologist as manifested in the qualitative elements code transactional and code proxemics. This could infer the placement of a priority on "business" expertise rather than skills dexterity.

It is noteworthy that the selected non-ideal student group possesses the element code ethic and would probably behave as a "good" student adhering to rules and regulations. This curriculum area requires more research in order to obtain definitive results.

QUESTION FOUR

Will the differences judged by the instructors between ideal and non-ideal students be reflected in the differences in the collective cognitive styles of those students?

The findings indicate that instructors are not highly discriminating between the selected ideal and selected non-ideal student groups for the following empirically derived observations:

a. the large quantity of elements held in common by the selected ideal and selected non-ideal

b. the small quantity of elements that are unique to the selected ideal and the selected non-ideal student groups

It had been anticipated that the selected ideal student groups would differ from the selected non-ideal student groups in obvious differentiations and also the number of differences.

QUESTION FIVE

Considered in the context of the collective cognitive styles of groups of students selected on the bases of instructor ratings, and in terms of student performance, can grade point averages be used as forms of reliability and validity verifiers of these student selection procedures within selected vocational curricular areas?

The findings in Table 2, Chapter IV, indicate that grade point averages discriminate between the ideal and non-ideal students within the Business Administration and Law Enforcement curriculum. It should be noted, however, that the use of grade point averages as verifiers or discriminators would be dependent on selected occupational curricula for the following reasons:

a. immediacy of employment upon completion of the occupational curriculum

b. continuity of specific skills activities from the classroom to the entry step of the occupation

c. the professional skills classes are in greater proportion than the academic classes within the occupational curricula

All of the above reasons would indicate that using the grade point averages of students can be a form of reliability and validity verification for the selection of collective cognitive styles of ideal and non-ideal student groups within occupational curricula. The reader will

note, however, that there is considerably less grade differentiation between the selected ideal and selected non-ideal student groups in the Business Administration curriculum. This can be attributed to the higher proportion of academic classes within this program and the fact that Business Administration students tend to transfer to universities rather than enter employment immediately after completion of the program.

On the other hand, Law Enforcement students tend to more consistently enter their occupation immediately upon completion of the program, or are already employed in the field. The grade differentiation between the ideal and non-ideal students appears to be highly discriminating.

IMPLICATIONS FOR FURTHER RESEARCH

There are a number of implications stemming from the conclusions of this research effort that lend themselves to the generation of relevant hypotheses.

The following hypotheses are derived from the conclusions emanating from Question 1:

Hypothesis 1

> Successful Business Administration students will exhibit only average abilities in subjects requiring extensive reading or writing skills.

Hypothesis 2

> Successful Business Administration students can be identified by certain qualitative code elements in their cognitive style.

The following hypotheses are derived from the conclusions emanating from Question 2:

Hypothesis 3

> The presence of a major qualitative code ethic will predispose a student to be successful in the Law Enforcement curriculum.

Hypothesis 4

> The presence of certain modalities of inference in the cognitive style map of potential Law Enforcement students will predispose them to success in that curriculum.

The following hypotheses are derived from the conclusions emanating from Question 3:

Hypothesis 5

> Cosmetology students that possess skills in personal interaction and communication will achieve higher grades in the cosmetology curriculum than those students evidencing skills dexterity.

Hypothesis 6

> Potential Cosmetology students that display the qualitative code ethic are predisposed to success in that area.

The following hypotheses are derived from the conclusions emanating from Question 4:

Hypothesis 7

> There are significant differences between the instructor determinations of ideal students and non-ideal students as they relate to their cognitive styles.

Hypothesis 8

> Instructor expectations of ideal students within a two-year technical curriculum correlate significantly with grades achieved by students in that curriculum.

The following hypothesis is derived from the conclusion emanating from Question 5 :

Hypothesis 9

> Grade point averages, which represent composite judgments of faculty members, are sufficiently adequate to differentiate cognitive styles of students within the two-year technical programs.

Hypothesis 9 would appear to be the most significant hypothesis generated by this study. Further exploration is recommended in the use of grade point averages as discriminators within the two-year technical curricula. It is recommended that research be restricted to the technical areas for two reasons. First, there is greater probability of intensive interaction between students and teachers; and second, the instructor feels an immediate responsibility for placing the student in the employment field.

It is further recommended that the grade point averages computed be based on technical classes only and should not include general education classes, i. e., those classes that have direct impact of technical faculty judgments should provide the most significant outcomes.

SUMMARY

The purpose of the final chapter has been to present the conclusions and implications for further research. It is hoped that this study has contributed useful information for the continued analysis of cognitive style as it relates to the field of educational guidance and the expansion of knowledge comprising the educational sciences.

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APPENDICES

APPENDIX A

Cognitive Style as an Educational Science

COGNITIVE STYLE AS AN EDUCATIONAL SCIENCE

During the latter half of the 1930's, many psychologists were particularly interested in the study of the consistency and predictability of personality. In the early 1940's, Allport suggested the concept of "style," which essentially he defined as the consistency and pattern of expressive behaviors that individuals manifest in performing various types of activities. In the context of Allport's descriptive definition of style, the term is highly similar to its common use in such expressions as: an individual's way (style) of living, a style of speaking, a writing style, or style of dress. This orientation permits the use of the term "style" to denote an entire pattern of responses, i. e., it can refer to not only a particular way of life, but to a particular class of events (e. g., style of speaking). In this sense, the term "style" is both general and relatively specific, i. e., it is not restricted to a particular denotation (e. g., all aspects of response patterns).

Turning to the consideration of investigations of cognitive behaviors, the traditional approaches in these endeavors have dealt mainly with concept formation. These types of studies have tended to be limited to such considerations as: what are concepts? how are they attained? or, how are they learned? In essence, these efforts have been directed toward investigations of various ramifications of what might be termed "concept learning." Investigators involved in these types of studies, however, have not examined cognitive functions in the context of personality.

During the past ten to fifteen years, the concept of cognitive style has been investigated in the context of cognition as a facet of personality. Witkin, for example, has advanced the notion that the phenomenon described as cognitive style is a type of personality construct expressed in the interaction between perceptual (cognitive) response systems and antecedent conditions in the life history of the subject (person). In this context, then, the investigator is interested in such phenomena as the quality of mother-child relationships as antecedents to certain types of cognitive styles.

Certain contemporary studies of cognitive style have been designed to consider the phenomenon as an individual's particular mode of response to a given set of stimuli (variables). Other modern efforts have sought antecedents, or correlates, between cognitive style and: (1) such personality variables as: dependency, anxiety, and passivity; (2) such cognitive variables as: intelligence, problem-solving, and reasoning; and (3) such psychological processes as: learning, and perception. In essence, then, the contemporary studies of cognitive style involve the investigation of cognitive processes in the context of personality and defined social variables. These approaches indicate the recognition on the part of certain psychologists (e. g., Broverman, Gardner, Kagan, Moss, Sigel, Witkin) that cognitive behaviors form a fundamental part of a socio-personal matrix, and that the employment of certain classes of behavior called "cognitive" have consistent qualities which justify their being defined as stylistic.

The concept of cognitive style employed as an educational science is somewhat different from those described and defined in the discipline of psychology. The construct of cognitive style as defined in terms of the educational sciences is a Cartesian product, G, composed of three sets, S, E, and H, where S denotes the set of elements defining symbolic orientations, E indicates the set of cultural determinants of the meaning of symbols, and H designates the set of modalities of inference. The formal definition of the construct is developed as follows:

Consider the set "S" composed of 288 possible binomial combinations involving major and minor theoretical and qualitative symbolic orientations. Expressed in the form of set notation:

$$S = \left\{ \begin{matrix} (T_x - Q_y),\ (T_x - q_y), \\ (t_x - q_y),\ (Q_y - t_x). \end{matrix} \right\}$$

Where "T" denotes a major theoretical symbolic orientation of an individual; "Q" indicates a major qualitative symbolic orientation; "t" a minor theoretical symbolic orientation; "q" a minor qualitative symbolic orientation, the subscript "x" is a place-holder for one of the following notations: "al" -

auditory linguistic, "aq" - auditory quantitative, "vl" - visual linguistic, and "vq" - visual quantitative; and the subscript "y" holds a place for one of eighteen following notations: "a" - auditory; "o" - olfactory, "s" - savory, "t" - tactile, "v" visual, "p" - proprioceptive, "pk" - proprioceptive kinematics, "pt" - proprioceptive temporal, "cem" - code empathetic, "ces" - code esthetic, "cet" - code ethic, "ch" - code histrionic, "ck" - code kinesics, "ckh" - code kinesthetics, "cp" - code proxemics, "cs" - code synnoetics, "ct" - code transactional, and "ctm" - code temporal. Since there are 72 possible binomial combinations for each of the four arrangements; i.e., since there are 72 combinations of the form $(T_x - Q_y)$, 72 of the form $(T_x - q_y)$, 72 of the type $(Q_y - t_x)$, and 72 of the "double minor" category $(t_x - q_y)$; "S" is a finite set composed of $4 \times 72 = 288$ elements.

Consider similarly the fifteen elements, twelve of which are binomial combinations and three of which are of monomial form, comprising the set "E" called "the cultural determinants of the meanings of symbols." Expressed in set notation:

$$E = \left\{ \begin{array}{lll} I, & A, & F, \\ (I - a_{(z)}), & (A - i_{(z)}), & (F - i_{(z)}, \\ (I - f_{(z)}), & (A - f_{(z)}), & (F - a_{(z)}). \end{array} \right\}$$

where "I" indicates a major "individuality" determinant of the meanings of symbols, "A" denotes a major "associates" determinant, "F" a major "family" determinant, "i" a minor "individuality" determinant, "a" a minor "associates" determinant, "f" a minor "family" determinant, and the subscript "z" holds a place for either a positive sign (+), or a negative sign (-) depending upon the type of influence the minor determinant involved tends to exert on the individual when he is in the process of determining meanings of symbols (e.g., words sentences, pictures, "feels," stories, "tastes").

Now, consider the set "H" of five monomial and six binomial elements involving what are called "the modalities of inference." Expressed in set notation, the eleven elements appear as follows:

$$H = \left\{ \begin{array}{llll} M, & D, & R, & L, \\ (M-d), & (D-m), & (R-m), & \textcircled{K} \\ (M-r), & (D-r), & (R-d). & \end{array} \right\}$$

Where K denotes a deductive inferential process necessary to the completion of certain types of "educational tasks" (e.g., proving a theorem in Euclidean geometry), "M" indicates a major "magnitude" inferential mode, "D" represents a major modality called "difference," "R" denotes a major modality termed "relationship," "L" indicates a major inferential mode known as "appraisal," "m" denotes a minor modality of "magnitude," "d" represents a minor "difference" mode, and "r" indicates a minor modality of inference called "relationship."

With the definitions of sets S, E, and H completed, a fourth set G, expressed as a Cartesian product, is possible. Thus, G becomes:

$$G = S \times E \times H,$$

or:

$$G = \left\{ \begin{array}{c} \underline{S} \\ (T_x - Q_y), (T_x - q_y), \\ (t_x - q_y), (Q_y - t_x) \end{array} \right\} \times \left\{ \begin{array}{ccc} \underline{E} & & \\ I, & A, & F, \\ (I - a_{(z)}), & (A - i_{(z)}), & (F - i_{(z)}), \\ (I - f_{(z)}), & (A - f_{(z)}), & (F - a_{(z)}) \end{array} \right\} \times \left\{ \begin{array}{cccc} \underline{H} & & & \\ M, & D, & R, & L \\ (M-d), & (D-m), & (R-m) & \textcircled{K} \\ (M-r), & (D-r), & (R-d). & \end{array} \right\}$$

A set "g", a Cartesian product of sub-sets of appropriate elements drawn from sets S, E, and H, can be constructed to define the "cognitive style" of an individual (e.g., student, teacher, administrator). Thus, there is an element "g" (a "cognitive style") of set G such that:

$$g = \emptyset(s, e, h) \qquad (1)$$

Where $\emptyset$ (phi) denotes a function in the form of a Cartesian product, and s, e, and h represent sub-sets of the sets S, E, and H, respectively. Obviously, each of these sub-sets are composed of elements unique to them (e.g., $s_1, s_2, s_3, e_1, e_2, h_1, h_2$). This type of notation is useful only in that it permits

a compact representation of the "style" of an individual at a particular point of time and level of accomplishment in his educational development.

Put in another way, the set G can be defined as the universal set, i.e., the set of all possible "cognitive styles" accommodated by the Cartesian product of sets S, E, and H. Consistent with the notation employed in (1), this definition of G becomes:

$$G = \emptyset (S, E, H) \qquad (2)$$

Under these circumstances, (1) refers to an element of G, while (2) denotes the universal set G. It should also be noted that according to these definitions, s, e, and h could be called the "coordinates" of "g".

Since the set S is composed of a possible 288 elements, 15 elements comprise E, and H includes 11, it follows that the Cartesian product of these sets, i.e., the universal set G, is composed of: 288 x 15 x 11 = 47,520 different "cognitive style" elements at a given level of educational development. This result is based on the reasoning that there are 288 ways of choosing an element from S, 15 ways of choosing one from E, and 11 ways of selecting one from H, or 288 x 15 x 11 possible ways of defining "styles" over S, E, and H. It should be noted, however, that in actual practice the maximum number of elements that can be included in an individual's style "g", at a given level of educational development, is: 72 x 4 x 8 = 2304.

According to the language of set theory, although G is called the "Cartesian product" (or "direct product") of sets S, E, and H, the term "product" only denotes how the number of elements (47,520) in G was defined. This approach to enumerating (counting) the number of elements in G does not imply that any algebraic operations are to be performed on the elements themselves.

In analogous fashion, the cognitive style of an individual, $g = \emptyset (s, e, h)$, is called "the Cartesian product of the sub-sets s, e, and h. The elements comprising the respective sub-sets serve as coordinates, or "profiles," of an individual's "cognitive style."

The construct called "cognitive style" can now be described as a Cartesian product, or direct product, of three sub-sets, i. e., s, e, and h, with the elements comprising these sub-sets serving as coordinates, or "profiles," of an individual's style. The phraseologies "Cartesian product" and "Cartesian space" are synonymous in mathematical lexicon, i. e., the term "space" is synonymous with "set." Therefore, a Cartesian product is a particular type of space (or set) whose elements may serve as coordinates of "profiles" defined over that space. In this context, a cognitive style profile is a coordinate space of a Cartesian product. The term "space," as used here, emphasizes the non-numerical, and the non-algebraic points of departure of various constructs which can be considered by means of modern mathematics methods.

Mapping

Classifying the elements of a given set (e. g, set A) into two categories included in a second set (e. g., B) is a process mathematicians call "mapping." The notation usually employed for this process is:

$$A \longrightarrow B \qquad (3)$$

The notation in (3) indicates a correspondence between the elements of set A and those of set B. In this example, set A is called the domain of the mapping, and B the range.

Mathematical mappings employ only the theoretical symbols of abstract logic or mathematics. Empirical mappings involve persons making judgments on a "makes sense" or "does not make sense" basis to classify elements (e. g., persons, processes, and properties of a social system called "curriculum") into "logical" categories. This type of decision-making employs not only theoretical symbolic mediations (e. g., "words" and "numbers") but demands qualitative symbolic aspects of reasoning (e. g., "picturing" the solution of a problem) as well. For example, in order to diagnose (map) the cognitive style ("g") of an individual, the "educational scientist" (e. g., teacher) must consider the individual's level of educational development in terms of the elements included in the sets S, E, and H, respectively. Empirically, the diagnostician ("scientist") must decide which elements in the sets S, E, and H, respectively, are appropriate

for inclusion in the sub-sets s, e, and h that form the individual's cognitive style. This approach demands the classification of the elements of S into two categories: s and $\tilde{s}$ (not s); E into the two categories: e and $\tilde{e}$ (not e); and H into h and $\tilde{h}$. The process involved here is called "empirical mapping." This type of mapping (diagnosis) can only be effected by a person (e. g., educational scientist) classifying the elements involved on a "makes sense," or "does not make sense" basis. If a mathematical mapping of these elements were desired, there would need to be a logical and theoretical vehicle (e. g., a formula, or equation) available by which the decision could be derived. In this case, a person is not actually involved in the decision-making process associated with the classification. Under these circumstances, the decision is rendered by performing indicated operations on the logical (mathematical) function used to determine the desired outcome. The point to be made is that the mapping of cognitive styles is mainly empirical in nature, and as such, is dependent upon the judgments of persons (diagnosticians) responsible for the process of classifying the elements of symbolic orientations, "cultural determinants," and modalities of inference into Cartesian products that represent the cognitive styles of the individuals under consideration.

The cognitive style of an individual cannot be empirically mapped without considering: (1) the level of educational development of the person, (2) the general symbolic conditions of educational tasks he will be called upon to accomplish, (3) certain antecedents (e. g., family) to his present state of development, and (4) the appropriateness of the elements under consideration for the conditions under which the educational tasks must be completed. The mapping of an individual's style is also affected by the diagnostician's cognitive style. In this context, diagnostic teams have generally been able to produce "styles" of higher predictive and concurrent validity than those "mapped" by the individual diagnostician.

Relationship

In order to reduce the amount of notation associated with the discussion and description of the processes and procedures associated with the empirical mapping of an individual's cognitive style, it is necessary

to consider a concept basic to all science, i. e., the concept of "relationship." The most useful definition of relationship for any branch of science is the one which mathematicians have developed in terms of the elementary concepts of set theory. The definition in question is:

A relationship is a sub-set of a Cartesian space.

A binary relationship is one whose Cartesian space is defined by two sets. A relationship of "n" dimensions (n-ary condition) can always be expressed as a binary relation by distributing the n sets over two groupings, and then defining the Cartesian space of these two groupings (sets) as the binary relation. It is in this sense that the diagnostician (e. g., "educational scientist") maps the n-profiles of an individual's cognitive style into the three sub-sets comprising the Cartesian product representing his style.

A function is defined to be a binary relationship. Therefore, the concept of function and that of mapping, as discussed here, are identical.

From equations (1) and (2) above, it should be noted that "g" is a function of s, e, and h; and that G is a function of S, E, and H. These facts were noted by including "Ø" (phi) to represent the functional relationships involved. These functional relationships permit the following notation to describe, with a minimum number of symbols, the process involved in: (1) the empirical mapping of an individual's cognitive style, and (2) the mapping of an augmented cognitive style. In this context, the notation in (4) describes the mapping of an individual's "style":

$$G \rightarrow g \qquad (4)$$

Where g denotes an individual's cognitive style derived from the "universal" set G composed of: 36,960 possible "profiles."

The cognitive style of an individual can be changed by the process of training and education. A cognitive style is considered to be changed at the training level of development when the individual exhibits behavior (e. g., responses to certain test variables, demonstration of certain physical actions) of his having acquired at least one or more elements in at least one of the sub-sets comprising his cognitive style.

This accomplishment can be noted by the expression shown in (5):

$$g \rightarrow g_a \tag{5}$$

Where g_a denotes the augmented cognitive style of the individual, and g is as previously defined in (4). This type of augmentation is defined to be training. When individual demonstrates behavior which indicates that he is employing the "augmented elements" of his "style" to accomplish educational tasks different from those used to effect the original augmentation of his "style," he is considered to be educated at a level of development higher than the one which was associated with his original cognitive style "g."

APPENDIX B

COLLECTIVE COGNITIVE STYLE SURVEY

Instructor _____

Curriculum _____

Date _____

INSTRUCTIONS:

Please read the following definitions carefully and evaluate each one as the characteristic of the potential ideal student in the _____ curriculum.

EXAMPLE:

Qualitative Code Ethic - commitment to a set of values, a group of principles, obligations and/or duties. This commitment need not imply morality. Both a priest and a criminal may be committed to a set of values although the "values" may be decidely different.

On a scale of 1-5, where 5 is the most desirable and 1 is least desirable, how important is this characteristic for the ideal student in your curriculum?

1_____2_____3_____4_____5_____

If you have any questions, please feel free to ask?

1. Theoretical Visual Linguistic--ability to find meaning from the printed word. A rating of 3 or higher indicates a student who reads with a better than average degree of comprehension and one who exhibits a better than average understanding of grammatical structure.

1_____2_____3_____4_____5_____

2. Theoretical Auditory Linguistic--ability to acquire meaning from the spoken word.

1_____2_____3_____4_____5_____

3. Theoretical Visual Quantitative--ability to acquire meaning from printed symbols and math relationships.

1_____2_____3_____4_____5_____

4. Theoretical Auditory Quantitative--ability to derive meaning from spoken symbols and math relationships.

1_____2_____3_____4_____5_____

5. Qualitative Code Empathetic--sensitivity to the feelings of others; ability to put yourself in another's place and identify with the role of another individual.

1_____2_____3_____4_____5_____

6. Qualitative Code Esthetic--ability to enjoy the beauty of an object or of the pureness of an idea.

1_____2_____3_____4_____5_____

7. Qualitative Code Ethic--commitment to a set of values, a group of principles, obligations and/or duties. This commitment need not imply morality. Both a priest and a criminal may be committed to a set of values although the "values" may be decidely different.

1_____2_____3_____4_____5_____

8. Qualitative Code Histrionic--ability to exhibit a deliberate behavior, or play a role to produce some particular effect on other persons. This type of person knows how to fulfill role expectations.

1_____2_____3_____4_____5_____

REMEMBER: 5 is most desirable and 1 is least desirable.

9. Qualitative Code Kinesics--ability to understand and to communicate by non-linguistic functions such as facial expressions and motions of the body (e. g., smiles and gestures).

1_____2_____3_____4_____5_____

10. Qualitative Code Kinesthetic--ability to perform motor skills, or effect muscular coordination according to a recommended or acceptable form (e. g., bowling according to form, or golfing).

1_____2_____3_____4_____5_____

11. Qualitative Code Proxemics--ability to judge the physical and social distance that the other person would permit, between oneself and that other person.

1_____2_____3_____4_____5_____

12. Qualitative Code Synoetics--a "realistic" personal knowledge of oneself.

1_____2_____3_____4_____5_____

13. Qualitative Code Transactional--ability to maintain a positive communicative interaction which significantly influences the goals of the persons involved so that there are positive outcomes for both.

1_____2_____3_____4_____5_____

14. Qualitative Code Temporal--ability to respond or behave according to time expectations imposed on an activity by members in the role-set associated with that activity.

1_____2_____3_____4_____5_____

CULTURAL DETERMINANTS

The following three statements indicate the degree of the influence on the meanings of symbols mediated by an individual.

15. Family--indicates a major family influence, or an extremely close friend.

1_____2_____3_____4_____5_____

16. Associates--indicates influence by colleagues, friends or persons other than those qualifying as family.

1_____2_____3_____4_____5_____

17. Individuality--the need of the individual to influence the meaning of symbols with his own interpretation.

1_____2_____3_____4_____5_____

MODALITIES OF INFERENCE

The following five statements indicate the form of inference which the person employs.

18. Magnitude--a form of "categorical reasoning" that utilizes norms or categorical classifications as the basis for accepting or rejecting a decision or opinion. Persons who need to define things in order to understand them reflect this form of inference.

1_____2_____3_____4_____5_____

19. Difference--this pattern suggests a tendency to reason in terms of one-to-one contrasts or comparisons of selected characteristics or measurements. Artists often possess this modality as do creative writers and musicians.

1_____2_____3_____4_____5_____

20. Relationship--this modality indicates the ability to synthesize a number of dimensions or incidents into a unified meaning, or through analysis of a situation to discover its component parts. Psychiatrists frequently employ the modality of relationships in the process of psychoanalyzing a client.

1_____2_____3_____4_____5_____

21. Appraisal--is the modality of inference employed by an individual who uses all three of the modalities noted above (M. D. and R) giving weight to each in his reasoning process. Individuals who employ this modality tend to analyze, question, or in effect, appraise that which is under consideration in the process of drawing a probability conclusion.

1_____2_____3_____4_____5_____

REMEMBER: 5 is most desirable and 1 is least desirable.

22. Deductive--indicates deductive reasoning or the form of logical analysis requiring premises and a conclusion that is a necessary consequence of the process employed.

1_____2_____3_____4_____5_____

APPENDIX C

PROBLEM SET ON: (1) SCALING ITEMS IN TERMS OF DIFFICULTY, (2) STANDARD SCORES, (3) PERCENTILE SCALING, AND (4) SCALING JUDGMENTS

1. Scaling Test Items in terms of Difficulty

The term scale, in the context of mental measurement, is considered to be a continuum throughout which entities such as items, tasks, and performances are located in terms of some attribute such as difficulty. The location of the zero point of a scale is an arbitrary decision made by the constructor of the scale. The size of the units of a scale may be arbitrarily determined by its constructor, but, ideally, should be equal, maintain the same meaning, and remain stable throughout the range of the scale.

In order to construct an instrumentality designed to accommodate a wide range of levels of educational development, it is necessary to include problems, tasks, or performances graded in terms of known steps or intervals of difficulty over a range beginning with items seeking responses that are relatively easy for the respondents to produce through those that present a great challenge to each respondent. It is possible to construct a crude scale of difficulty by arranging the items comprising an instrumentality in a percent order of difficulty. It should be noted, however, that percent differences are not always satisfactory indices of differences in difficulty of items.

If it can be assumed that the measurements of a "style" element are distributed approximately normally, then the variability of the measurements of a group, i. e., the standard deviation (σ) unit of a normal distribution associated with the percent of group passing, provides a better means for scaling difficulty than does the approach of "percent of group passing each of the items" alone. The "variability" approach makes it possible to locate and space items in terms of σ distance at specific points along a continuum of difficulty. In this context, the positions of the items relative to each other, as well as being relative to a selected "zero point," are then known in terms of a stable unit, i. e., in terms of standard deviation, or σ scaling. The

following example, and the five step approach which it includes, describes how this type of scaling can be used in the construction of an instrumentality.

Suppose that a scale is to be constructed to measure qualitative proprioceptiveness, Q(P), of children in grades K-3; or a scale is to be constructed for measuring qualitative code kinesthetics, Q(CKH), reflected by children in grades 4-6; or a scale for measuring qualitative code temporal, Q(CTM in high school students is to be formed. The process for constructing such an instrumentality, based upon an item analysis approach, can be effected by the following five steps:

(1) Prepare a large number of items, or tasks, or performances that range in difficulty from a very elementary, or easy, level to a highly advanced, or difficult, level in the element of "style" being sampled; and administer this collection to a large number of individuals drawn randomly from the population (group) for which the instrumentality is being designed. For example, if a scale is to be constructed to help teachers assess qualitative proprioceptiveness, Q(P), in children grades K-3, a large number of items describing tasks or performances such as: putting wooden pins in a peg board, coloring within lines, walking a balance beam, and tossing bean bags at a target, should be compiled. During the time that these tasks are being compiled each one of them should be assessed for level of difficulty by observing the level of educational development of the children finding it easy to perform the task in question and the "level" of those children having a decidedly difficult time in effecting the performance requested. After all the items have been sorted according to their possible levels of difficulty, they are administered to a large sample of pupils drawn from the population of children in "grades" K-3 available to the constructor of the instrumentality.

(2) After the collection of "items" has been administered to the sample group, calculate

the percent of the group that performed satisfactorily on each item, where the term "satisfactorily" pertains to a performance leading to a mapping of either a minor or major orientation at the grade level the "item" was considered to sample, this grade level having been determined on the basis of pilot study information produced during the time the item was being developed. Eliminate items that are duplicates, those that appear to be too easy to master, those that are too difficult, and those that may be unsatisfactory for other reasons. Arrange the items selected for inclusion in the instrumentality, i. e., the scale, in an order of descending percents of difficulty. In this context, a task performed successfully by 95 percent of the sample group is easier than one accomplished by 80 percent of the group, while in turn the latter task is less difficult than one successfully performed by 60 percent of the sample group. Thus, the greater the percent of students accomplishing the task, the less difficult the item is considered to be, and therefore the lower the item is to be placed in a scale of difficulty.

(3) Employing a table of values of a cumulative normal distribution,* the percent of students successfully performing the task associated with the item under consideration is converted into a positive, or a negative, standard deviation distance, i.e., a ($+\sigma$), or a ($-\sigma$) distance, relative to the mean. Recalling the inverse relationship between the percent of group successfully accomplishing an "item" and the σ distance above (+), or below(-), the mean. To illustrate this point,in the earlier example, the task accomplished successfully by 95 percent of the sample group would be located $-1.645\,\sigma$ (below) from the mean; the task which was successfully performed by 80 percent of the group would be located $-1.282\,\sigma$ units below the mean; the task "accomplished" by 60 percent of the group would be located, approximately, $-.25\,\sigma$ below the mean; and if there were another task which only 30 percent of the group successfully performed,

*See attached table.

it would be located, approximately, +.525σ (above) from the mean. It is in this fashion that each item can be located along a continuum of difficulty, assuming that the distribution of difficulty is distributed normally.

(4) After the σ distance of each "item" has been determined, find the σ distance of each item from the zero point, i. e., from the level of zero ability, on the scale (continuum). The zero point can be located arbitrarily as follows: Suppose that 2.5 percent of the entire group fail to perform satisfactorily on all the items being considered. This result could place the level of zero ability 47.5 percent of the distribution below the mean, or at a distance of, -1.96σ from the mean. It should be noted that the decision regarding the location of the zero point of a scale is always an arbitrary one, and merely locates a reference point (e. g., a level of minimum ability) from which performance can be measured. The point, -3.00σ is often chosen as a convenient zero or reference point when the normal distribution is assumed to pertain to the activity under consideration. To illustrate how the σ distance of each item from the zero point can be determined, the examples used in Step (3) are shown in the table below:

	Items			
	A	B	C	D
Percent Performing Successfully	95	80	60	30
Distance from Mean in Percent Terms	-45	-30	-10	+20
σ Distance from Mean	-1.645	-1.282	-.25	-.525
σ Distance from Arbitrary Zero Point, -1.96	-(-1.960) = +.315	-(-1.960) = +.678	-(-1.960) = +.710	-(-1.960) = +2.485

It should be noted that the value of the σ distance of an item from the zero point or reference point is determined by subtracting algebraically the σ distance of the zero point from the mean, from that of the item. For example, the σ distance of Item A from the zero point is: -1.645 - (-1.960) = +.315; for Item B: -1.282 - (-1.960) = +.678; while for Item D: +.525 - (-1.960) = +2.485.

(5) When the distance of each item from the reference point has been determined, the difficulty of each item relative to that of the others, and to the zero point, is known and the scaling process is completed. What is done with the instrumentality beyond this point depends upon the purposes of the constructor. A large number of items separated by relatively small σ distances may be selected so that the instrumentality covers a fairly wide range of educational development. On the other hand, the range may be limited to items from -2.50 σ distance to +2.50 σ, and the instrumentality might be composed of a relatively few items spaced at, say, .5 σ distance of difficulty. The σ distance approach provides a means for establishing "norms" for an instrumentality designed for individuals of different levels of educational development, or different ages, or different school grades, or for persons comprising each of several different occupational groups.

2. Standard Scores

If there are constraints in terms of time or human resources, instead of scaling separate items of an instrumentality, it is possible to scale aggregates of items or total scores. One of the more popular approaches to this end is that of standard scores.

Scores made by the same individual on several different instrumentalities cannot usually be compared directly because of differences in the units of the instrumentality. In other cases, the scores of individuals in the same group earned on each of, say, four different tests cannot be

compared directly because of the change in the variability of the group's performance from one test to another. One means of overcoming these difficulties is to translate the raw score of an individual on a test to standard score form.

It can be shown that the mean of a group's standard scores of the form:

$$Z = 50 + 10\left(\frac{X-\bar{X}}{S}\right)$$

Where Z denotes the standard score, X is the raw score of an individual on an instrumentality, $\bar{X}$ is the value of the mean score of the group's performance on the instrumentality, and S is the value of the standard deviation of the distribution of the group's scores on the instrumentality. The mean of a set of Z scores is: $\bar{Z} = 50$, and the standard deviation is: $S_z = 10$. Employing this formula, the comparison of scores made by the same individual on several different tests can be effected, but even more importantly the performance of an individual over a series of tests can be compared with those of another individual over the same series of tests. For example, suppose that the distribution of scores for Student A and Student B, respectively over three tests, are as shown in the table:

	Students' Raw Scores (X)		Mean	S.D.
Test	A	B	$\bar{X}$	S
1	90	70	80	2.5
2	80	80	80	5.0
3	70	90	80	10.0

At first glance, the arithmetic average (mean) of Student A's raw scores: $\bar{X}_A = \frac{90+80+70}{3} = 80$, and the mean of Student B's raw scores over the three tests is: $\bar{X}_B = \frac{70+80+90}{3} = 80$. Moreover, A's performance appears to have declined over the three tests, while B's performance reflects a gain or improvement trend. Translating the raw scores to Z scores, it is found that:

	Student A	Student B
Test 1	$Z = 50 + 10\left(\frac{90-80}{2.5}\right) = 90$	$Z = 50 + 10\left(\frac{70-80}{2.5}\right) = 10$
Test 2	$Z = 50 + 10\left(\frac{80-80}{5}\right) = 50$	$Z = 50 + 10\left(\frac{80-80}{5}\right) = 50$
Test 3	$Z = 50 + 10\left(\frac{70-80}{10}\right) = 40$	$Z = 50 + 10\left(\frac{90-80}{10}\right) = 60$

The total of Student A's Z-scores would be: 180 (N. B. the mean score of a series of Z-scores earned on different tests is not itself a mean Z-score); while the total for Student B would be: 120. It is apparent that the level of performance over the three tests expressed in standard score form for each of the students is different, but expressed in raw score form the performance of each would appear to be equal with a slight possible advantage accruing to B because of the improvement or gain trend reflected over the three tests. In this context, it can be seen how Z-scores can be employed to provide a comparable scaling of the performances of individuals over a series of instrumentalities designed to measure the same aspects (e. g., a given "style" element).

Although standard scores make comparisons of otherwise dissimilar scores possible, the T score, which is nothing more than a normalized Z (standard) score increases the stability of the scaling. For example, a Z-score of 70 would indicate that the individual earning this score would be two standard deviations ($S_z = 10$) above the mean ($\bar{Z} = 50$), while a T score of 70 would indicate not only how far above the mean the individual was, but would denote that he was in approximately the 98th percentile of the distribution which has been normalized. Although the transformation of Z-scores to T-scores is a simple procedure, it is omitted here in the interest of purpose, time, and space.

Another means of stabilizing the scaling of scores is that of stanine scores. The term "stanine" is a contraction of the phraseology "standard nine." Essentially, the stanine scale is a condensed form of a scale of T-scores. Stanine scores range from 1 through 9 along the base

line of a normal curve forming a scale in which the "distance" unit is .5σ and the value of the median is 5. The percent of scores in each stanine is shown in Figure 1.

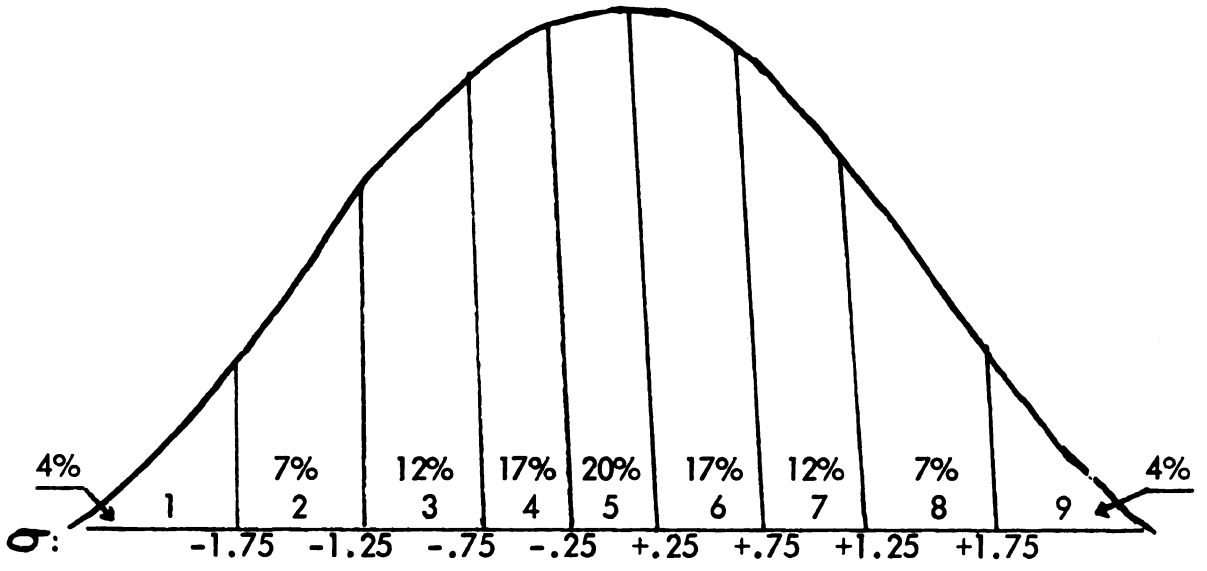

Figure 1. Stanine Scale with Percent of Scores in Each Stanine

Since stanine scores are but a condensed form of a scale of T-scores, once again in the interest of purpose, time and space further discussion is omitted.

3. Percentile Scaling

A percentile rank of a score locates the individual achieving that score on a scale of 100 and indicates the propor on of the group of 100 that has achieved scores lower than that score. An error commonly made by persons employing percentile rank scales is that the difference between a "rank" of 10 and a "rank" of 20 is considered to be the same as the difference between a "rank" of 50 and a "rank" of 60, i.e., that the differences between percentile ranks are equal throughout the range of the scale. This assumption of equal differences among percentile ranks is true only if the distribution of raw scores is rectangular in shape. The assumption is in error when the distribution of raw scores is approximately normal. Since distributions of raw scores are rarely rectangular, but are frequently approximately normal in their distribution, the assumption of "equal differences"

rarely applies.

If the normal curve were partitioned into five sections, each of which included 20 percent of the area under the curve, it would appear as shown in Figure 2.

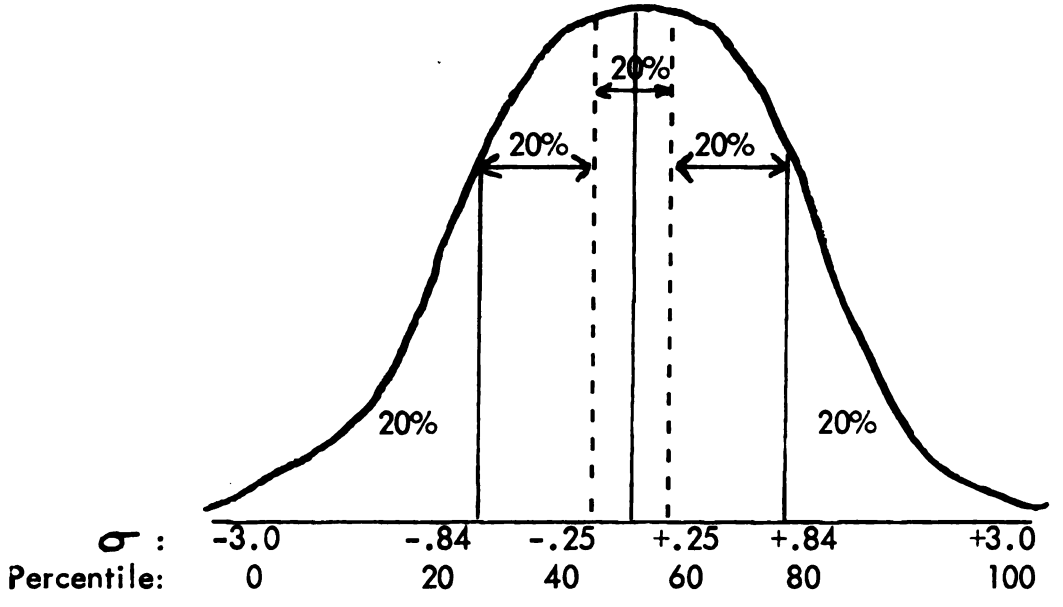

Figure 2. Normal Distribution Showing Relationship Between Quintiles and σ Distances from Mean

From a table of values pertaining to a cumulative normal distribution, if it is assumed that -3.0 σ is associated with zero accumulated area, then the first 20% of the area is accumulated between -3.0 σ and -.84 σ, the second 20% between -.84 σ and -.25 σ, the third 20% between -.25 σ and +.25 σ, the fourth 20% between +.25 σ and +.84 σ, and the fifth 20% between +.84 σ and +3.0. In terms of absolute σ distance, i. e., ignoring the algebraic sign, the first 20% covers: -3.0 - (-.84) = 2.16 σ; the second 20%: -.84 - (-.25) = .59 σ, the third 20%: -.25 - (+.25) = .50 σ; the fourth: +.25 -.84 = .59 σ; and the fifth 20%: +.84 - 3.0 = 2.16 σ.

It should be obvious that the intervals along the base line associated with the 20 percent sections at the lower and upper ends of the distribution, respectively, are approximately four times as long as the one associated with the middle 20 percent section. These relationships are

preserved if percentile ranks are converted to T scores as shown in the array below:

Percentile Rank	σ Distance	T-Score
99	2.33	T = 50 + 10(2.33) = 73
95	1.64	T = 50 + 10(1.64) = 66
90	1.28	63
80	.84	58
70	.52	55
60	.25	53
50	.00	50
40	-.25	47
30	-.52	45
20	-.84	42
10	-1.28	37
5	-1.64	34
1	-2.33	27

Merely by expressing the percentile ranks of raw scores (assuming they are approximately normally distributed) in terms of T-scores automatically converts the scaling of these percentile ranks into an appropriate normalized form.

4. Scaling Judgments

Responses to Questionnaire Items. There are several possible forms of replies to questionnaire items such as: Rarely, Sometimes, Usually; Yes, No; Most Like Me through Least Like Me; or Most, Many, Some, Few, None. In those cases where the respondent is asked to select one of

four or five categories as his response to the item, it is frequently desirable to weight each of the categories in accordance with how divergent it might be from the "neutral," or the "typical" category of the set. In order to solve this problem, it is assumed that the opinions, attitudes, or judgments represented by the set of four or five response categories are approximately normal in their distribution over that set. Under these circumstances, based upon the percent of the group that selects a given category as a response to an item, a σ distance from the mean ("neutral" or "typical" category) can be determined and, in turn, be used as a "weight" for the category in question. Although Garrett discusses a method for scaling: (1) responses to questionnaire items, and (2) judges ratings, by means of employing highly precise σ distances associated with the normal curve,* the use of a scale of T-scores accomplishes these purposes with far less work, and with relatively little loss in the precision of the "weightings" or scalings of the categories involved. It is in this context that a scale of T-scores is employed to "weight" the response categories associated with the item included in the example below.

> Suppose that a questionnaire is composed of 20 statements regarding elements of "demeanor" associated with administrative style. The opinion of the respondent regarding the topic covered by the statement is to be expressed in terms of one of the following five categories: Strongly Agree, Agree, Undecided, Disagree, and Strongly Disagree. If each of these categories associated with the statement:
>
> The administrator who follows the guide of: my goals my way; usually provides good leadership.
>
> Strongly Agree Agree Undecided Disagree Strongly Disagree

*Henry E. Garrett, Statistics in Psychology and Education, Longmans, Green and Co., New York: 1958, Fifth Edition: pp. 323-332.

were selected by the percent of group shown in the table, assuming the selections of these categories by the respondents would be approximately normally distributed, i. e., that relatively few respondents will strongly agree or disagree, while the majority will hold intermediate views, find the "weight" for each category by employing the T-score method of scaling.

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Area of section, or percent of group selecting	13	43	21	13	10
Approximate values of σ distance from mean to baseline point for cumulative area to one-half the section	-1.50	-.40	.43	.98	1.65
T-score	35	46	54	60	67

The values shown in the table are calculated in the following fashion:

Step 1. The percent of group selecting a category is found by dividing the number of selections of the category by the total number of selections. For example, suppose that 100 persons respond to the statement. The data in the top row of the table shows that 13 persons selected the category "Strongly Agree" as representing their opinions of the statement, while 43 selected the category "Agree."

Step 2. The approximate value of the σ distance from the mean ("neutral"

answer) to the baseline point associated with the cumulative area up to one-half the area of the section is explained by the following calculations:

A. In the case of the category "Strongly Agree," one-half of the 13 percent of the group at lower extreme of the normal curve, i. e., 6.5 percent, is at an approximate -1.50 σ from the mean. The value -1.50 is approximated from values found in Table A-4, Cumulative Normal Distribution.

B. Regarding the category "Agree," the area associated with the category "Strongly Agree," i. e., 13 percent, is added to one-half the area (43/2 = 21.5) of the section associated with the category "Agree." This cumulative area of: 13+21.5 = 34.5 is at an approximate -.40 σ from the mean. The value -.40 is approximated from values found in Table A-4, Cumulative Normal Distribution.

C. The cumulative area associated with the category "Undecided" is: 13 + 43 + 21/2 = 66.5; i. e., the area associated with "Strongly Agree," plus the area with "Agree," plus one-half the area of the section associated with "Undecided." Employing Table A-4, a cumulative area of .6650 is found to be associated with an approximate σ distance from the mean of .43.

D. The cumulative area associated with the category "Disagree" is:

13 + 43 + 21 + 13/2 = 83.5. Employing Table A-4, a cumulative area of .8350 is found to be associated with an approximate σ distance from the mean of .98.

E. In the same fashion as those of Steps A-D, the cumulative area associated with the category "Strongly Disagree" is found to be: 13 + 43 + 21 + 13 + 10/2 = 95; and the approximate σ distance from the mean is found to be -1.65.

Step 3. Employing the formula: T = 50 + 10z; where T denotes the "rounded," whole number value of the T-score, and z the σ distance from the mean, the T-scores for each category are found as follows:

Strongly Agree:	T = 50 + 10 (-1.5) = 35
Agree:	T = 50 + 10 (-.40) = 46
Undecided:	T = 50 + 10 (.43) = 54
Disagree:	T = 50 + 10 (.98) = 60
Strongly Disagree:	T = 50 + 10 (1.65) = 67

It should be noted that employing the "average σ distance" method of scaling recommended by Garrett, the standard scores for the categories were found to be: Strongly Agree: 34; Agree: 46; Undecided: 54; Disagree: 60; Strongly Disagree: 68. Only in the categories covering the upper and lower extremes of the normal distribution is there a relatively small difference (one point of score) between the approximative T-score method of "one-half the area σ distance" scaling and the standard score method of scaling based upon the "average σ distance" from the mean approach.

If, in the same fashion, the categories of each of the 20 statements comprising the questionnaire are "weighted" in terms of T-scores, then an individual's "score," i. e., his opinion

regarding the elements of "demeanor" in administrative style, can be found by adding the T-scores assigned to the 20 categories, i. e., one category per statement, which he selected. Since the units of the T-score scale are equal, they may be compared from item to item, from category to category, or from scale to scale. This type of T-score scaling provides a more accurate assessment of the extent to which extreme opinions regarding a given item are divergent from "neutral" opinion than does an arbitrary weighting (scaling) method.

Diagnosticians' Ratings. Many of the orientations of "style" elements for an individual can be mapped on the basis of diagnosticians' ratings of behaviors assumed to be associated with the elements under consideration. In some cases the diagnosticians rate individuals in terms of a five-point scale, where a rating of "5" indicates the "element" is reflected to a marked degree, a rating of "1" denotes a decided lack of presence of the element, and ratings of 4, 3, and 2 indicate intermediate degrees of presence of the element. Each diagnostician assigns a rating of the individual independent from the others. Some diagnosticians tend to rate individuals' behaviors at the higher end of the scale more frequently than at the lower end. Others rate behaviors at the lower end of the scale more frequently than at the higher end. Under these circumstances, it becomes necessary to assign weights to these ratings in order to make them comparable from diagnostician to diagnostician.

The distributions of all the elements associated with the "styles" defined in the Educational Sciences are assumed to be normal in each of the populations of individuals that might be considered by diagnosticians. It is also assumed that diagnosticians are approximately equal in competence to rate the behaviors (and therefore the "elements") under consideration. Under these circumstances, the T-score method of weighting (scaling) the ratings of diagnosticians, in a fashion similar to the one used in weighting categories associated with questionnaire items, can be employed. The following example illustrates the procedure:

Suppose that two diagnosticians, A and B, rated 50 individuals for qualitative code proxemics, Q(CP), on the five-point scale described above. Assume that the percent of individuals are rated by each diagnostician as follows:

	Rating				
Diagnostician	5	4	3	2	1
A	10%	15	50	20	5
B	20	40	20	10	10%

From these tabled percents it is apparent that Diagnostician B rates "higher" than A, and that a rating of 5 by A may not mean the same degree of presence of Q(CP) as a rating of 5 by B.

Employing Table A-4, Cumulative Normal Distribution, the approximate values of σ distance from the mean to a baseline point for cumulative area up to one-half of the section under consideration would be:

	Rating				
Diagnostician	5	4	3	2	1
A	1.65	.95	.00	-1.04	-1.96
B	1.28	.253	-.524	-1.04	-1.65

The approximate T-scores (weights) associated with each of these values would become:

	Rating				
Diagnostician	5	4	3	2	1
A	67	60	50	40	30
B	63	53	45	40	33

From the T-score scalings (weightings) of the diagnosticians' ratings, it is interesting to note

that the rating of "3" assigned by Diagnostician B, which on the surface is the "neutral" or midpoint rating of the range 1 through 5, and therefore could be assumed to be associated with the fiftieth percentile of the presumed to be normal distribution of Q(CP) in the population from which the individuals under consideration were drawn, has a T-score scaling of 45. Since a T-score of 50 is located at the fiftieth percentile of a normal distribution, the T-score scaling of 45 of B's rating of "3" would locate it at approximately the thirtieth percentile. In this context, a rating of "3" assigned an individual by "B" should be interpreted as a minor orientation in the Q(CP) element, while a rating of "3" by A (which shows a T-score of 50) should be considered a minimal major orientation in that element.

The T-score scaling approach is relatively easy to employ when categorical information must be translated into stable units of numerical data. Since all the elements included in the "styles" defined by the Educational Sciences are assumed to be distributed normally throughout any population of individuals, relative judgments (e. g., diagnosticians' ratings) of these elements can be "weighted" by the T-score scaling process.

Problems

1. During a process of item analysis it is found that five problems associated with the measurement of T(VQ) are passed by: 15%, 34%, 50%, 62%, and 80%, respectively, of a large randomly selected group of individuals. If the zero point of ability for these problems is assumed to be at -3.0 σ distance from the mean of the assumed normal distribution of the difficulty of these items, find the σ distance from the reference point for each item. (Ans. In order presented: 4.04; 3.41; 3.00; 2.69; 2.16)
2. On locally constructed instrumentalities designed to measure T(AL) and T(AQ), respectively, the empirically established norms are: Mean = 70 and SD = 5; and Mean = 60 with SD = 7.5, respectively. If an individual earns a score of X = 75 on each

of the instrumentalities, use standard scores to determine if he possesses equal "strength" in the respective elements. (Assume the instrumentalities to be of equal reliability, validity, objectivity, and discriminative power.)

3. Five individuals earned T-scores of: 63, 53, 47, 45, and 42, respectively, on a standardized instrument designed to measure T(VL). Find the percentile rank of each "score," and determine whether the individual with this score should be assigned a major, a minor, or a negligible orientation in the element.

4. On an inventory designed to measure M, D, R, and L, each statement which pertains to only one of the four modalities is to be ranked from 1 through 5 (ranking of 1, high). The rankings of a statement pertaining to the "appraisal (L) modality" were found to be distributed as follows:

1	2	3	4	5
8%	20%	38%	24%	10%

Using the T-score scaling approach, find the "weight" of each ranking category associated with this item. (Ans. 1-32; 2-41; 3-49; 4-58; 5-67)

5. Fifty individuals are rated for "Individuality" (I) on a seven-point scale by two diagnosticians. If the distributions of ratings ("1," high) by the two diagnosticians are as shown below, employ the T-score scaling approach, and determine if the rating of "3" by each diagnostician is different. Which diagnostician is the more lenient of the two in his ratings?

Diagnostician A:

Rating	f
1	5
2	10
3	20
4	5
5	4
6	4
7	2
	n=50

Diagnostician B:

Rating	f
1	2
2	4
3	4
4	5
5	20
6	10
7	5
	n=50

(Ans. A-50; B-60

TABLE A-4. CUMULATIVE NORMAL DISTRIBUTION

z	X	Area	z	X	Area
−3.25	$\mu - 3.25\sigma$	.0006	−1.00	$\mu - 1.00\sigma$	.1587
−3.20	$\mu - 3.20\sigma$	.0007	− .95	$\mu - .95\sigma$	.1711
−3.15	$\mu - 3.15\sigma$	.0008	− .90	$\mu - .90\sigma$	.1841
−3.10	$\mu - 3.10\sigma$	.0010	− .85	$\mu - .85\sigma$	.1977
−3.05	$\mu - 3.05\sigma$	.0011	− .80	$\mu - .80\sigma$	.2119
−3.00	$\mu - 3.00\sigma$	.0013	− .75	$\mu - .75\sigma$	.2266
−2.95	$\mu - 2.95\sigma$	.0016	− .70	$\mu - .70\sigma$	.2420
−2.90	$\mu - 2.90\sigma$	.0019	− .65	$\mu - .65\sigma$	.2578
−2.85	$\mu - 2.85\sigma$	.0022	− .60	$\mu - .60\sigma$	.2743
−2.80	$\mu - 2.80\sigma$	.0026	− .55	$\mu - .55\sigma$	.2912
−2.75	$\mu - 2.75\sigma$	.0030	− .50	$\mu - .50\sigma$	.3085
−2.70	$\mu - 2.70\sigma$	.0035	− .45	$\mu - .45\sigma$	.3264
−2.65	$\mu - 2.65\sigma$	.0040	− .40	$\mu - .40\sigma$	.3446
−2.60	$\mu - 2.60\sigma$	.0047	− .35	$\mu - .35\sigma$	.3632
−2.55	$\mu - 2.55\sigma$	.0054	− .30	$\mu - .30\sigma$	.3821
−2.50	$\mu - 2.50\sigma$	.0062	− .25	$\mu - .25\sigma$	.4013
−2.45	$\mu - 2.45\sigma$	.0071	− .20	$\mu - .20\sigma$	.4207
−2.40	$\mu - 2.40\sigma$	.0082	− .15	$\mu - .15\sigma$	.4404
−2.35	$\mu - 2.35\sigma$	.0094	− .10	$\mu - .10\sigma$	.4602
−2.30	$\mu - 2.30\sigma$	.0107	− .05	$\mu - .05\sigma$	.4801
−2.25	$\mu - 2.25\sigma$	.0122			
−2.20	$\mu - 2.20\sigma$	.0139			
−2.15	$\mu - 2.15\sigma$	.0158	.00	μ	.5000
−2.10	$\mu - 2.10\sigma$	.0179			
−2.05	$\mu - 2.05\sigma$	.0202			
−2.00	$\mu - 2.00\sigma$	.0228	.05	$\mu + .05\sigma$	.5199
−1.95	$\mu - 1.95\sigma$	.0256	.10	$\mu + .10\sigma$	.5398
−1.90	$\mu - 1.90\sigma$	.0287	.15	$\mu + .15\sigma$	.5596
−1.85	$\mu - 1.85\sigma$	.0322	.20	$\mu + .20\sigma$	.5793
−1.80	$\mu - 1.80\sigma$	.0359	.25	$\mu + .25\sigma$	.5987
−1.75	$\mu - 1.75\sigma$	.0401	.30	$\mu + .30\sigma$	.6179
−1.70	$\mu - 1.70\sigma$	.0446	.35	$\mu + .35\sigma$	.6368
−1.65	$\mu - 1.65\sigma$	.0495	.40	$\mu + .40\sigma$	.6554
−1.60	$\mu - 1.60\sigma$	.0548	.45	$\mu + .45\sigma$	.6736
−1.55	$\mu - 1.55\sigma$	.0606	.50	$\mu + .50\sigma$	.6915
−1.50	$\mu - 1.50\sigma$	.0668	.55	$\mu + .55\sigma$	.7088
−1.45	$\mu - 1.45\sigma$	.0735	.60	$\mu + .60\sigma$	.7257
−1.40	$\mu - 1.40\sigma$	.0808	.65	$\mu + .65\sigma$	.7422
−1.35	$\mu - 1.35\sigma$	.0885	.70	$\mu + .70\sigma$	.7580
−1.30	$\mu - 1.30\sigma$	.0968	.75	$\mu + .75\sigma$	.7734
−1.25	$\mu - 1.25\sigma$	.1056	.80	$\mu + .80\sigma$	.7881
−1.20	$\mu - 1.20\sigma$	.1151	.85	$\mu + .85\sigma$	.8023
−1.15	$\mu - 1.15\sigma$	.1251	.90	$\mu + .90\sigma$	.8159
−1.10	$\mu - 1.10\sigma$	.1357	.95	$\mu + .95\sigma$	.8289
−1.05	$\mu - 1.05\sigma$	.1469	1.00	$\mu + 1.00\sigma$	.8413

TABLE A-4. CUMULATIVE NORMAL DISTRIBUTION (*Continued*)

z	X	Area	z	X	Area
1.05	$\mu + 1.05\sigma$	.8531	−4.265	$\mu - 4.265\sigma$	.00001
1.10	$\mu + 1.10\sigma$	.8643	−3.719	$\mu - 3.719\sigma$	.0001
1.15	$\mu + 1.15\sigma$	.8749	−3.090	$\mu - 3.090\sigma$	.001
1.20	$\mu + 1.20\sigma$	.8849	−2.576	$\mu - 2.576\sigma$	.005
1.25	$\mu + 1.25\sigma$	.8944	−2.326	$\mu - 2.326\sigma$	.01
1.30	$\mu + 1.30\sigma$	.9032	−2.054	$\mu - 2.054\sigma$	.02
1.35	$\mu + 1.35\sigma$	.9115	−1.960	$\mu - 1.960\sigma$	.025
1.40	$\mu + 1.40\sigma$	.9192	−1.881	$\mu - 1.881\sigma$	.03
1.45	$\mu + 1.45\sigma$	.9265	−1.751	$\mu - 1.751\sigma$	.04
1.50	$\mu + 1.50\sigma$	.9332	−1.645	$\mu - 1.645\sigma$	.05
1.55	$\mu + 1.55\sigma$	.9394	−1.555	$\mu - 1.555\sigma$	.06
1.60	$\mu + 1.60\sigma$	.9452	−1.476	$\mu - 1.476\sigma$	.07
1.65	$\mu + 1.65\sigma$	.9505	−1.405	$\mu - 1.405\sigma$	.08
1.70	$\mu + 1.70\sigma$	.9554	−1.341	$\mu - 1.341\sigma$	.09
1.75	$\mu + 1.75\sigma$	.9599	−1.282	$\mu - 1.282\sigma$	.10
1.80	$\mu + 1.80\sigma$	.9641	−1.036	$\mu - 1.036\sigma$	.15
1.85	$\mu + 1.85\sigma$	.9678	− .842	$\mu - .842\sigma$	.20
1.90	$\mu + 1.90\sigma$	.9713	− .674	$\mu - .674\sigma$	.25
1.95	$\mu + 1.95\sigma$	.9744	− .524	$\mu - .524\sigma$	.30
2.00	$\mu + 2.00\sigma$	.9772	− .385	$\mu - .385\sigma$	.35
2.05	$\mu + 2.05\sigma$	.9798	− .253	$\mu - .253\sigma$	.40
2.10	$\mu + 2.10\sigma$	.9821	− .126	$\mu - .126\sigma$	.45
2.15	$\mu + 2.15\sigma$	.9842	0	μ	.50
2.20	$\mu + 2.20\sigma$	.9861	.126	$\mu + .126\sigma$	.55
2.25	$\mu + 2.25\sigma$	.9878	.253	$\mu + .253\sigma$	.60
2.30	$\mu + 2.30\sigma$	.9893	.385	$\mu + .385\sigma$	.65
2.35	$\mu + 2.35\sigma$	.9906	.524	$\mu + .524\sigma$	.70
2.40	$\mu + 2.40\sigma$	.9918	.674	$\mu + .674\sigma$	.75
2.45	$\mu + 2.45\sigma$	.9929	.842	$\mu + .842\sigma$	.80
2.50	$\mu + 2.50\sigma$	.9938	1.036	$\mu + 1.036\sigma$	.85
2.55	$\mu + 2.55\sigma$	.9946	1.282	$\mu + 1.282\sigma$	.90
2.60	$\mu + 2.60\sigma$	.9953	1.341	$\mu + 1.341\sigma$	.91
2.65	$\mu + 2.65\sigma$	.9960	1.405	$\mu + 1.405\sigma$	.92
2.70	$\mu + 2.70\sigma$	.9965	1.476	$\mu + 1.476\sigma$	.93
2.75	$\mu + 2.75\sigma$	.9970	1.555	$\mu + 1.555\sigma$	.94
2.80	$\mu + 2.80\sigma$	.9974	1.645	$\mu + 1.645\sigma$	.95
2.85	$\mu + 2.85\sigma$	.9978	1.751	$\mu + 1.751\sigma$	.96
2.90	$\mu + 2.90\sigma$	.9981	1.881	$\mu + 1.881\sigma$	.97
2.95	$\mu + 2.95\sigma$	.9984	1.960	$\mu + 1.960\sigma$	.975
3.00	$\mu + 3.00\sigma$	.9987	2.054	$\mu + 2.054\sigma$	.98
3.05	$\mu + 3.05\sigma$	.9989	2.326	$\mu + 2.326\sigma$	.99
3.10	$\mu + 3.10\sigma$	.9990	2.576	$\mu + 2.576\sigma$	.995
3.15	$\mu + 3.15\sigma$	.9992	3.090	$\mu + 3.090\sigma$	.999
3.20	$\mu + 3.20\sigma$	.9993	3.719	$\mu + 3.719\sigma$	.9999
3.25	$\mu + 3.25\sigma$	.9994	4.265	$\mu + 4.265\sigma$	.99999

Reprinted from: W. J. Dixon and F. J. Massey, Introduction to Statistical Analysis, McGraw-Hill Book Company, New York: 1957: pp. 382-383.

APPENDIX D

PROBLEM SET ON OBJECTIVITY OF PROCESS OF MAPPING "STYLES"

In the chapter on mapping it was noted that by the very nature of the information with which the "mapper" of a "style" must deal, in addition to the variability accruing to his own cognitive style, i. e., the way he views the world, the process of mapping must be relatively subjective. It was also noted that in order to reduce this element of subjectivity, the three Principles for determining major, minor, and negligible orientations of "style" elements, respectively, must be employed throughout the mapping process. In addition to these constraints, data from standardized tests, inventories, and scales should be employed with the Principles in the mapping process. It was further noted that when standardized instruments were not available and locally-constructed instruments had to be employed, certain principles pertaining to: the objectivity of test items, the objectivity of questionnaires, the objectivity of rating scales, and the objectivity of observational methods need to be employed to help reduce the subjectivity of the mapping process.

Although objectivity is given a high priority in the mapping process, the mappings employed in the Educational Sciences are not intended to be impersonal diagnoses. To the contrary, transactions between the subject and the diagnostician are encouraged so that the resulting mappings of measurements and data yielded by the observations involved can become more valid, reliable, and meaningful than they otherwise might be.

In consideration of the fact that the diagnostician, and therefore his mappings, might well be suspect not only in terms of their reliability and validity, but in regard to their objectivity and discriminative power as well, it becomes important to be aware of four main sources of error that tend to be operating during the processes of diagnosing and mapping, respectively. Without regard to ranking in importance to these processes, the sources of error in question are:

Conditions-Time Bias Error. Many behaviors which should be covered by the set of test measurements and/or observations of the individual under consideration may be inadequately sampled (or even omitted), because they occurred too infrequently (or not at all) during the period of observation, or during the testing situation. This source of error can be minimized by increasing the number of "sampling situations," and including a variety of conditions under which observations can be made. In addition to these provisions, lengthening the interval of the observational periods has also proven to be beneficial.

Classification-Bias Error. This source of error is a function of the diagnostician's tendency to interpret several relatively similar behaviors and certain results from measuring instruments in terms of a particular profile of "style" elements, thus assigning a disproprotionate weighting to that aspect of the individual's map. For example, if an individual is observed to behave somewhat different from the "usual" mode of behavior of subjects being observed in a given situation, some "mappers" place increased weightings on the "D" (difference) modality of inference, while the weighting might better be assigned to the subject's "individuality" (I). In any event, this type of error can be minimized by the diagnostician following a pattern of accommodation, and a "wait and see" attitude, while continuing to consider all the possible profiles of elements that might "explain" the behavior.

Role Expectation-Bias Error. Behaviors which certain individuals tend to display during periods of observation and testing are those which they perceive as expected of them at those times. Role expectation errors can be minimized by adjusting when and where observations are made, and by adjusting the setting of the testing period and the type

of instrument to be used. Of paramount importance to the reduction of this type of error is the rapport which the diagnostician can establish with this type of individual.

Cognitive Style-Bias Error. This source of error includes a wide variety of possible response sets on the part of the diagnostician, such as the "halo effect," or at the opposite extreme the "cognitive dissonance effect." The reliability, validity, objectivity, and discriminatory powers of a mapping process may be seriously affected by an intersection (e. g., major match) of the respective cognitive styles of the diagnostician and the individual he is considering. Under these circumstances, the behaviors of the individual might well fulfill the expectancies imposed upon them by the cognitive style of the diagnostician, and a halo effect on the mapping process could result. In similar fashion, but at the opposite extreme, a disjunction (e. g., negligible match, or "low minor") of the "styles" of the diagnostician and the individual, respectively, could lead to each person witnessing cognitive dissonance regarding the other, and the map of the individual's "style" being distorted accordingly.

The effect of cognitive style bias can be minimized by the diagnostician being acutely aware of his own "style," and adjusting his mapping processes accordingly, or even disqualifying himself for the mapping of the individual under consideration. In the field of psychoanalysis this type of bias is dealt with by the psychiatrist undergoing analysis and being completely informed of the results prior to being allowed to practice. In some cases, psychoanalysts have disqualified themselves for the treatment of certain patients because of their knowledge of themselves, and the probable existence of certain factors with which they might not be able to deal objectively.

In many ways the analysis of diagnosticians, and their processes of mapping, is analogous

to attempts to determine the accuracy of his social perceptions, sensitivity to others, self-assessment, and other similar types of factors. It is generally agreed that most such attempts have not yielded valid results. Recent developments in the study of these factors have led to the examination of the process involved instead of the accomplishments evidenced by individuals in these dimensions. These types of approaches are consistent with those employed in the examination of the mapping process in the Educational Sciences, instead of an overt concentration on the accomplishments of the diagnostician regarding these factors.

Objectivity of Diagnosticians. The process of mapping should yield verifiable, reproducible information that is more than the idiosyncratic "mappings" of a given diagnostician. The process of mapping, nonetheless, essentially depends upon a diagnostician (or team of diagnosticians) exercising judgments pertaining to the appropriate orientations of elements of "style" for an individual based upon the results of observations made of that individual under certain conditions, or measurements of his abilities yielded by appropriate tests, scales, or inventorying devices.

Team of Two Diagnosticians. A highly acceptable method for determining the objectivity of a given diagnostician is to compare the orientations of the elements of "style" he maps for a given individual for agreements and disagreements with those mapped for that individual by an experienced diagnostician, where the orientations mapped by both diagnosticians are based upon the same set of data and observatian periods. Under these circumstances, a measure of the objectivity of the diagnostician and his process of mapping could be the percent of agreement between the orientations of the elements of "style" mapped for the individual by the novice and the experienced diagnostician, respectively.

Following a method described by Bernstein,* let P_x be defined as the probability that the

*See Allen L. Bernstein, "An Estimate of the Accuracy (objectivity) of Nominal Category Coding," Michigan-Ohio Regional Educational Laboratory (MOREL) Monograph Series Number One, Detroit, Michigan, October, 1968.

novice diagnostician will map the orientations of the elements of an individual's style "correctly." Let P_y be defined as the probability that the experienced diagnostician will map the orientations of these elements of style "correctly." The necessary assumptions that P_x and P_y are constant and independent, and that the number of categories (orientations) to be considered is constant, i. e., a "major," or a "minor," or a "negligible" orientation for each of the elements to be mapped are the only "categories" to be considered, can be satisfied. Under these circumstances, the question becomes: "From the set of paired elements (paired "orientations of the elements mapped by the novice and experienced diagnosticians, respectively), how can the estimate of the value of P_x and that of P_y be calculated?"

By definition:

$$Q_x = 1 - P_x,$$

$$Q_y = 1 - P_y,$$

and A denotes the ratio (percent) of agreement in the set of paired elements yielded by matching the mappings of orientations of "style" elements mapped by novice diagnostician X with those mapped by the experienced diagnostician Y.

If $(P_1, P_2, P_3, \ldots, P_n)$ is defined as the set of probabilities associated with the set of orientations of "style" elements $(1, 2, 3, \ldots, n)$ mapped by each diagnostician, then estimates $(p_1, p_2, p_3, \ldots, p_n)$ of $(P_1, P_2, P_3, \ldots, P_n)$ can be used to define the probabilities of the n elements under consideration.* For example, suppose diagnostician X mapped orientations of five elements of "style" for a given individual, with the following probabilities being determined by the percent of agreement between his "mappings" and previously known information**

*It should be noted that the capital letters $(P_1, P_2, P_3, \ldots, P_n)$ denote parameters of the dichotomous population of "successful classification" (mapping), and "unsuccessful classification" of orientations of "style" elements; while the lower case letters $(p_1, p_2, p_3, \ldots, p_n)$ indicate estimates, i. e., statistics, of their counterpart parameters, derived from samples, or "guesstimates."

**Suppose the diagnostician is asked to map elements of "style" for the map of an individual

regarding these "elements," $p_1 = .72$, $p_2 = .67$, $p_3 = .77$, $p_4 = .80$, and $p_5 = .85$; then these values can be used as estimates of $(P_1, P_2, \ldots, P_5)$ for n = 5 elements of "style."

The probabilities associated with the possible results for diagnostician X and Y, respectively, can be found by means of the following expression:

$$(P_x + Q_x)(P_y + Q_y) = P_xP_y + Q_xP_y + P_xQ_y + Q_xQ_y \qquad (1)$$

An analysis of the interpretations of the products on the right side of equation (1) would show:

Outcomes	Probability	Nature of Agreements and Disagreements
Diagnostician X and Diag. Y "correct"	P_xP_y	X and Y agree
Diag. X "correct," Diag. Y "incorrect"	P_xQ_y	X and Y disagree
Diag. X "incorrect," Diag. Y "correct"	Q_xP_y	X and Y disagree
Diag. X and Diag.Y "incorrect"	Q_xQ_y	X and Y agree on the same "incorrect" element, or X and Y disagree, but each maps an "incorrect" element

Now, if A = ratio (percent) of agreement in the set of elements yielded by matching the "mappings" of "novice" X with those of diagnostician Y, then:

$$A = P_xP_y + Q_xQ_yK$$

where K denotes the fraction of the events in the set associated with the probability represented by the product: Q_xQ_y, i. e., the probability indicating that diagnostician X and diagnostician Y have selected the same incorrect "element" in their respective mappings. For example, when:

$$P_x = .7, \text{ and } Q_x = 1 - P_x = 1 - .7 = .3,$$

$$P_y = .8, \text{ and } Q_y = 1 - P_y = 1 - .8 = .2,$$

then:

$$A = (.7)(.8) + (.3)(.2)K,$$

or: $A = .56 + .06K,$

is the value of the ratio (percent) of agreement in the set of paired "elements" of the respective diagnosticians' mappings.

Bernstein has shown that the value of K can be estimated in a variety of ways, and has provided the following table of values of P for different values of A and K.*

I - TABLE OF VALUES OF P, FOR VALUES OF K AND A

A	K = 1	.5	.3	0
.95	.974	.975	.975	.975
.90	.947	.948	.949	.949
.85	.919	.920	.921	.922
.80	.888	.891	.893	.894
.75	.854	.860	.865	.866
.70	.816	.828	.832	.836
.65	.774	.793	.799	.807
.60	.724	.755	.764	.775

*Values in the Table are found by a formula derived as follows: $A = P_xP_y + Q_xQ_yK$, can be written as: $A = P_xP_y + (1 - P_x)(1 - P_y)K$. When the two diagnosticians X and Y are considered to be properly trained and approximately equally experienced, it is reasonable to assume: $P_x = P_y = P$. If this assumption is true, then A becomes: $A = P^2 + (1-P)^2K$; or: $P^2 + K - 2PK + P^2K = A$. Solving this quadratic equation for the value of P yields: $P = \frac{K \pm \sqrt{A(1+K)-K}}{1+K}$. Because with <u>trained</u> diagnosticians, the values of A should be $\geq 1/2$, and P should be $>1/2$, the smaller of the two quadratic roots is excluded. Using the larger root, P becomes: $P = \frac{K+\sqrt{A(1+K)-K}}{1+K}$.

It should be noted that the extreme values, K = 1 and K = 0, yield values of P a little different from each other until the value of A is as low as .70. Even in this case, the difference is but: .836 - .816 = .02. Under these circumstances, it is a reasonably safe procedure to choose K = 0, and estimate the value of P by the formula: $p = \sqrt{a}$

Team of Three Diagnosticians. In general, it is desirable to use a third experienced diagnostician, thereby forming a "team" approach to mapping, whenever possible. Under these circumstances, the assumption that: $P_x = P_y = P$, is not necessary. With the addition of a third experienced diagnostician $\bar{z}$, it is possible to provide three sets of paired mapped orientations of elements of "style," one associated with X and Y, one with X and $\bar{z}$, and one with Y and $\bar{z}$.

The probability set associated with the possible independent outcomes for three diagnosticians can be found from the equation:

$$(P_x+Q_x)(P_y+Q_y)(P_{\bar{z}}+Q_{\bar{z}})=P_xP_yP_{\bar{z}}+P_xP_yQ_{\bar{z}}+P_xQ_yP_{\bar{z}}+Q_xP_yP_{\bar{z}}+P_xQ_yQ_{\bar{z}}+Q_xP_yQ_{\bar{z}}+Q_xQ_yP_{\bar{z}}+Q_xQ_yQ_{\bar{z}} = 1 \quad (2)$$

If it is arbitrarily assumed that agreement between the orientations of a given "style" element mapped by any two of the three diagnosticians constitutes a "correct" mapping of that element, then the sum of the first four terms of the right side of equation (2) is the probability that the results of the given observation or measurement will be mapped into the "correct" orientation of the "style" element under consideration.

In a fashion similar to the case of two diagnosticians, it is possible for three diagnosticians to agree on (or map) "incorrect" mappings, and therefore a factor K must be applied to all terms of the equation except the first four. If we employ the value: K = 1, the percent of agreement between the diagnosticians will become 1.00 (or 100%), which is a highly unlikely event for a set of mappings. If it is assumed, however, that K = 0, and $P_x = P_y = P_{\bar{z}}$, then the following results calculated by formulas (1) and (2), respectively, occur as shown in the

table below:

II - TABLE OF VALUES FOR A, FOR VALUES OF P, AND K = 0

P	Problem of Agreement of two Diag. on "Correct" Mapping	Problem of Agreement of Three Diag. under Assumption that Agreement of two Diag.'s Mappings Determine "Correct" Mapping
90	$A = P_x P_y = P^2 = (.90)^2 = .81$	$A = P_x P_y P_z + P_x P_y Q_z + P_x Q_y P_z + Q_x P_y P_z = P^3 - 3P^2Q =$ $.90^3 - 3(.90)^2(.10) = .972$
80	.64	.896
70	.49	.784
60	.36	.648

Example 1. (Three Diagnosticians).

If M is defined as the percent of "correct" mappings, under the assumption that agreement by at least two of the diagnosticians on a mapping determines a "correct" mapping, and if the condition K = 0 is assumed to exist, then:

$$M = P_x P_y P_z + P_x P_y Q_z + P_x Q_y P_z + Q_x P_y P_z$$

Since this is a single equation involving three variables, one of its solutions will occur under the condition of: $P_x = P_y = P_z$. Assuming this condition exists, the following cubic equation results:

$$M = P^3 - 3P^2Q$$

This equation is the same as the one employed in the "Table of Values for A."

(a) Suppose that three trained diagnosticians are to employ the data yielded by their observations of an individual in seven different settings to map the "orientations" (a "major," or a "minor," or a "negligible") for each of five different "style" elements. Assuming that the "correct" mapping of an orientation of a style element is defined as that orientation of the given

element that is mapped by at least two of the diagnosticians, and assuming that the probability of mapping the "correct" orientation of a given element for each of the diagnosticians is the same, i. e., $P_x = P_y = P_z = P$, and that the value of that probability is: $P = .83$, find the probability (objectivity index) that all three diagnosticians (the total team) will map the orientation of that element correctly.

Solution.

Employing the equation: $M = P^3 - 3P^2Q$, the probability of all three diagnosticians mapping the "correct" orientation would be: $M = (.83)^2 - 3(.83)^2(.17) \approx .572 + .351 \approx .923$.

(b) Suppose the same conditions exist as in (a), but $P = .90$.

Solution.

Reading from the second column of Table II in the row where $P = .90$, the probability of all three diagnosticians mapping the "correct" orientation would be: $M = .972$.

Example 2.

If the percent of agreement on correctly mapped orientations of style elements between diagnosticians X and Y is defined as A, that between X and Z is defined as B, and the "percent of agreement" between Y and Z is defined as C, then the following three equations may be written

$$P_x P_y = A; \; P_x P_z = B; \text{ and } P_y P_z = C.$$

Multiplying the expression for A by the one for B, it is found that:

$$P_x^2 P_y P_z = AB,$$

or:

$$P_x^2 = \frac{AB}{P_y P_z} = \frac{AB}{C}.$$

In similar fashion, it is found that:

$$P_y^2 = \frac{AC}{B}; \text{ and } P_z^2 = \frac{BC}{A}.$$

These expressions permit the substitution of an estimate of the value of P_x, P_y, and P_z, respectively, under the assumption that K = 0.

Suppose that the percent of agreement between X and Y on "correctly" mapped orientations of "style" elements, included in a pilot study sample of "mappings," is found to be: .80. Then, the estimated value of A would become: a = .80. In similar fashion, suppose the percent of agreement between X and Z is estimated to be: b = .75; and, finally, the "agreement" between Y and Z is estimated as: c = .70.*

Then: $p_x^2 = \frac{(.80)(.75)}{.70}$; $p_y^2 = \frac{(.80)(.70)}{.75}$; and $p_z^2 = \frac{(.75)(.70)}{.80}$;

or: $p_x = \sqrt{\frac{(.80)(.75)}{.70}}$; $p_y = \sqrt{\frac{(.80)(.70)}{.75}}$; and $p_z = \sqrt{\frac{(.75)(.70)}{.80}}$;

and: $p_x = \sqrt{.8571}$; $p_y = \sqrt{.7467}$; and $p_z = \sqrt{.65625}$;

or: $p_x \approx .925$; $p_y \approx .864$; and $p_z \approx .810$.

These results indicate that diagnostician X would have the highest probability ($p_x \approx .925$), and therefore would probably be the most objective of the three diagnosticians, in mapping the "correct" orientation of a "style" element based upon a given set of data, diagnostician Y the next highest probability ($p_y \approx .864$), and objectivity, and diagnostician Z the lowest probability ($p_z \approx .810$), and the least objective, of the three. It should be noted, however, that since the three probabilities range in value from an estimated p = .810 to p = .925, the objectivity of a mapping of an orientation of the "style" element under consideration by any of these three diagnosticians would be rated as, "relatively high."

*It should be noted that a, b, and c, respectively, are statistics from the pilot study sample whose values estimate those of their counterpart parameters A, B, and C which are characteristics of the population from which the sample was drawn.

These methods provide a good approach to determining the objectivity of diagnosticians engaged in the process of mapping orientations of "style" elements associated with the Educational Sciences. It should be emphasized at this point that the use of three diagnosticians tends to improve the process of estimating the objectivity of diagnosticians. In addition to this advantage, the three member team approach to mapping also increases the probability of increasing the reliability, validity, and discriminative power of the process.

Problem

1(a). If it is known that the probability of a novice diagnostician, X, mapping the "correct" orientation of a given "style" element is $P_x = .60$, and the probability of an experienced diagnostician, Y, mapping the "correct" orientation of a given "style" element is: $P_y = .90$; assuming that the mappings are based upon the same set of data, and that $K = .2$, determine the objectivity of diagnostician X. (Hint: Find values of Q_x and Q_y, and use formula for A, "percent of agreement.")

1(b). If $A > .50$ is considered "minimally acceptable" for the objectivity of the novice diagnostician, should the training of X be continued? Why?

2(a). If the percent of agreement between equally experienced diagnosticians, X and Y, is: $A = .85$, and the value of K is known to be: $K = .5$, what is the probability of X mapping "correct" orientations for the "style" elements under consideration? What is the probability of Y accomplishing the same goal? (Hint: Use Table I).

2(b). If the situation existed where: $K = .3$, and $P_x = P_y = .799$, what would be the value of the percent of agreement between the "mappings" of the diagnosticians.

3. Suppose that three members (X, Y, and $\bar{z}$) of a diagnostic team consider an individual's responses to a series of inventory items regarding three elements of cognitive style, and view a videotape showing the individual participating in "exercises" that elicit behaviors pertaining

to these three elements of "style." If the percent of agreement between X and Y on "correctly" mapped orientations of these three elements of "style," included in a pilot study sample of "mappings," is found to be: .85; and in similar fashion, the percent of agreement between X and $\bar{Z}$ is estimated to be: .80; and the "agreement" between Y and $\bar{Z}$ is estimated as: .90; then which of the diagnosticians could be considered the most objective of the three regarding these mappings? The least objective?

APPENDIX E

FIGURE_____

Scaling Procedures

CURRICULUM COSMETOLOGY

	DISTRIBUTION OF INSTRUCTOR RESPONSES					TOTAL
	1	2	3	4	5	
Responses	0	1	4	8	8	21
entile	0	2	14	43	81	
ore	20	30	40	48	59	
ructor 1						
Responses	0	0	6	6	9	21
entile	0	0	14	41	77	
ore	20	20	40	48	58	
ructor 2						
Responses	0	0	3	9	9	21
entile	0	0	7	34	77	
ore	20	20	55	54	58	
ructor 3						
Responses	0	0	0	10	11	21
entile	0	0	0	24	74	
ore	20	20	20	43	56	
ructor 4						
Responses	1	3	8	2	7	21
entile	2	11	36	59	83	
ore	30	37	47	52	60	
ructor 5						
Responses	0	0	0	4	17	21
entile	0	0	0	9	59	
core	20	20	20	36	53	
ructor 6						

FIGURE_____

Scaling Procedures

CURRICULUM BUSINESS ADMINISTRATION

	DISTRIBUTION OF INSTRUCTOR RESPONSES					TOTAL
	1	2	3	4	5	
: Responses	0	5	6	4	6	21
:entile	0	11	36	61	86	
:ore	20	38	46	53	61	
:ructor 1						
Responses	0	4	3	9	5	21
entile	0	10	25	55	90	
ore	20	37	43	52	63	
ructor 2						
Responses	2	3	2	4	10	21
entile	5	19	32	45	76	
ore	34	41	45	49	57	
ructor 3						
Responses						
entile						
ore						
ructor 4						
Responses						
entile						
ore						
ructor 5						
Responses						
entile						
:ore						
ructor 6						

FIGURE_____

Scaling Procedures

CURRICULUM LAW ENFORCEMENT

	DISTRIBUTION OF INSTRUCTOR RESPONSES					TOTAL
	1	2	3	4	5	
Responses	0	0	4	11	6	21
entile	0	0	10	45	85	
ore	20	20	37	48	61	
ructor 1						
Responses	1	1	4	8	7	21
entile	4	7	19	47	88	
ore	32	35	41	49	62	
ructor 2						
Responses	0	0	6	5	10	21
entile	0	0	28	40	76	
ore	20	20	44	47	57	
ructor 3						
Responses	1	6	9	3	2	21
entile	4	19	54	83	95	
ore	32	41	51	60	67	
ructor 4						
Responses						
entile						
ore						
ructor 5						
Responses						
entile						
core						
ructor 6						

FIGURE

CURRICULUM BUSINESS ADMINISTRATION

INSTRUCTORS RESPONSES

ITIVE STYLE PROTOTYPE ACTERISTICS		1	2	3	Average Percentile
retical	(a)	86	90	76	84
al Linquistic	(b)	5	5	5	
retical Auditory		86	55	76	72
uistic		5	4	5	
retical Visual		86	55	32	57
titative		5	4	3	
retical Auditory		36	25	32	31
titative		3	3	3	
itative Code Empathetic		86	90	76	84
		5	5	5	
itative Code Esthetic		11	10	19	13
		2	2	2	
itative Code Ethic		86	55	76	55
		5	4	5	
itative Code Histrionic		36	55	45	45
		3	4	4	
itative Code Kinesics		11	55	19	28
		2	4	2	
itative Code Kinesthetic		11	10	19	13
		2	2	2	
itative Code Proxemics		11	25	76	37
		2	3	5	
itative Code Synoetics		61	55	45	52
		4	4	4	
itative Code Transactional		11	90	76	53
		2	5	5	
ıral Determinant - Family		36	10	5	17
		3	2	1	
ıral Determinant - Associate		61	55	5	40
		4	4	1	
ural Determinant - Individuality		61	55	76	64
		4	4	5	

FIGURE _____

CURRICULUM BUSINESS ADMINISTRATION - 2

INSTRUCTORS RESPONSES

ITIVE STYLE PROTOTYPE ACTERISTICS	1	2	3	Average Percentile
rential Modality - Magnitude	36 3	25 3	45 4	35
rential Modality - Difference	36 3	10 2	19 2	21
rential Modality - Relationship	86 5	55 4	45 4	62
rential Modality - Appraisal	36 3	55 4	76 5	55
rential Modality - Deductive	61 4	55 5	76 5	64

Percentile Figure
Rating

FIGURE_____

CURRICULUM COSMETOLOGY

INSTRUCTORS RESPONSES

TIVE STYLE PROTOTYPE CTERISTICS		1	2	3	4	5	6	Average Percentil
tical	(a)	14	14	7	24	36	9	17
Linquistic	(b)	3	3	3	4	3	4	
tical Auditory		14	77	34	74	82	9	48
		3	5	4	5	5	4	
tical Visual		14	14	34	24	11	9	17
tative		3	3	4	4	2	4	
tical Auditory		14	14	77	74	11	9	33
		3	3	5	5	2	4	
ative Code Empathetic		81	77	77	74	82	59	75
		5	5	5	5	5	5	
ative Code Esthetic		81	77	34	74	36	59	60
		5	5	4	5	3	5	
ative Code Ethic		43	77	77	74	82	59	68
		4	5	5	5	5	5	
ative Code Histrionic		43	41	34	24	82	59	47
		4	4	4	4	5	5	
ative Code Kinesics		81	41	7	24	82	59	49
		5	4	3	4	5	5	
ative Code Kinesthetic		81	77	77	NA	82	59	75
		5	5	5		5	5	
ative Code Proxemics		43	14	34	74	36	59	43
		4	3	4	5	3	5	
ative Code Synoetics		43	77	77	74	59	59	64
		4	5	5	5	4	5	
ative Code Transactional		NA	77	77	24	36	59	54
			5	5	4	3	5	
al Determinant - Family		43	77	7	24	2	59	35
		4	5	3	4	1	5	
al Determinant - Associate		29	41	34	24	11	59	28
		2	4	4	4	2	5	

FIGURE_____

CURRICULUM COSMETOLOGY - 2

INSTRUCTORS RESPONSES

IVE STYLE PROTOTYPE TERISTICS	1	2	3	4	5	6	Average Percentil
al Determinant - Individuality	81 5	77 5	77 5	74 5	36 3	59 5	67
ntial Modality - Magnitude	43 4	41 4	77 5	24 4	36 3	59 5	46
ntial Modality - Difference	81 5	14 3	77 5	74 5	82 5	59 5	64
ntial Modality - Relationship	43 4	41 4	34 4	24 4	82 5	59 5	47
ntial Modality - Appraisal	81 5	41 4	77 5	74 5	36 3	59 5	61
ntial Modality - Deductive	81 5	14 3	34 4	24 4	36 3	59 5	41
rcentile Figure ting							

FIGURE_____

CURRICULUM LAW ENFORCEMENT

INSTRUCTORS RESPONSES

ITIVE STYLE PROTOTYPE ACTERISTICS		1	2	3	4	Average Percentile
retical	(a)	45	88	40	54	57
al Linquistic	(b)	4	5	4	3	
retical Auditory		45	88	28	54	54
listic		4	5	3	3	
retical Visual		10	19	40	19	22
itative		3	3	4	2	
retical Auditory		10	19	28	19	19
itative		3	3	3	2	
tative Code Empathetic		45	88	76	54	65
		4	5	5	3	
tative Code Esthetic		10	47	28	4	22
		3	4	3	1	
tative Code Ethic		85	88	76	95	86
		5	5	5	5	
tative Code Histrionic		45	47	76	19	46
		4	4	5	2	
tative Code Kinesics		45	47	76	54	55
		4	4	5	3	
tative Code Kinesthetic		85	47	40	83	63
		5	4	4	4	
tative Code Proxemics		10	47	76	54	46
		3	4	5	3	
tative Code Synoetics		85	47	40	83	64
		5	4	4	4	
tative Code Transactional		45	19	76	83	56
		4	3	5	4	
ral Determinant - Family		45	88	40	54	57
		4	5	4	3	
ral Determinant - Associate		45	4	28	54	33
		4	1	3	3	
ral Determinant - Individuality		45	47	76	95	66
		4	4	5	5	
ential Modality - Magnitude		85	7	28	19	35
		5	2	3	2	

FIGURE_____

CURRICULUM LAW ENFORCEMENT - 2

INSTRUCTORS RESPONSES

ITIVE STYLE PROTOTYPE ACTERISTICS	1	2	3	4	Average Percentile
rential Modality - Difference	45 4	19 3	28 3	19 2	28
rential Modality - Relationship	85 5	88 5	76 5	19 2	67
rential Modality - Appraisal	45 4	47 4	76 5	54 3	56
rential Modality - Deductive	85 5	88 5	76 5	54 3	76

'ercentile Figure
Rating

APPENDIX F

DUPLICATION OF COMPUTER PRINT-OUT PERCENTILES

1=Negligible, 2=Minor, 3=Major

Cosmetology - Ideal (14)

T(AL)

Percent	Count	Response
.643	9	2
.357	5	3

T(AQ)

Percent	Count	Response
.357	5	1
.571	8	2
.071	1	3

T(VL)

Percent	Count	Response
.429	6	2
.571	8	3

T(VQ)

Percent	Count	Response
.714	10	2
.286	4	3

Q(Cem)

Percent	Count	Response
1.000	14	3

Q(CES)

Percent	Count	Response
1.000	14	3

Q(CET)

Percent	Count	Response
.286	4	2
.714	10	3

Q(CH)

Percent	Count	Response
.786	11	2

Q(CK)

Percent	Count	Response
.071	1	1
.286	4	2
.643	9	3

Q(CKH)

Percent	Count	Response
.286	4	2
.714	10	3

Q(CP)

Percent	Count	Response
.214	3	2
.786	11	3

Q(CS)

1.000	14	3

Q(CT)

.071	1	1
.643	9	2
.286	4	3

0= does not exist, 1=exists

1

Percent	Count	Response
.214	3	0
.786	11	1

A

Percent	Count	Response
.929	13	0
.071	1	1

F

Percent	Count	Response
.214	3	0
.786	11	1

M

Percent	Count	Response
.500	7	0
.500	7	1

D

Percent	Count	Response
1.000	14	0

R

Percent	Count	Response
.357	5	0
.643	9	1

L

Percent	Count	Response
.071	1	0
.929	13	1

K

Percent	Count	Response
.857	12	0
.143	2	1

NON-IDEAL

T(A1)

Percent	Count	Response
.643	9	2
.357	5	3

T(AQ)

Percent	Count	Response
.357	5	1
.571	8	2
.071	1	3

T(VL)

Percent	Count	Response
.429	6	2
.571	8	3

T(VQ)

Percent	Count	Response
.714	10	2
.286	4	3

Q(Cem)

Percent	Count	Response
1.000	14	3

Q(CES)

Percent	Count	Response
1.000	14	3

Q(CET)

Percent	Count	Response
.786	11	2
.214	3	3

Q(CK)

Percent	Count	Response
.071	1	1
.286	4	2
.643	9	3

Q(CKH)

Percent	Count	Response
.286	4	2
.714	10	3

Q(CP)

Percent	Count	Response
.214	3	2
.786	11	3

Q(CS)

Percent	Count	Response
1.000	14	3

Q(CT)

Percent	Count	Response
071	1	1
.643	9	2
.286	4	3

0=Does not Exist, 1=Exists

1

Percent	Count	Response
.214	3	0
.786	11	1

A

Percent	Count	Response
.214	3	0
.786	11	1

F

Percent	Count	Response
.214	3	0
.786	11	1

M

Percent	Count	Response
.500	7	0
.500	7	1

R

Percent	Count	Response
.357	5	0
.643	9	1

L

Percent	Count	Response
.071	1	0
.929	13	1

K

Percent	Count	Response
.857	12	0
.143	2	1

1-Negligible, 2=Minor, 3=Major

Business Administration Non-Ideal

T(AL)

Percent	Count	Response
.875	21	2
.125	3	3

T(AQ)

Percent	Count	Response
.125	3	1
.542	13	2
.333	8	3

T(VL)

Percent	Count	Response
.750	18	2
.250	6	3

T(VQ)

Percent	Count	Response
.042	1	0
.417	10	1
.208	5	2
.333	8	3

Q(CEM)

Percent	Count	Response
.042	1	1
.083	2	2
.875	21	3

Q(CES)

Percent	Count	Response
.167	4	1
.687	16	2
.167	4	3

Q(CET)

Percent	Count	Response
.333	8	2
.667	16	3

Q(CH)

Percent	Count	Response
.458	11	1
.333	8	2
.208	5	3

Q(CK)

Percent	Count	Response
.208	5	1
.458	11	2
.333	8	3

Q(CKH)

Percent	Count	Response
.083	2	1
.292	7	2
.625	15	3

Q(CP)

Percent	Count	Response
.042	1	1
.333	8	2
.625	15	3

Q(CS)

Percent	Count	Response
.208	5	2
.792	19	3

Q(CT)

Percent	Count	Response
.167	4	1
.458	11	2
.375	9	3

1

Percent	Count	Response
.208	5	0
.792	19	1

A

Percent	Count	Response
1.000	24	0

F

Percent	Count	Response
.833	20	0
.167	4	1

M

Percent	Count	Response
.708	17	0
.292	7	1

D

Percent	Count	Response
.917	22	0
.083	2	1

R

Percent	Count	Response
.792	19	0
.208	5	1

L

Percent	Count	Response
.292	7	0
.708	17	1

K

Percent	Count	Response
.625	15	0
.375	9	1

IDEAL Business Administration

T(AL)

Percent	Count	Response
.766	36	2
.234	11	3

T(AQ)

Percent	Count	Response
.128	6	1
.319	15	2
.553	26	3

T(VL)

Percent	Count	Response
.830	39	2
.170	8	3

T(VQ)

Percent	Count	Response
.340	16	1
.447	21	2
.213	10	3

Q(CEM)

Percent	Count	Response
.085	4	2
.915	43	3

Q(CES)

Percent	Count	Response
.106	5	1
.489	23	2
.404	19	3

Q(CET)

Percent	Count	Response
.170	8	2
.830	39	3

Q(CH)

Percent	Count	Response
.340	16	1
.532	25	2
.128	6	3

Q(CK)

Percent	Count	Response
.064	3	1
.617	29	2
.319	15	3

Q(CKH)

Percent	Count	Response
.447	21	2
.553	26	3

Q(CP)

Percent	Count	Response
.128	6	2
.872	41	3

Q(CT)

Percent	Count	Response
.319	15	2
.638	30	3

0=Does not Exist, 1=exists

1

Percent	Count	Response
.340	16	0
.660	31	1

A

Percent	Count	Response
.915	43	0
.085	4	1'

F

Percent	Count	Response
.511	24	0

M

Percent	Count	Response
.574	27	0
.426	20	1

D

Percent	Count	Response
.915	43	0
.085	4	1

R

Percent	Count	Response
.957	45	0
.043	2	1

L

Percent	Count	Response
.277	13	0
.723	34	1

K

Percent	Count	Response
.702	33	0
.298	14	1

Law Enforcement -Ideal

1=Negligible, 2-Minor, 3 Major

T(AL)

Percent	Count	Response
.529	9	2
.471	8	3

T(AQ)

Percent	Count	Response
.059	1	1
.529	9	2
.412	7	3

T(VL)

Percent	Count	Response
.647	11	2
.353	6	3

T(VQ)

Percent	Count	Response
.294	5	1
.235	4	2
.471	8	3

Q(CEM)

Percent	Count	Response
.118	2	2
.882	15	3

Q(CES)

Percent	Count	Response
.412	7	1
.412	7	2
.176	3	3

Q(CET)

Percent	Count	Response
.235	4	2
.765	13	3

Q(CH)

Percent	Count	Response
.176	3	1
.706	12	2
.118	2	3

Q(CK)

Percent	Count	Response
.059	1	1
.647	11	2
.294	5	3

Q(CKH)

Percent	Count	Response
.353	6	2
.647	11	3

Q(CP)

Percent	Count	Response
.294	5	2
.706	12	3

Q(CS)

Percent	Count	Response
.059	1	2
.941	16	3

Q(CT)

Percent	Count	Response
.471	8	2
.529	9	3

I

Percent	Count	Response
.176	3	0
.824	14	1

A

Percent	Count	Response
.176	3	0
.824	14	1

F

Percent	Count	Response
.824	14	0
.176	3	1

M

Percent	Count	Response
.824	14	0
.176	3	1

D

Percent	Count	Response
.882	15	0
.118	2	1

R

Percent	Count	Response
.765	13	0
.235	4	1

L

Percent	Count	Response
.294	5	0
.706	12	1

K

Percent	Count	Response
.647	11	0
.353	6	1

Law Enforcement - Non - Ideal

1=Negligible, 2=Minor, 3=Major

T(AL)

Percent	Count	Response
.833	5	2
.167	1	3

T(AQ)

Percent	Count	Response
.833	5	2
.167	1	3

T(VL)

Percent	Count	Response
.833	5	2
.167	1	3

T(VQ)

Percent	Count	Response
.667	4	1
.333	2	2

Q(CEM)

1.000	6	3

Q(CES)

Percent	Count	Response
.167	1	1
.500	3	2
.333	2	3

Q(CET)

Percent	Count	Response
.500	3	2
.500	3	3

Q(CH)

Percent	Count	Response
.333	2	1
.333	2	2
.333	2	3

Q(CK)

Percent	Count	Response
.167	1	1
.167	1	2
.667	4	3

Q(CKH)

Percent	Count	Response
.333	2	2
.667	4	3

Q(CP)

Percent	Count	Response
.167	1	2
.833	5	3

Q(CS)

Percent	Count	Response
1.000	6	3

Q(CT)

Percent	Count	Response
.167	1	2
.833	5	3

I

Percent	Count	Response
.333	2	0
.667	4	1

A

Percent	Count	Response
1.000	6	0

F

Percent	Count	Response
.500	3	0
.500	3	1

M

Percent	Count	Response
.500	3	0
.500	3	1

D

Percent	Count	Response
.667	4	0
.333	2	1

R

Percent	Count	Response
1.000	6	0

L

Percent	Count	Response
.667	4	0
.333	2	1

K

Percent	Count	Response
.667	4	0
.333	2	1