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DIFFERENTIAL CHARACTERISTICS OF FIRST YEAR
ARCHITECTURAL STUDENTS AND PRE-EDUCATION
STUDENTS.

THE OHIO STATE UNIVERSITY, PH.D., 1979
DIFFERENTIAL CHARACTERISTICS OF FIRST YEAR
ARCHITECTURAL STUDENTS AND PRE-EDUCATION STUDENTS

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By
Jean McClain Smith, B.S., M.A.

* * * * *

The Ohio State University
1979

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CHAPTER I

INTRODUCTION

Achievement has held a dominant position in education. Researchers in education and psychology have gathered masses of data on motivation, interests, ability, intelligence and personality in their attempts to understand achievement. More recently an interest has been shown in a different approach called learning style by some, cognitive style by others. This work with achievement and cognitive style (or learning style) has yielded information on the relationship between cognitive style and career differentiation. The factors that differentiate cognitive style appear to be factors that also differentiate career choices.

A growing body of research is being published on the role of cognitive style in career differentiation. This work shows an increased attention to variables other than the traditional abilities and interests in career decision making. A major reason for enthusiasm in the role that cognitive styles may play in career differentiation is their bipolar nature which avoids a value imprint.
Cognitive styles also provide a means for evaluating elusive and difficult to assess noncognitive characteristics.

Using a cognitive styles approach this study addresses the role of individual differences in career differentiation at the pre-professional or initial course level of a college program. The study asks whether there are diagnosable differences in cognitive style and personality related to the choice of a college major that are discernible prior to entering or early in a course of study.

Statement of the Problem

It was the purpose of this study to identify significant characteristics that differentiate students in beginning architecture courses from those who choose a pre-education program and plan to major in education.

Do architecture students and education students differ significantly on selected personal characteristics:

1. field-dependent-independent cognitive styles;
2. learning styles as defined by cognitive mapping;
3. personality characteristics of extraversion-introversion, sensing-intuitive, thinking-feeling, judging-perceiving;
4. verbal abilities, math abilities, total abilities?

In addition the implications of these findings for future academic choices will be considered.

Significance of the Study

Today, counselors of undergraduate students are looking for information to focus, expand and give alternatives for a better match between career choice and personal characteristics of the individual. There is a felt need for more pertinent information to help students in career decision making (Osipow, 1969). Personal characteristics which may be pertinent are individual differences in cognitive style and personality.

An increasing body of research literature suggests that cognitive style may play an important role in career differentiation and development. Studies with persons already employed in occupations show differences in cognitive style that are directly related to career choice (DiStefano, 1969; Braun, 1971; MacKinnon, 1962; Barrett & Thornton, 1967; Crutchfield, et al., 1959; Cullen, Harper, and Kidera, 1969).

Witkin and associates (1977) report that individual differences in field dependence-independence, a cognitive-style dimension, are associated with selection and graduation in natural science as compared with education
majors and unrelated to selection and graduation in social science or humanities per se. Field-dependence-independence may instead be associated with specialization areas within social science disciplines. Feldman and Newcombe (1969) propose that preexisting differences tend to become more pronounced while prospective professionals are studying in their major fields. "Preexisting" would imply differences do exist at initial entry to a major field. The present study considers the meaning of cognitive style differences at initial selection and entry into a college major.

Personality variables have been considered as relevant to career decision making. Individual personalities are the unique product of their particular heredity and environment and are therefore different. Basic differences are orderly and consistent by the way people prefer to use their minds, specifically the way they use perception and judgment. Perception includes the processes of becoming aware of things, people, occurrences, and/or ideas; while judgment includes the processes of coming to conclusions about what has been perceived. Perception is what one sees and judgment is what he does about it. These two variables of personality govern a large part of external behavior and may have a direct relationship to one's career choice. Other personality variables constituting basic differences
are extraversion-introversion, intuition-sensing, and feeling-thinking. Each of these is the opposite end of a continuum with extraversion meaning the direction of interests outward or to things outside the self as contrasted to introversion or the direction of interests inward or to things upon the self. Intuition is the imaginative operation—the world of possibility rather than the world of facts while sensing is the perceptual operation dealing with reality by means of the senses. Feeling is the emotional operation and evaluates personal experiences by means of empathy and emotional sensitivity while thinking is the rational operation of ideas according to the laws of logic. Extensive use of one standardized inventory has found from sixty-six to one hundred percent relationship between specific personality variables and occupation (MacKinnon, 1962). For example in one study of creative persons the majority were found to be perceptive as contrasted to judgmental. In this same study one hundred percent of the architects studied were intuitive as contrasted to sensing, and two-thirds of the entire group of creative people were introverted.

Cognitive style is considered with increasing frequency in psychological and educational research. In the literature cognitive style has at least two different meanings. A distinction will be made in this study
between cognitive style as considered in the field of psychology and cognitive style as referred to in the "Educational Sciences" approach (Hill, 1970). Both approaches hold potential for a better match for the individual between task requirements in a career and individual characteristics. However, so far, little or no comparison of these two quite different approaches has been made, particularly in the area of career counseling.

Cognitive Style: Research in Psychology

Cognitive style in this work will refer to consistent individual differences in information processing as observed in psychological research. Cognitive styles are assumed to:

- involve how people perceive information and solve problems (information processing);
- be pervasive dimensions of psychological functioning and appear in perceptual and intellectual activity, personality, and social interaction;
- be stable over time;
- be bipolar in value. The value of each style is in comparison to the task involved.

While many cognitive styles have been investigated in psychology (Messick, 1970) a well-documented cognitive style dimension is that of field dependence-independence (Witkin, Dyk, Paterson, Goodenough & Karp, 1974).
Field-dependent persons are likely to rely on external referents as guides in information processing while field-independent persons tend to give greater credit to internal referents (Witkin, et al., 1954/1972).

**Learning Style: Educational Sciences Approach**

The second meaning of cognitive style, termed learning style in this study, comes from applied work in an educational setting (Hill, 1970). Learning style refers to the manner in which an individual seeks meaning from his environment, and may find a distant theoretical base in symbolic interaction as described by Mead, embodying cultural symbols and ideosyncratic sets of symbols for each individual. Learning style is determined by Cognitive Mapping (Educational Sciences; Hill, 1970), a procedure which assesses a person's attitude toward self, others, and his environment. An individual's learning style is identified assuming that a person does what he does best and avoids that which he does poorly.

**Personality**

Personality is the complex of characteristics that distinguishes a particular individual or individualizes or characterizes him in his relationships with others. It is the total of distinguishable traits and characteristics, the organization of the individual's emergent
tendencies to act or behave, to act on, interact with, perceive, and react to.

**Definition of Terms**

The following represent operational definitions of terms used throughout this study:

1. **Cognitive Style.** The consistent individual differences in information processing as observed in psychological research.

2. **Learning Style.** The manner in which an individual seeks meaning from his environment. This is called cognitive style by many researchers but a distinction is deliberately drawn here.

3. **Cognitive Mapping.** A procedure developed by Hill which assesses a person's attitude toward self, others, and his environment.

The following are the categories used in this study in referring to Hill's Q-Sort.

4. **Auditory Linguistics.** Ability to acquire meaning through hearing spoken words.

5. **Visual Linguistics.** Ability to find meaning from words you see.

6. **Auditory Quantitative.** Ability to find meaning in terms of numerical symbols, relationships, and measurements that are spoken.
7. **Visual Quantitative.** Ability to acquire meaning in terms of numerical symbols, relationships, and measurements you see.

8. **Empathy.** Sensitivity to the feelings of others.

9. **Qualitative Transactional.** Ability to maintain a positive communicative interaction which significantly influences the goals of the persons involved in that interaction.

10. **Associates.** Weighting or filtering symbolic information as one's associates do.

11. **Family.** Weighting or filtering symbolic information in ways you have learned from your family.

12. **Individuality.** Weighting or filtering symbolic information based on the idea that one's own ability to direct behavior is best.

13. **Inference-Magnitude.** The use of rules and definitions to reason and draw conclusions.

14. **Inference-Difference.** A reasoning process which involves specific differences in the characteristics of objects, facts, and events.

15. **Inference-Relationship.** The ability to synthesize a number of dimensions into a unified meaning.

16. **Inference-Appraisal.** The modality of inference using modality, difference, and relationship giving equal weight to each in his reasoning process.
17. **Inference-Deductive.** Indicates deductive reasoning or the form of logical proof used in geometry or in syllogistic reasoning.

The following are the terms used in this study when referring to personality as interpreted by the Myers-Briggs Type Indicator.

18. **Personality.** The dynamic organization within the individual of those psycho-physical systems that determine his unique adjustment to the world.

19. **Extraversion.** A tendency to be oriented primarily to the outer world and to focus perception and judgment upon people and things.

20. **Introversion.** Oriented primarily to the inner world of ideas and tends to focus perception and judgment upon concepts and ideas.

21. **Sensing.** A preference for perceiving by using the five senses for becoming aware of things directly.

22. **Intuition.** Indirect perception by way of the unconscious with the emphasis on ideas or associations which the unconscious tacks on to the outside things perceived.

23. **Thinking.** A way of judging which discriminates impersonally between true and false.

24. **Feeling.** A way of judging which discriminates between valued and not-valued.
25. **Judging.** A process for using the process of thinking-feeling or sensing-intuition in dealings with the outer world.

26. **Perceiving.** The other process for using thinking-feeling or sensing-intuition in dealings with the outer world.

**Organization of the Remainder of the Study**

This chapter has included an introduction, statement of the problem, an overview of cognitive style with its psychological base as compared to learning style and its "Educational Sciences" approach and the questions to be addressed.

Chapter II presents a review of the relevant literature in each of the three areas addressed: cognitive style, learning style and personality.

Chapter III contains a description of the setting and population, the design and instrumentation, and the data analysis and statistical methods used.

Chapter IV is a discussion of the findings in a general overview and then in specific reply to each section of the questions asked.

The summary, conclusions, implications and recommendations for further study are given in Chapter V.
CHAPTER II

REVIEW OF THE LITERATURE

This chapter will review current relevant literature on cognitive style, learning style, and personality as it relates to career choice.

**Cognitive Styles**

A review of the literature on cognitive style reveals (1) a dichotomy by disciplines that has created isolated avenues of research and articles based upon initial assumptions and (2) a paucity of applied research in any discipline.

According to Clark (1975) there exists no theory of cognitive styles and there has not been a study which describes how these areas and dimensions of cognitive styles relate to each other. It appears these dimensions are not orthogonal, thus, one dimension might be highly predictive of another.

It is interesting to note that cognitive style has received considerable attention in the field of psychology but the results of thousands of studies in this discipline
are not evident in applied form in education. There appears to be little or no communication between psychological research and educational practice on cognitive style over the last twenty-five years. One of the few exceptions to applied research on cognitive style is the work at Oakland Community College by Hill and others (Hill, 1970).

Messick (1969) has defined cognitive styles as information processing habits which represent the learner's typical modes of perceiving, thinking, remembering and problem solving. They are "stable, relatively enduring consistencies in the manner or form of cognition". Messick discusses nine cognitive style dimensions:

1. Field dependence vs. field independence
2. Scanning
3. Breadth of categorizing
4. Conceptualizing style
5. Cognitive complexity vs. simplicity
6. Reflectiveness vs. impulsivity
7. Leveling vs. sharpening
8. Constricted vs. flexible control

For Ausubel (1968) cognitive style refers to both individual differences in cognitive organization and various self-consistent personal tendencies that are not
reflective of human cognitive functioning in general. Styles are enduring individual differences.

McKenny's definition considers both cognitive strategies and habits. "Cognitive style reflects an individual's propensity and preference for coming to terms with the data-stimuli of his environment through particular modes of thinking that are partly conscious strategies and partly unconscious habits" (McKenny and Keen, 1974). Both information gathering and information processing patterns are considered.

Hill's definition differs from those developed in psychology. Cognitive style represents the manner in which an individual seeks meaning from his environment (DeLoach, et al., 1971). It is defined as the cartesian product of four sets: (1) symbols and their meanings, (2) cultural determinants, (3) modalities of inference and (4) memory-concern. Hill believes the cognitive style of an individual can be changed by the process of training and education. Ausubel believes styles are enduring individual differences. Researchers in psychology raise the question of changing cognitive style, but do not make a positive statement that change can be created. As noted earlier, Hill is the only one with an applied model for education which is in use.
For this work cognitive styles refers to a person's typical modes of perceiving, remembering, thinking and problem solving (Messick, 1970).

Messick has reviewed the literature in cognitive style and identified nine cognitive style dimensions with some supporting research evidence.

1. **Field dependence vs. field independence**: An analytical vs. a global way of perceiving. Field independence entails a tendency to experience items as discrete from their backgrounds and reflects ability to overcome the influence of an embedding context. Field dependence focuses on the relationship of items and their background. This dimension, identified by Witkin and his associates, is the most thoroughly researched. The numerous studies have shown, among other things, that there are positive relationships between field independence and verbal, mathematical and spatial abilities. Evidence of field dependence indicates that individuals with this style are more sensitive to their social environment and more adept at interpersonal communications.

2. **Scanning**: Differences in the extensiveness and intensity of attention deployment. Attention deployment may be broad or narrow, and individuals' style may be to scan or to focus. The bulk of the
research on this dimension has concentrated on scanning as an extension of attention deployment. No educational application has been made. This dimension may overlap to some degree with breadth of categorization and conceptual differentiation styles.

3. **Breadth of categorizing**: Consistent preferences for broad inclusiveness as opposed to narrow exclusiveness in establishing the acceptable range for specified categories. Given an established category, the broad categorizer prefers to include many items and lessen the risk that something might be left out. The narrow categorizer, however, will exclude items to lessen the risk of including something that might not belong. There is a strong tendency for individuals to be consistently broad or narrow across the quantitative, verbal and geometric domains.

4. **Conceptualizing Style**: The tendency to conceive of things as having many properties as opposed to few. This style includes both conceptual differentiation and compartmentalization. Conceptual differentiation relates to the number of similarities and differences perceived; thus, the number of categories selected or groups formed in a sorting task. Compartmentalization relates to the utilization of particular
conceptualizing approaches as the basis for forming concepts.

5. **Cognitive complexity vs. simplicity**: Individual differences in the tendency to construe the world, particularly the world of social behavior, in a multidimensional and discriminating way. This style concerns the number of dimensions available to a person in understanding his environment. A high complexity style sees diversity, conflict and contradiction, whereas the low complexity style is more attuned to consistent regularities in the environment.

6. **Reflectiveness vs. impulsivity**: Individual consistencies in the speed with which hypotheses are selected and information processed. The impulsive style tends to offer the first answer that occurs even though it is frequently incorrect while a person with a reflective style is more likely to ponder various possibilities before deciding. Originally the emphasis was on the speed of evaluation of cognitive products, recent research has emphasized correct response as well as speed.

7. **Leveling vs. sharpening**: Reliable individual variations in assimilation in memory. Levelers show a tendency to assimilate new precepts to previously
presented materials, to over generalize. Sharpeners separate memory of prior stimuli and current information, they over-discriminate. "If the major portion of classroom learning involves reception of information existing cognitive structures, as Ausubel (1963) claims, it would be highly surprising if leveling-sharpening tendencies did not influence the learning and retention of meaningful new material. It is quite astonishing to discover how little empirical research has been directed to so important an educational issue" (Kogan, 1971).

8. **Constricted vs. flexible control**: Individual differences in susceptibility to distraction and cognitive interference in tasks containing conflicting cues. The constricted control style tends to be susceptible to distraction and to retain incidental information while the flexible control style is more able to concentrate on the task at hand without noting interference.

9. **Tolerance for unrealistic experiences**: A dimension of differential willingness to accept perceptions at variance with conventional experience. A high tolerance style shows readiness to accept and report experiences which may vary with either conventional reality or what the individual knows to be true.
Some of the same properties are found in cognitive styles and in abilities; but Kogan (1972) states "a difference in emphasis should be noted: Abilities concern level of skill—the more and less of performance—whereas cognitive styles give greater weight to the manner and form of cognition."

Messick gives the following ways in which cognitive style and abilities differ:

1. Abilities and the measurement of abilities tend to emphasize the maximum of performance. The concern is with the extent to which a person can solve problems under optimal conditions, sometimes called standard or standardized. Cognitive styles are more concerned with the individual's typical behavior, the extent to which a person spontaneously approaches a particular problem.

2. Ability dimensions tend to be unipolar; they extend from nothing to a great deal. Cognitive styles are contrasts of one kind of performance vs. another kind of performance that has an opposite, or different, element but not completely opposite characteristics. The characteristics are just different rather than necessarily opposite.

3. Ability dimensions are value loaded, but cognitive styles have none of the value differentiation. For
each of the cognitive styles there are advantages to being in one direction in one situation and to be in the other direction in another situation. Situation and task determine value differences.

4. Cognitive styles and abilities differ in their intellectual origins. The concept of abilities has historically been tied to education and there has been a close relationship between the measurement of abilities and the application of ability measurement in education. Work on cognitive style has come out of the psychological laboratory with the concept developing from personality theory.

**Field-Dependence-Independence**

Field-dependence vs. field-independence involves an analytical vs. a global way of perceiving. Field-independence refers to a tendency to experience items as discrete from their backgrounds and reflects ability to overcome the influence of an embedding context. Field-dependence focuses on the relationship of items and their background. This dimension, identified by Witkin and his associates (1962), is the most thoroughly researched. The numerous studies have shown, among other things, that there are positive relationships between field-independence and mathematical and spatial abilities (1977). Evidence
on field-dependence indicates that individuals with this style are more sensitive to their social environment and more adept at interpersonal communication. Thus, field-dependence-independence may carry educational significance for the classroom.

Both relatively field-dependent and relatively field-independent persons appear to be similar in learning ability and memory but are different in what is relevant, attended to, and salient to them in the learning. First, more field-dependent persons tend to be better at learning and remembering social material. For example, Ruble and Nakamura (1972) found field-dependent children did better when the examiner gave a visual or verbal cue (and field-independent children were better when social cues were eliminated). Fitzgibbons, et al. (1965) used an incidental learning paradigm and found in retention of words more field-dependent individuals retained social words but there was no difference between more field-dependent and field-independent persons in retention of neutral words.

More field-dependent students require external referents for self-definition and externally defined goals and reinforcements. For example, research on the effects of punishment in the form of verbal criticism found field-dependent persons are more affected by this
form of external reinforcement (Ferrall, 1971; Randolph, 1971). Raab (1973) also found differential effects of reinforcement on field-dependent-independent students. When external rewards for learning are introduced, performance differences between more field-dependent and field-independent students disappear regardless of whether rewards are material in nature or in the form of praise (Steinfeld, 1973). In comparison, more field-independent students have self-defined goals and tend to learn more under conditions of intrinsic motivation (Fitz, 1970; Steinfeld, 1973).

The field-dependent views the field "as is" while the field-independent imposes structure and analyzes when the field is already organized. Field-independents provide interceding structural rules. Fleming (1968) using a list of words found no differences between field-dependent and field-independent when the words were organized in a superordinate to subordinate sequence while field-independents were best in a subordinate to superordinate sequence. Schwen (1970) in studies with programmed instruction found that in a large step version with a number of generalizations and examples given before an active response was required field-independent students performed better, but in a small step version with fewer generalizations and examples there was no
difference in performance between field-dependents and field-independents. Renzi (1974) in his studies asked subjects to draw an exact ellipse and varied the amount of feedback provided the learner. Field-dependents performed much better on the posttest when feedback was provided.

Research involving videotaping modeling procedures by Koran, Snow, and McDonald (1971) found more field-dependent student teachers benefited from this method. More field-independent student teachers did as well with written protocols as with video-modeling. They concluded that for the field-dependent explicit, concrete presentation of stimuli may provide a behavioral representation for the learner that he could not provide for himself in the written-modeling treatment (p. 226).

Bruner, Goodnow, and Austin (1956) determined that concept attainment was by the spectator approach for field-dependents and by the hypothesis testing model for field-independents. Field-dependents showed steady improvement with successive trials (Nebelkopf and Dreyer, 1973) while field-independents had sudden spurts. The sudden spurts were created by a plateau while the incorrect hypothesis was tried. Differences were in method not quantity and there was no difference in the number of trials. The
field-dependent had more difficulty with unstructured classroom learning situations.

Several studies of cue salience found field-independents learn concepts more rapidly when a salient cue is irrelevant to the definition of the concept (Dargel & Kirk, 1971; Davis, 1972, 1973).

Ohnmacht (1966) and Zawel (1969) found field-dependents have difficulty breaking learning sets when cues from one concept definition becomes irrelevant in learning a new problem context. It has been suggested that teachers can use a direct cue to use the hypothesis approach or a spectator approach. Field-dependent and field-independent favor different learning strategies and it is not the strategy that creates better achievement but the nature of the learning task. The strategy needs to match the learning task. The question then becomes "can students be taught to adapt to the requirements of the learning situation?"

A number of studies investigate field-dependence-independence and occupational interests. In studies using interest inventories and cognitive style it has been found that field-dependent subjects tend to be interested in people-oriented occupations which utilize social skills and interpersonal relations in daily activities. Field-independent persons are more interested in fields which
utilize cognitive skills in articulation, structuring and analysis with less reliance on social skills (Arbuthnot & Gruenfeld, 1969; Keen, 1973; Scheibner, 1969). The Strong Vocational Interest Inventory has been widely used in these studies and the findings are that interpersonal domains requiring social skills are chosen by field-dependent persons. Social worker, minister, rehabilitation counselor and elementary education are some of the helping relationships preferred. In teaching the field-dependents tend to choose areas that do not require analytical ability but utilize interpersonal relationship skills. Field-independent persons show interests in mathematics and science domains. In teaching the areas requiring analytical structuring skills were most often chosen.

Taking the approach that analytical-nonanalytical and impersonal-interpersonal are significant characteristics for field-dependent and field-independent persons, Clar applied these dimensions to create four interest categories. Using the Strong Vocational Interest Inventory she paired the interest category with six vocations for each cell. The results support the theory of a relationship between the cognitive style and the social attributes found together at each end of the dimension (Clar, 1971).
Other studies examine field-dependence-independence and career choice specifically. Cognitive style seems to affect the process of career choice in at least two ways: (1) readiness and conceptualization of careers (Glatt, 1970; Witkin, 1974) and (2) the ease of career choice (Osipow, 1969; Witkin, 1974) and shifting of majors (Kennedy, 1972). Studies have tended to show a relationship between cognitive style and the interpersonal requirements of the career choice. Field-dependents prefer interpersonal relationships and fields requiring this attribute, while field-independents prefer fields that draw on ability in cognitive articulation and more impersonal social relationships (Witkin, et al., 1977). Field dependent students are more likely to choose humanities, elementary education, religion, clinical psychology, nursing, social work, and languages. Field-independent students are more likely to choose architecture, experimental psychology, engineering, art, science and mathematics.

Studies with persons already employed in occupations show social-studies teachers (DiStefano, 1970), writers (MacKinnon, 1962) and social workers (Braun, 1971) tend to be more field-dependent, while airplane pilots, math-science teachers, architects and engineers tend to be

Within a given field one sees a tendency for field-dependents and field-independents to either choose, or execute their role in relation to their cognitive style. For example, Quinlan & Glatt (1972) state they found psychiatric nurses, who work with people, to be field-dependent; while surgical nurses, who work in the operating room, were field-independent. They draw the distinction this is a difference in the social interaction requirements of each career. Along this same line Kennedy (1972) found students in a navy officer training program to be more field-independent if they were student pilots as contrasted to navigators or radar intercept operators. Nagle (1967) contrasted clinical psychologists, who work with people, and are field-dependent, with experimental psychologists, who work in the laboratory, and were field-independent.

Witkin, et al. (1977) view fields as "broad-gauge", such as social sciences, or "narrow-gauge", such as mathematics, science, architecture or elementary education. Within a "broad-gauge" discipline Witkin found that field-dependents often shift to a major more congruent with their cognitive style (Witkin, 1974). A "narrow-gauge" field such as mathematics requires a
field-independent cognitive style and field-dependents must switch majors from this field for a better "fit" between cognitive style and the requirements of the major. Witkin further proposes there is more movement from a narrow-gauge field and this will be most often found in field-dependent persons moving from a narrow-gauge field-independent occupation for a better match between career choice and cognitive style. Witkin's longitudinal study on career choice indeed revealed shifts by field-dependents from math/science fields and fewer shifts from social sciences.

Finally, Glatt (1970) writes about readiness for occupational planning with eighth grade boys. He focused on ability to verbalize strengths and weaknesses, accuracy of self-awareness, relevant factors and occupational choice. Field-independents showed more readiness for occupational planning. Clar (1971) found field-dependents to be less decided about a vocation than field-independents while field-independents were more realistic in their initial vocational choices. Field-independents were more active in their search while field-dependents were more passive. In addition, one study (Linton, 1972) states that field-independent college students tend to choose occupations which are unusual for their peer group. This would imply the
field-dependents tend to choose occupations that were usual for their peer group.

Learning Style

The term "Learning Style" will be used in this paper when referring to the work of Hill and others in a deliberate attempt to clarify the difference between Hill's work in the applied field of education and Witkin's work in psychology.

Learning style then becomes the manner in which an individual seeks meaning from his environment. It embodies cultural symbols and ideosyncratic sets of symbols for each individual. Learning style is determined by a process called "cognitive mapping" which assesses a person's attitude toward self, others, and his environment. An individual's learning style is identified assuming that a person does what he does best and avoids that which he does poorly.

The Hill model of learning style was developed as part of his conceptual framework for education which he terms the Educational Sciences. The Educational Sciences used in the applied field of education provide a framework and a common language for Hill and others to explain the variables encountered in attempting to explain the processes involved in teaching and learning. The
Educational Sciences and the Hill model of learning style offer a different approach from that of Witkin. The process of creating and developing the Educational Sciences is based on the assumptions:

- Education is the process of searching for meaning.
- Thought is different from language.
- The human creature is social in nature and has an unique capacity for deriving meaning from its environment and personal experiences through the creation and use of symbols.
- Not content with biological satisfactions alone, humankind continually seeks meaning (Hill & Nunney, 1971).

**Hill's Seven Sciences**

Hill (1971) outlined his seven sciences and the research upon which each of the "sciences" was based. Hill felt education needed to be a "science" as there were other sciences and it was his contribution to initiate an attempt in that direction to give education a common language and base. His seven sciences and their base are:

1. **Symbols and their Meanings** (Based on research by John C. S. Peirce, N. L. Champlin, F. T. Villemanin, A. Korzybski, A. Rapaport, and others.) Its primary
assumptions are that humankind uses two kinds of symbols—theoretical and qualitative, and that these symbols are basic to the acquisition of knowledge and meaning. Cognitive mapping is utilized and indicates whether the student is primarily a reader or a listener. It shows the extent to which one makes use of sensory stimuli; the capacity for programmed symbolic mediations requiring synthesis, such as playing an instrument or typewriting; and the sensitivity and ability in various other cultural codes such as empathy, responsibility or commitment, esthetics, kinesis and communication interaction.

2. **Cultural Determinants of the Meanings of Symbols**
(Draws on research by E. C. Kelley, M. Sherif, E. C. Tolman, R. K. Merton, and others) This science centers on the cultural influences that affect what symbols mean to particular individuals. Some students like to study alone, make decisions alone, put situations in their own words. Others like to study with associates or are influenced by their peers.

3. **Form of Inference** (Concepts derived from statistics and logic, plus research by J. Piaget, M. Wertheimer, J. Bruner, and J. P. Guilford) A student may use categorical reasoning, reason by comparison and
contrast, synthesize a number of components into a related unity, or employ all of these processes to appraise the situation and draw a conclusion. Both inductive and deductive reasoning may be utilized.

4. Memory Concern emphasizes the neurological bases of memory. Early work was done by D. O. Hebb, followed by D. Krech and a research group at the University of California at Berkeley. Short and long term memory functions are exceedingly complex in their relationships to energy and biochemical elements. The memory processes of recognition, retention, recall, and association are identified in the testing process by the "concern" components relating to persons, processes, and properties.

5. Cognitive Style is the product of the first four sciences. In this paper this is called Learning Style to differentiate it from the use of the term cognitive style which is used to refer to the work of Witkin and others. For Hill this fifth science is based on work by C. W. Allport, H. A. Witkin, R. W. Gardner, J. Kagas, H. Moss, and I. Sigel.

6. Teaching, Counseling, and Administrative Style Each of these styles is a product of three sets of information pertaining to demeanor, emphasis, and symbolic orientation. It is based on R. K. Merton's

7. Systemic Analysis Decision Making (Based on works by J. vonNeumann and O. Morgenstern, N. Weiner, D. Cook, and L. vonVertalanffy) An educational program may be defined as a social system composed of people, processes, and properties and their interconnections considered over a period of time. Basic to the system is the statement of goal or mission which includes specific performance criteria and determines inputs. The outputs are measurements of how well the results fulfill the mission. The educational process requires much human feedback, communication and modification or revision in order to keep the system adjusted. The purpose of systemic analysis is to make decisions based on a choice of options—decisions that are best for all parts of the system.

Within the past year there has been some renaming of the sciences. The third science, Form of Inference, is now referred to as Modalities of Inference. The fourth science Memory Concern is now referred to as Biochemical and Electrophysiological Aspects of Memory—Concern. The fifth science is referred to as Educational
Cognitive Styles of Individuals. The sixth science has added student style to the previous teaching style, counseling style, and administrative style.

This study deals in part with the fifth science, Educational Cognitive Styles of Individuals. The concept of cognitive style, as defined by Hill, is a Cartesian product of four sets. When viewed in this manner it is somewhat related to Guilford's "dimension of intellect". Guilford's model is a Cartesian product of three sets that represent intellect, content and things. The Cartesian product designed to represent cognitive style is composed of the first four educational sciences.

\[
\text{COGNITIVE SYMBOLS} \quad \text{CULTURAL MODALITIES} \quad \text{N.E.B. ASPECTS} \\
\text{STYLE} = \text{and} \quad X \quad \text{DETER-} \quad X \quad \text{of} \quad X \quad \text{of MEMORY} \\
\text{MEANINGS MINANTS INFERRENCE FUNCTION}
\]

Each set in this model is composed of a series of elements which interact with elements in the other sets to form the individual's cognitive style. In the first set, symbols, there are two dimensions, theoretical (language related) which have a more general meaning in our society and include words and numbers, and secondly, qualitative (thought related) those symbols from which individuals develop more personalized meanings. An individual's cultural background modifies these symbols according to cultural determinants of meaning. The three major determinants are an individual's own personal assessment,
family influences, and associates (e.g. friends, peers). After symbols are modified by cultural determinants, the individual makes tentative conclusions about their meaning based on his characteristic thought processes. Modalities of inference are these processes and can be either inductive or deductive. The fourth set is neurological, electrophysiological and biochemical aspects of memory function. Hill's literature refers to cognitive style mapping as the Cartesian product of the first four sets and that set four is "less developed" than the first three sets. "The state of the art of using electrophysiological measurements and biochemical factors as mathematical educational mappings of memory is not sufficiently developed to allow their use in the classroom." (Nullally, 1977) This article states that ECS (Educational Cognitive Style mapping) is the Cartesian product of the first three sets.

The Hill model has been widely used in Michigan at all grade levels and was designed for application in educational settings. The plan identifies the cognitive style of students and teachers through cognitive mapping; teachers are made aware of their own styles and learn to prescribe personalized educational approaches for their students. DeLoach, Dworkin and Wyett (1971) have briefly described the procedures:
Cognitive styles of students, teachers and administrators are mapped. Based on the information obtained, an educational prescription is prepared and the student is matched, if possible, with compatible teachers (matching strategies) or placed in a situation where his style may be expanded through contact with experiences designed to add new elements to his style (augmentation strategy).

The student and teacher jointly plan and define the educational goals based on the student's cognitive style. Emphasis may be on independent study, lectures, programmed instruction, seminars, films, etc.

Constant feedback mechanisms insure that both teacher and student are aware of progress or lack of it. Modification of the program is possible at regular intervals if the student is not progressing satisfactorily.

The following is a brief guide to Cognitive Style Mapping.

I. Symbols and Their Meanings

T(VL) Theoretical Visual Linguistics—ability to find meaning from words you see. A major in this area indicates someone who reads with a better than average degree of comprehension.

T(AL) Theoretical Auditory Linguistics—ability to acquire meaning through hearing spoken words.
T(VQ) Theoretical Visual Quantitative-ability to acquire meaning in terms of numerical symbols, relationships, and measurements.

T(AQ) Theoretical Auditory Quantitative-ability to find meaning in terms of numerical symbols, relationships, and measurements that are spoken.

The five qualitative symbols associated with sensory stimuli are

Q(A) Qualitative Auditory-ability to perceive meaning through the sense of hearing. A major in this area indicates ability to distinguish between sounds, tones of music, and other purely sonic sensations.

Q(O) Qualitative Olfactory-ability to perceive meaning through the sense of smell.

Q(S) Qualitative Savory-ability to perceive meaning by the sense of taste. Chefs should have highly developed qualitative olfactory and savory abilities.

Q(T) Qualitative Tactile-ability to perceive meaning by the sense of touch, temperature, and pain.

Q(V) Qualitative Visual-ability to perceive meaning through sight.

The qualitative symbols that are programmatic in nature are:

Q(PF) Qualitative Proprioceptive (Fine)-ability to synthesize a number of symbolic mediations into a performance demanding monitoring of a complex involving small, or fine, musculature (e.g. playing a musical instrument, typing); or into an immediate awareness of a possible set of interrelationships between symbolic mediations, i.e. dealing with "signs."
Q(PG) Qualitative Proprioceptive (Gross)-ability to synthesize a number of symbolic mediations into a performance demanding monitoring of a complex task involving large, or gross, musculature (e.g., throwing a baseball, skiing).

Q(PDF) Qualitative Proprioceptive Dextral (Fine)-a predominance of right-eyed, right-handed and right-footed tendencies (a typically right-handed person) while synthesizing a number of symbolic mediations into a performance demanding monitoring of a complex task involving small, or fine, musculature (e.g., writing right-handed).

Q(PDG) Qualitative Proprioceptive Dextral (Gross)-a predominance of right-eyed, right-handed and right-footed tendencies (a typically right-handed person) while synthesizing a number of symbolic mediations into a performance demanding monitoring of a complex task involving large, or gross, musculature (e.g., throwing a baseball with the right hand).

Q(PKF) Qualitative Proprioceptive Kinematics (Fine)-ability to synthesize a number of symbolic mediations into a performance demanding the use of gross musculature while monitoring a complex physical activity involving motion.

Q(PKG) Qualitative Proprioceptive Kinematics (Gross)-ability to synthesize a number of symbolic mediations into a performance demanding the use of gross musculature while monitoring a complex physical activity involving motion.

Q(PSF) Qualitative Proprioceptive Sinistral (Fine)-a predominance of left-eyed, left-handed and left-footed tendencies (a typically left-handed person) while synthesizing a number of symbolic mediations into a performance demanding monitoring of a complex task involving small, or fine, musculature (e.g., writing left-handed).

Q(PSG) Qualitative Proprioceptive Sinistral (Gross)-a predominance of left-eyed, left-handed and
left-footed tendencies (a typically left-handed person) while synthesizing a number of symbolic mediations into a performance demanding monitoring of a complex task involving large, or gross, musculature (e.g., throwing a baseball with the left hand).

Q(PTF) Qualitative Proprioceptive Temporal (Fine)-ability to synthesize a number of symbolic mediations into a performance demanding the use of fine musculature while monitoring a complex physical activity involving timing.

Q(PTG) Qualitative Proprioceptive Temporal (Gross)-ability to synthesize a number of symbolic mediations into a performance demanding the use of gross musculature while monitoring a complex physical activity involving timing.

The remaining ten qualitative symbols associated with cultural codes are defined as:

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

Q(CES) Qualitative Code Esthetic-ability to enjoy the beauty of an object or an idea. Beauty in surroundings or a well-turned phrase are appreciated by a person possessing a major strength in this area.

Q(CET) 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 decidedly different.

Q(CH) 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.
Q(CK) 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).

Q(CKH) 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).

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

Q(CS) Qualitative Code Synnoetics-personal knowledge of oneself.

Q(CT) Qualitative Code Transactional-ability to maintain a positive communicative interaction which significantly influences the goals of the persons involved in that interaction (e.g., salesmanship).

Q(CTM) 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.

II. Cultural Determinants

There are three cultural determinants of the meaning of symbols: (1) individuality (I), (2) associates (A), and (3) family (F). It is through these "determinants" that cultural influences are brought to bear by the individual on the meanings of symbols.

I Individuality-Uses one's own interpretation as an influence on meanings of symbols.

A Associates-Symbolic meanings are influenced by one's peer group.

F Family-Influence of members of the family, or a few close personal friends, on the meanings of symbols.
III. Modalities of Inference

The third set of the Cartesian product indicating cognitive style includes elements which indicate the individual's modality of inference, i.e., the form of inference he tends to use.

M Magnitude—a form of "categorical reasoning" that utilizes norms or categorical classifications as the basis for accepting or rejecting an advanced hypothesis. Persons who need to define things in order to understand them reflect this modality.

D 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.

R 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 relationship in the process of psychoanalyzing a client.

L 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.

K Deductive—indicates deductive reasoning, or the form of logical proof used in geometry or that employed in syllogistic reasoning.

Personality

In this paper, "Personality is the dynamic organization within the individual of those psycho-physical systems
that determine his unique adjustment to the world" 
(Allport, 1937). Allport collected at least fifty 
definitions of personality and divided them into five 
types: omnibus, arrangement, hierarchial, adjustment, 
and distinctiveness. From this in depth study he wrote 
his definition of personality which has become the base 
for several texts.

Personality is directly related to values and can be 
viewed from three perspectives: Subjectively--as the 
person sees himself, objectively--as seen by others, or 
veridically--as one really is.

Personality is the complex of characteristics that 
distinguishes a particular individual or individualizes or 
characterizes him in his relationships with others. It is 
the total of distinguishable traits and characteristics, 
the organization of the individual's emergent tendencies 
to act or behave, to act on, interact with, perceive, and 
react to.

Individual personalities are the unique product of 
their particular heredity and environment and are there­ 
fore different. Within this framework there are many 
personality theories, but Carl Jung's analytical psychology 
was used in this study since it was the base for the 
Myers-Briggs Type Inventory given in the study to 
differentiate personality types.
Personality theories are assumptions and hypothesis that seek to explain the natural order of things in terms of the extremes of human behavior and individual differences, but also of typical and universal patterns. Theories take into account intrapersonal and interpersonal dynamics and integrate these into a construct of the psyche.

In Jungian analytical psychology individualization processes proceed throughout life in relation to one's "psychological type". There are two basic ego attitudes toward life, introversion and extraversion. The difference is in the interest (or psychic energy or libido) and the extravert focuses on the external world and objective facts while the introvert focuses on the way it relates to his own psychology. One is comfortable in the external world the other is comfortable with internal thoughts and ideas. Jung's introversion-extraversion concept is based on the work of Binet, for he worked with Binet for some time.

In Jung's theory there are two modes of perception, sensing and intuition, which are outside the province of reason and are two alternative nonrational functions. Sensing refers to perception through the five senses and reality is as it exists in the present contrasted with the intuitive which transmits perceptions via the
unconscious of the other person. Intuition is an awareness of the entire configuration without attention to the details of the whole and focuses on possibilities. The sensing type lives in the present, the intuitive in the past or future. The focus of interest is different and the sensing deals with the inner and outer facts while the intuitive deals with the possibilities. The sensing depends on concrete data while the intuitive is restricted by data.

The two rational functions for assessing or judging capacity are thinking and feeling. The thinking person takes action after intellectual consideration and attention to the known rules of human experience. It can be impersonal and is concerned with both inner and outer content while naming, clarifying, and classifying. Feeling puts a value or judging of the time, the place, and the person. It is a personal function and is directly related to the individual's personal values and morality.

Every individual utilizes both extraversion and introversion and all four functions—sensing vs. intuition, and thinking vs. feeling—however one ego attitude and one of each pair of functions usually predominate and characterize a typical way of relating to one's inner and outer life. Jung's concept was to pair opposing attitudes, perceptions, and functions. This personality theory is
the basis for the personality inventory used in this study, the Myers-Briggs Type Indicator.

Summary

This chapter has reviewed the current literature on cognitive style relative to the field-dependent-independent dimension in psychology as interpreted by Witkin and of cognitive style in the "Educational Sciences" by Joseph Hill (Hill, 1970). Since each makes some claims relative to personality the philosophy of the inventory used in this study for personality interpretation is also included. This review of the literature indicates the previous research, the background of the present study, and provides the basis for comparison in the analysis of the data.
CHAPTER III

METHODOLOGY

The purpose of the study was to determine significant variables that differentiate students entering architecture from those who choose elementary education and to compare two assessments of cognitive style.

The setting in which the study was conducted was The Ohio State University and dealt specifically with the School of Architecture and University College.

The Ohio State University is a large state assisted educational facility with a main campus in Columbus, four branch campuses, and several research and extension centers. The enrollment is just over 50,000 students on the main campus. Undergraduate students who enroll at The Ohio State University may enroll in seventeen different colleges, divisions, or schools and choose from over two hundred majors offering baccalaureate programs. The major one chooses determines whether he enters directly into a college or enters "University College".

University College is a unique aspect of The Ohio State University and most freshmen and transfer students
from other colleges must enter and remain in this college until they have completed requirements for entrance into a degree granting college.

Some degree-granting units have an open admissions policy and students are admitted if they meet the transfer criteria of a minimum number of hours or specific courses. The Colleges and Schools which have open admission policies are the College of Arts and Sciences, the College of Agriculture and the Schools of Natural Resources and Home Economics, the College of Engineering and the School of Architecture and the College of Administrative Science and the School of Social Work.

The other degree granting schools, divisions and colleges have more applicants than facilities can accommodate and practice a policy of selective admissions. The College of Education has a selective admissions policy which differs with each faculty, or major, within the college.

The College of Education at The Ohio State University is located on what is termed "main" campus. The policy of selective admissions was instituted in Summer Quarter, 1971. When students have met the selection criteria they apply to the major in which they want a degree. The majority of the students in the education segment of this study are in the pre-
selection portion of their program. The Freshman Early Experiencing Program from which the education students were drawn for this study, is a requirement prior to application for selection to a major in education.

The School of Architecture is located on the Columbus campus. The school, as noted previously, has a policy of open admission. Students apply for admission when they have forty-five hours or the equivalent of university credit. Many students transfer directly from other universities to the School of Architecture. Students taking their only college credit at The Ohio State University transfer into the School of Architecture upon attaining the hours and grade point minimum. The architecture students involved in the study are in the second or third quarter of a sequence of courses in this division. This would indicate some selection has already taken place for a student must pass the initial screening for acceptance to the School and then must have survived one or two courses in the sequence. It is a matter of record that architecture enrollments decrease over twenty-five percent the first and second quarters in the 241, 242, 243 sequence.

Population

At the present time there is no selection of students to either the Freshman Early Experiencing Program or the
School of Architecture beyond the requirements for admission to The Ohio State University and the completion of forty-five hours of college work for the School of Architecture. There was a wide range of ages represented, from eighteen to forty-nine, and about two percent were foreign students with English as a second language.

Sample

The sample consisted of the entire population enrolled in Architecture 242 and 243 (96 students) and three sections of the Freshman Early Experiencing Program (104 students). The sections represented were Columbus City Schools, Scioto-Darby City Schools and the Upper Arlington City Schools. Some selection was operating since students in the Early Experiencing Program choose an urban or a suburban setting for their field work.

Embedded Figures Test

The Embedded Figures Test is designed to measure an individual difference dimension initially labeled by Herman Witkin as field-dependent-independent and more recently as psychological differentiation.

This cognitive and perceptual style is viewed as an underlying process of development toward greater psychological complexity. Psychological differentiation is
manifested in cognition by global vs. articulated and in perception by field-dependent-independent (Buros, 1972).

A more detailed description and evaluation of the Embedded Figures Test is given in Buros Sixth Edition written by Harrison Gough. He describes the test as having twenty-four complex figures. (It is really two forms of twelve figures in each form.) The test is a derivation of Gottscholdt's work in 1920 on the influence of experience on perception. Each complex figure is shown for fifteen seconds and the subject is asked to describe the complex design in his own words. (This has significance but there is little research on the interpretation of these individual differences.) It was found by this researcher that foreign students improved dramatically in a test-retest situation using alternate forms if the student described the figure in his first language as contrasted to explaining the figure in English.

The simple figure is placed over the complex figure for ten seconds then removed. The subject is asked to find and trace the simple figure. The score is the time in seconds to find the simple design. At no time are the simple and the complex figures shown together but reexamination of the simple figure is permitted for ten second intervals as often as requested by the subject. Items differ considerably in difficulty with time being called
at the end of three minutes if the subject has not found the simple figure.

Tyler states the test has a theoretical rather than a practical orientation, but finds it to be a convenient and usable instrument. Field-dependents showed up as more passive and anxious about control of body impulses, with lower self-esteem. Females were more field-dependent. She recommends greater utilization of the test because of its unique characteristics (Buros, 1972).

Reliability coefficients, whether by the odd-even, test-retest, or analysis of variance method, are excellent, the median coefficient in ten studies being .905.

Its diagnostic implications are seen as related to (a) field dependence, (b) cognitive clarity, (c) an analytic versus global perceptual mode, and (d) a general disposition to articulate and structure experience.

The test is "...firmly anchored in a (Witkin, and others) systematic context of theory and empirical evidence" (Buros, 1965). Gottschaldt reports the test does assess intellectual ability and holds potential
for cross-cultural use since it is a culture free test. He states "it is not merely synonymous with Henmon-Nelson, Raven's matrices, Cattell's culture fair test, but as an "instrument which assesses a new and important facet of cognitive domain" (Buros, 1972).

A pilot study was administered to students enrolled in Architecture 243, Spring Quarter 1977. This preliminary testing involved the Myers-Briggs Type Indicator and the Embedded Figures Test Individual Form. These inventories were administered to all students enrolled in the course at the conclusion of that quarter and the instructors.

Problems in the administration of the Embedded Figures Test were apparent from the results and the participants. These inconsistencies in the testing were reading of the stop watches during extra viewings of the simple figures, reading the total time on the stop watches, and distractions during the testing. Procedures were planned to eliminate these problems in future testings by using digital stop watches for timing splits which retained the time while a subject attempted incorrect responses,
digital watches also gave an accurate read-out eliminating errors in reading half-minutes and minutes that had proved previously to be a problem,
only two testing stations were operated at a time and these were separated by partitions which improved the standardization and permitted efficient monitoring.

**Hill's Q-Sort**

A test, Q-Sort was developed by Hill for use at Oakland Community College, Bloomfield, Michigan. The instrument is administered to all incoming students and the information it yields is applied to personalize the student's college program and study methodology. The entire test consists of two hundred sixteen (216) items used to measure twenty-seven (27) elements of cognitive learning style with eight items for each element.

There is a shortened version containing one hundred twenty (120) items which assesses fifteen elements of cognitive learning style. The instrument is used for diagnostic purposes by Hill to produce a cognitive learning style map which is altered as needed augmenting weak areas with strong areas as the student improves his learning procedures.
The fifteen elements of cognitive learning assessed in the shortened version to be examined in this study are

1. Theoretical Auditory Linguistic—T(AL)—ability to acquire meaning through hearing spoken words.

2. Theoretical Visual Linguistics—T(VL)—ability to find meaning from words you see. A major in this area indicates someone who reads with a better than average degree of comprehension.

3. Theoretical Auditory Quantitative—T(AQ)—ability to find meaning in terms of numerical symbols, relationships, and measurements that are spoken.

4. Theoretical Visual Quantitative—T(VQ)—ability to acquire meaning in terms of numerical symbols, relationships, and measurements.

5. Qualitative Code Empathetic—Q(CEM)—ability to put oneself in another's place.

6. Qualitative Code Synnoetics—Q(CS)—personal knowledge of oneself.

7. Qualitative Code Transactional—Q(CT)—ability to communicate with others in a way that influences their goals or objectives.

8. Cultural Determinant Associates—A—weighting or filtering symbolic information as one's associates do.

9. Cultural Determinant Family—F—weighting or filtering
symbolic information in ways you have learned from your family.

10. Cultural Determinant Independent--I--weighting or filtering symbolic information based on the idea that one's own ability to direct behavior is the best.

11. Modality of Inference Magnitude--M--use of rules and definitions to reason and draw conclusions.

12. Modality of Inference Differences--D--reasoning process which involves specific differences in the characteristics of objects, facts, events.

13. Modality of Inference Relationships--R--reasoning process which involves the similar characteristics of two or more facts, events, or objects.

14. Modality of Inference Appraisal--L--reasoning process which includes definite rules and finding differences and similarities to draw conclusions (M, D, and R combined).

15. Modality of Inference Circle K--(K)--Deductive reasoning or logical proof.

Each item has three choices for response: A--Usually--carries a weight of five; B--Sometimes--carries a weight of three; and C--Rarely--carries a weight of one. A score of forty is possible if each of the eight items of an element is answered A. The range for an
element could be from eight to forty. Each of the fifteen elements is assessed on the basis of the score as a major element (score of 27 to 40), minor element (score of 16 to 26), or negligible (score of 8 to 15).

No information is available on validity or reliability. Hill is concerned with construct and content validity since his focus is diagnostic not predictive. Hill suggests Kuder-Richardson 20 correlational formula for determining internal consistency of the instrument on one testing.

**ACT Test**

Initiated in 1959 the ACT program consists of four tests English usage, mathematics usage, social studies reading and natural sciences reading. This battery is a direct development of the Iowa Tests of Educational Development and is taken by nearly a million students in the United States each year.

The English usage section consists of four long readings with underlined words or phrases, there are seventy-five items with a thirty minute time limit. ACT publications state the test measures the student's understanding and use of the basic elements in correct and effective writing including punctuation, capitalization, usage, phraseology, style and organization. One review
in Buros states "there is no evidence the test actually measures what it purports to measure, especially the student's use of the basic elements described" (Buros, 1972).

The mathematics test is fifty questions covering algebra, arithmetic, and plane geometry in a fifty minute time limit. Different forms of the test place varied emphasis on geometry and there are many "wordy" problems but it is traditional math with little or no modern math.

The social studies reading test consists of fifty-two items in a thirty-five minute time limit that measures "the evaluative reading and problem solving skills needed in the social studies" (Buros's Seventh, p. 300). Thirty-seven of the fifty-two items are based on four readings.

The natural sciences reading test measures the critical reasoning and problem solving skills required in the natural sciences. Again there are fifty-two items, thirty-seven are based on four readings, with a thirty-five minute time limit. Physical science is included in the readings.

All items on the ACT are multiple choice with math items having five options and all other questions having four options. The arrangement of the test items in the booklet is described in Buros as "excellent" (Buros, Sixth, p. 800). In spite of the numerous criticisms of
the ACT in the Buros' reviews it must be pointed out that the ACT is excellent in its predictive validity for grades in college. There are extensive norms, well developed and described and appropriately selected for the intended uses and interpretations of the test results.

**Myers-Briggs Type Indicator**

The Myers-Briggs Type Indicator was developed by Isabel Briggs Myers and is a forced-choice questionnaire containing one hundred sixty-six items on a self-report descriptive design. It is based on that part of the theory of C. G. Jung which describes psychological types as described earlier in this paper. The theory is that variations in behavior which seem random are actually consistent and orderly when one understands differences in the ways people prefer to use their perception and judgment. Four preferences are scored: E-I (Extraversion-Introversion), SN (Sensing-Intuition), TF (Thinking-Feeling), and JP (Judging-Perceiving). The four scores combine to generate a possible sixteen personality categories, or types (See Tables 5 and 7). The author recommends using continuous scores on each of the four continuums so all research with the instrument utilizes the same scoring process for comparability purposes. This was followed in this study.
Scores on the Myers-Briggs indicate the direction and the strength of each preference on each of the four scales. The essentials of each type are perception and judgment; perception meaning becoming aware of something while judgment is coming to a conclusion about something (Saunders, 1958). On each scale one direction will be preferred and dominant.

The interpretation of the four scales is described by Saunders (1958) as:

The most fundamental premise of the theoretical formulation underlying the Myers-Briggs is that every time you use your mind for any purpose whatever you perform either an act of perception (P) or an act of judgment (J). Most people gain a great deal more pleasure from one of them than from the other...

...Thinking versus Feeling (T-F). These are two forms of judgment. Thinking-Judgment is a logical formalizable process, aimed at an impersonal finding of fact and well suited to situations which can be encompassed by some propositional statements...Feeling-judgment is a more complicated process of appreciation, reasonable in its way but bestowing personal and subjective values upon the elements of situations too complicated for logical analysis... Most people... make some decisions with one function and some with the other, but...trust one more than the other, and by use and practice...develop that one so that it grows more and more trustworthy.

Sensation and Intuition (S-N), are the two forms of perception... Sense-perception is the direct awareness of something by way of one or more of the five conventional senses—sight, hearing, touch, taste, or smell. Intuitive-perception is indirect perception by way of the unconscious, accompanied by
ideas or associations which the unconscious adds on to the sensations from outside the organism. These unconscious contributions run a wide gamut from the merest masculine "hunch" or feminine "intuition" through the whole range of semi-original and original ideas... As before, you undoubtedly make some use of both sorts of perception but one of them interests you more than the other and gets a resultant priority.

Extraversion-Introversion (E-I) refers to the two basic attitudes or patterns of organization in the original Jungian sense... Extravert refers to an attitude in which one's main points of reference are external, centered in the outer world of people and things. Introvert refers to an attitude in which one's main points of reference are internal.

Split half reliability for internal consistency shows correlations in .70 and .80 range for continuous scores. Validity is not dealt with in the manual but concurrent validity with other instruments is in the expected range (Buros, 1974).

Data Collection

Architects and elementary education teachers are examples of different groups studied by Witkin. The pre-professional level of these groups was the target sample of this study. Do architecture students and education students differ on the Embedded Figures Test? Other inventories were also administered to gather additional data that was cited in the literature as significant factors in career selection. These are the Learning Style Inventory, ACT scores, and the Myers-Briggs Type Indicator.
ACT scores were gathered for students enrolled Spring Quarter 1978 in Architecture 242, Architecture 243, and three sections of Education: Special Services 271. Students for whom ACT scores were available were given the Embedded Figures Test, the Learning Style Inventory, and the Myers-Briggs Type Indicator.

Examiners were trained in the administration of the Embedded Figures Test via a video tape on the correct procedure and common problems. The tape was created by Dr. C. A. Moore who has an extensive background in the administration and interpretation of the Embedded Figures Test at Stanford University and at the Educational Testing Services.

Critical to the validity of this study was the accuracy of the administration of the Embedded Figures Test. All testing was Spring Quarter, 1978, with the exception of the pilot study which was done Spring Quarter, 1977. Precise records were collected on the examiner, the examinee, the date of testing, and the sequence of examinees for each examiner on each date. This data was examined for unique patterns attributable to the examiner. In the final analysis the distribution of scores can be explained by the variations within the subjects for other factors were monitored and controlled. This refinement in the administration of the Embedded Figures Test was a
direct outgrowth of the Pilot Study of the Spring of 1977.

The Myers-Briggs Type Indicator and the Learning Style Inventory were administered in class to each group during a four week period early in the quarter.

Analysis of Data

The numerical data produced by this study were analyzed by the use of descriptive statistics. Frequency distributions, means and measures of variability by pair-deletion and by line-deletion were utilized. Percentages are used where it is appropriate.

The Statistical Package for the Social Sciences (SPSS) was used for the analysis of the data. This system provides a unified and comprehensive package that enables the user to perform many different types of data in a simple and convenient manner. SPSS allows a great deal of flexibility in the format of data. It provides the user with a comprehensive set of procedures for data transformation and file manipulation, and it offers the researcher a large number of statistical routines commonly used in the social sciences.

In addition to the usual descriptive statistics, simple frequency distributions, and cross-tabulations, SPSS contains procedures for simple correlation (for both ordinal and interval data), partial correlation, means and variances for stratified subpopulations, one-way and n-way analysis of variance (including multiple classification analysis tables), multiple regression, discriminant analysis, scatter diagrams, factor analysis, canonical correlations, and Guttman Scaling. The data-management facilities can be used to modify a file of data permanently and can also be used in conjunction with any of the
statistical procedures. These facilities enable the user to generate new variables which are mathematical and/or logical combinations of existing variables, to recode variables, and to sample, select, or weight specified cases...
the user can add to or alter the data cases or the data-descriptive information in the file, such as labels, missing-value codes, etc (Nie, Hull, Jenkins, Steinbrenner, and Bent, 1970).

In this chapter the procedures and instruments for the study were described. Analysis of the data, a description of the findings and a discussion of the results will be discussed in Chapter IV.
CHAPTER IV

PRESENTATION OF THE FINDINGS

It was the purpose of this study to identify significant characteristics that differentiate students in beginning architecture courses from those who choose a pre-education course and plan to major in education.

Data are presented in the tables as they relate to the questions raised in the problem statement. The findings are discussed following each table.

Characteristics of the Population

The sample of three units of the Freshman Early Experiencing Program and the entire population enrolled in Architecture 242 and Architecture 243 at the end of Spring Quarter 1978 show there are differences in the students choosing these majors based on age and sex. Table 1 contains these data.

Since Architecture 242 is the second course and Architecture 243 is the third course in what is considered a second college year sequence one might expect an age variance of four quarters of college, or a year and three
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<th>Age</th>
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<th>Male</th>
<th>Female</th>
<th>% Arch. in Study</th>
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<td></td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>84</td>
<td>101%</td>
<td>84</td>
<td>12</td>
<td>98%</td>
</tr>
</tbody>
</table>

Total by Field 101 96
months in age, to be "logical" based solely on the course level in the given curriculum. As mentioned in Chapter II architecture accepts students into the course sequence after completion of forty-five hours which is the equivalent of one year of college. Education, on the other hand, accepts students at the end of the second year or ninety hours of college credit. Students used in this study were Pre-Education, or first year college Freshmen, while Architecture students were in courses considered a second college year sequence.

Data gathered for this study show that education students tend to be from one to three years younger than those in the selected architecture courses and are predominately female. The study involved eighty-four (84) females and seventeen (17) males in these three Pre-Education units. The median age was nineteen (19) years and the range was from eighteen (18) years to forty-one (41) years. The clustering was from eighteen (18) years of age to twenty-one (21) years of age. Ninety-five percent of the population was within these four years and seventy-five (75) percent were either eighteen or nineteen.

Architecture students would be expected to be a little more than one year older than education students by the previously mentioned selection and sequencing
of courses. The median age for students in both courses of architecture was twenty-one (21) years of age with the range being from eighteen (18) years (one student) to forty-nine (49) (one student). The age range was not as clustered for the architecture students as it was for the education students. This may be explained by the selection criteria and the fact these students were in their major field. One wonders if the same results would be true if the education sample was drawn from students in their second or third quarter in the College of Education.

It is interesting to note that eighty-four males were enrolled in the architecture courses and only twelve females. This makes eighty-four and a half percent (84.5%) of the enrollment male and twelve and a half percent (12.5%) female. Almost the direct opposite of the education sample on the basis of sex. The clustering of age for architecture was from nineteen (19) years of age to twenty-seven (27) years. There was more than the expected one year difference in the ages of the two groups.

Summary

Architecture students were two or more years older than the pre-education students and predominately male. The pre-education students were younger and predominately female.
Since one purpose of this study was to compare two groups at the pre-professional level for specific traits on designated inventories that are reported in the literature as significant discriminators at the professional level, the first question determined whether there are traits that have been found in successful professionals in architecture and in those who choose education similar to those found in a group of pre-professional students studying in these respective fields.

Question 1: Do architecture students and education students differ significantly on the selected personal characteristic of field-dependence-independence cognitive style?

Specifically, the question was whether the Embedded Figures Test scores would be significantly different for pre-education students from the scores of beginning architecture students. Does the Embedded Figures Test indicate that those who disembedded in a short time, and who are designated by this test as field-independent, tend to choose architecture which is considered in the literature to be a narrow gauge profession, drawing on capabilities associated with field-independence? In contrast do pre-education students score at the other end of the continuum taking a longer time to disembed (Witkin, et al., 1962-1977).

Table 2 shows the mean, standard deviation, range, minimum and maximum scores and t-statistic for the
### TABLE 2

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
<th>Minimum/Maximum</th>
<th>t</th>
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</thead>
<tbody>
<tr>
<td>Architecture</td>
<td>95</td>
<td>23.0</td>
<td>12.1</td>
<td>48.7</td>
<td>3.6</td>
<td>52.3</td>
</tr>
<tr>
<td>Education</td>
<td>84</td>
<td>64.9</td>
<td>35.2</td>
<td>160.4</td>
<td>19.6</td>
<td>180.0</td>
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</table>

*** p < .001
Embedded Figures Test. Architecture students had a mean score of 23.0 seconds compared to the pre-education students mean score of 64.9 seconds. This is a difference in the mean score of the two groups of 41.9 seconds. This becomes even more significant when one realizes the Embedded Figures Test is comprised of twelve complex figure's and a subject's score is the mean number of seconds needed to disembed the twelve simple figures from the complex figures divided by twelve. Another way of stating this is that an individual's score is his total solution time divided by twelve, or the arithmetic mean. A difference between the architecture group and the education group of 41.9 seconds means a difference in total solution time of 41.9 seconds times twelve, or a difference of over eight minutes. Obviously in this study the Embedded Figures Test does discriminate between architecture students and education students. The results according to the table are significant beyond the .001 level of probability.

Since architecture students were predominately male and the pre-education students were predominately female this suggests the question "Is there a sex relationship to the disembedding task rather than a between group difference related to the selection of the field?" Table 3 shows that females enrolled in architecture are more
<table>
<thead>
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<th>Field</th>
<th>Male n</th>
<th>Male Mean</th>
<th>Male Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td>84</td>
<td>24.2</td>
<td>12.1</td>
</tr>
<tr>
<td>Female</td>
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</tr>
<tr>
<td>Education</td>
<td>16</td>
<td>71.2</td>
<td>36.7</td>
</tr>
<tr>
<td>Female</td>
<td>65</td>
<td>62.4</td>
<td>34.8</td>
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</table>
field-independent than their male counterparts and the predominance of males represented in Table 2 does not account for a group difference in the results. Instead, there probably is a real difference in the ability of the two groups to perform the assigned task. This tendency holds a question for future investigation.

**Summary**

Architecture students were able to disembed a simple figure from a complex figure in less than half the time required by pre-education students to solve the same test. This ability did not appear to be sex related for females in architecture required less time than males and females in education required less time than males choosing that major.

**Question 2.** Do architecture students and education students differ significantly on the personal characteristic of learning style as defined by cognitive mapping?

Table 4 indicates indeed there is a difference on eight of the fifteen scales of Hill's Q-Sort Learning Style. Since this is a free choice instrument this implies a difference between the two groups in either self-confidence or preference on these items. Q1 is obtaining meaning from a word or graphic symbol by talking or listening. The mean for architecture students was 25.9 and for pre-education students 27.1. The t value
### TABLE 4

Q-Sort Results

Mean, Standard Deviation, Range, Minimum and Maximum Scores by Fields

<table>
<thead>
<tr>
<th>Q1 Auditory Linguistics</th>
<th></th>
<th></th>
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<tbody>
<tr>
<td>Architecture</td>
<td>95</td>
<td>25.9</td>
<td>4.2</td>
<td>22</td>
<td>16</td>
<td>38</td>
<td>-2.11*</td>
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<tr>
<td>Education</td>
<td>104</td>
<td>27.1</td>
<td>4.1</td>
<td>22</td>
<td>16</td>
<td>38</td>
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<table>
<thead>
<tr>
<th>Q2 Visual Linguistics</th>
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<td>5.2</td>
<td>26</td>
<td>14</td>
<td>40</td>
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<table>
<thead>
<tr>
<th>Q3 Auditory Quantitative</th>
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<td>32.6</td>
<td>3.7</td>
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<td>40</td>
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<table>
<thead>
<tr>
<th>Q4 Visual Quantitative</th>
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<table>
<thead>
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<th>Q5 Empathy</th>
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*p < .05

*** p < .001
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* p < .05  
*** p < .001
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</table>

* \( p < .05 \)

*** \( p < .001 \)
was -2.11 and was significant beyond the .05 level. Education students felt more competent at this learning style than architecture students.

Q3 Gaining meaning from sounds other than words shows architecture students to have a mean score of 32.6 and pre-education students a mean score of 30.6 with a t value of 3.40 significant beyond the .001 level of probability. Architecture students feel they have competency in the ability to find meaning in terms of numerical symbols, relationships, and measurements that are spoken in comparison to the pre-education students self-assessment.

Q4 is the ability to find meaning in terms of seeing numerical symbols, relationships, and measurements. The mean score for architecture students was 30.1 and for pre-education students it was 28.1 with a t value of 3.69 which was significant beyond the .001 level of probability. Again architecture students choose this as a more successful learning style for them than the pre-education group.

Q6 is the ability to establish realistic goals for oneself and includes personal knowledge of oneself. The mean for the architecture group was 31.6 and for the pre-education group it was 33.1. The t value was -2.10 and was significant beyond the .05 level of probability.
Q8 is the weighting of symbolic information as one's associates do. It is one of three cultural determinants of the meaning of symbols and it is through these "determinants" that cultural influences are brought to bear by the individual on the meanings of symbols. The architecture students had a mean score of 25.1 while the education students had a mean score of 27.3 with a t value of -3.24 significant beyond the .001 level of probability. Education students are obviously more influenced by their peer group than architecture students. This is another reason for the score in Q6 to be suspect.

Q9 is the weighting or filtering of symbolic information in ways you have learned from your family. The architecture students had a mean score of 26.1 and the pre-education students a mean score of 29.2 with a t value of -3.94 significant beyond the .001 level of probability.

Q10 the weighting or filtering of symbolic information based on the idea that one's own ability to direct behavior is the best approached significance with architecture having a mean score of 30.1 and pre-education a mean score of 29.5 with a t value of 1.78 which was significant at the .07 level of probability.

Q14 the reasoning process which includes definite rules and finding differences and similarities to draw
conclusions is employed by those individuals who use modalities 11, 12 and 13 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. Architecture students had a mean score of 32.8 while pre-education students had a mean score of 31.3. The t score was 2.38 and was significant beyond the .05 level of probability. This was as expected due to the nature of the questions making up this category.

Q15 indicates deductive reasoning, or the form of logical proof used in geometry or that employed in syllogistic reasoning. Architecture students had a mean score of 27.0 and pre-education students a mean score of 23.9. The t value was 4.50 and was significant beyond the .001 level of probability.

The Q-Sort Cognitive Style Inventory is a self-assessment and helps to identify how one thinks he/she learns best. Of the fifteen scales eight were significant. The four significant for pre-education students were (1) ability to acquire meaning through hearing spoken words, (6) personal knowledge of oneself, (8) weighting or filtering symbolic information as one's associates do, and (9) weighting or filtering symbolic
information in ways you have learned from your family. One and six were significant beyond the .05 level of probability, eight and nine were significant beyond the .001 level of probability.

Since pre-education students were field-dependent, according to the literature this means they are better at social situations and social cues, it seems consistent for they do value the activities represented by measures one, six, eight, and nine.

Question 3. Do architecture students and pre-education students differ significantly on selected personality characteristics of extraversion-introversion, sensing-intuitive, thinking-feeling, and judging-perceiving?

Table 5 indicates there is a difference on two of the four continuums comprising the Myers-Briggs Type Indicator, the instrument used to obtain scores on personality characteristics. The first scale extravert-introvert shows architecture students to have a mean score of 98.5 while pre-education students have a mean score of 86.9. This continuum score has a breaking point of 100 between extraversion and introversion and the results show the architecture students to be closer to 100 than the education students. Another way of stating this is that pre-education students were more extraverted than architecture students. The t score


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* p < .05
was 2.44 and was significant beyond the .05 level of probability. This was in the expected direction.

Sensing-Intuitive, the second continuum, shows architecture students to have a mean score of 95.7 and pre-education students a mean score of 92.5 with a t score of 0.69 which was not significant.

The third continuum, Thinking-Feeling, shows architecture students to have a mean score of 102.6 and pre-education students a mean score of 116.8. The t value was -3.33 significant beyond the .05 level of probability. Education students were further on the feeling side of the continuum than architecture students but both groups were in the same direction and more feeling than thinking.

Judging-Perceiving is the fourth continuum and architecture students had a mean score of 90.1 while pre-education students had a mean score of 95.0 for a t score of -1.15 which was not significant. This can be interpreted that pre-education students may be more judging than architecture students but not to a significant degree.

Summary

Pre-education students were more extraverted than architecture students in this study. Architecture students were only slightly extraverted (98.5 with 100 being the
change point for introversion). Therefore many architecture students were introverted. This was significant beyond the .05 level.

Pre-education students were more sensing than architecture students. Again 100 is the breaking point and the mean for architecture students was 95.7 with pre-education students scoring closer to the architecture students with 92.5 than architecture was to 100.

On the thinking-feeling continuum both groups were feeling but there was a significant difference beyond .05 level with pre-education students being more feeling 116.8 compared to architecture at 102.6.

On the judging-perceiving continuum both groups were judging with architecture being more judging (90.1) than pre-education (95.0) since distance from 100 is the criteria for degree on the scale.

The difference on the composite personality between architecture and pre-education shows architecture students to be extraverted, sensing, feeling, and judging. Pre-education students were more extraverted than architecture students, more sensing than architecture students, more feeling than architecture students, and less judging than architecture students.

Table 6 gives the percent of pre-education students and architecture students scoring in each personality
TABLE 6

Comparison of Personality Traits by Fields

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trait. Fifty-three (53%) percent of the architecture students were extraverted and seventy-three (73%) percent of the pre-education students. Forty-seven percent (47%) of the architecture students were introverted and twenty-seven percent (27%) of the pre-education students.

Fifty-nine percent (59%) of architecture was sensing compared to sixty-three (63%) for pre-education.

Forty-one percent (41%) of architecture students were intuitive and thirty-seven percent (37%) of pre-education students. Forty-seven percent (47%) of architecture was feeling and eighty percent (80%) of pre-education. The difference between this score and the mean score can be accounted for by the use of continuous scores. When treated arithmetically a few skewed scores affect the mean.

Sixty-nine percent (69%) of architecture students were judging and sixty-four percent (64%) of pre-education.

Table 7 shows that thirty-two percent (32%) of the pre-education students were ESFJ and twelve percent (12%) were ENFP. Almost half of the sample is found in these two personality types.

Architecture students were found to be more scattered as to type preference. Twelve percent (12%) were ENFJ, and eighteen percent (18%) were ISFJ. The remainder were scattered throughout the other types.
### TABLE 7

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<td>Educ 4 4%</td>
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<td>Arch 4 12%</td>
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<td>Educ 9 9%</td>
<td>Educ 32 32%</td>
<td>Educ 6 6%</td>
<td>Educ 1 3%</td>
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</table>
Question 4. Do architecture students and education students differ significantly on selected personal characteristics of verbal abilities, math abilities, and total abilities?

Scores on the ACT test were used to explore this question. The results are found in Table 8. Architecture students had a mean score on the verbal ability of 19.4 while pre-education students had a mean score of 18.6. This gave a t value of 1.18 which was not significant.

Act math scores showed architecture to have a mean score of 25.7 while pre-education students had a mean score of 18.8 with a t value of 7.61 which was significant beyond the .001 level. Again this was as expected since math is considered essential for success in architecture.

ACT total scores show architecture to have a mean score of 23.1 and pre-education students to have a mean score of 19.1 with a t value of 5.49 significant beyond the .001 level. Overall, architecture students have higher scores on the ACT than pre-education students.

Table 9 presents the correlations between variables for the entire sample (199 students) using pair-deletion instead of line-deletion that was used in the previous data analysis. This enables utilization of the entire data to be computed by Pearson product-moment correlations for pairs of data to assess the strength of relationships.

Q3 the ability to find meaning in terms of numerical symbols, relationships, and measurements that are spoken
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*** p < .001
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<td>Math</td>
<td>-0.63***</td>
<td>0.09</td>
<td>0.08</td>
<td>-0.18</td>
<td>-0.07</td>
</tr>
<tr>
<td>ACT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>-0.59***</td>
<td>0.14</td>
<td>0.13</td>
<td>-0.12</td>
<td>-0.01</td>
</tr>
</tbody>
</table>

* p < .05
** p < .01
*** p < .001
and low scores on the Embedded Figures Test are significant beyond the .01 level of probability.

Q4 is the visual ability to find meaning in terms of numerical symbols, relationships, and measurements and again there is a correlation with low scores on the Embedded Figures Test beyond the .05 level of probability this time.

Q5 the sensitivity to the feelings of others and the ability to see things from another's point of view correlates with extraversion and with thinking beyond the .05 level of probability.

Q7 the ability to maintain a positive communicative interaction which significantly influences the goals of the persons involved in that interaction correlates with extraversion beyond the .001 level of probability.

Q8 the meaning of symbols for the individual is influenced by one's associates correlates with extraversion and with feeling beyond the .001 level of probability.

Q9 the meaning of symbols for the individual as influenced by one's family correlates with high scores on the Embedded Figures Test (field-dependence) and with sensing (MBTI) beyond the .001 level of probability, with feeling beyond the .01 level, and with extraversion beyond the .05 level.
Q10 using one's own interpretation as an influence on meanings of symbols correlates with intuition and with thinking beyond the .01 level.

Q11 Inference-Magnitude or a need to define things in order to understand them correlates with extraversion beyond the .001 level.

Q13 the ability to synthesize a number of dimensions into a unified meaning, or through analysis of a situation to discover its component parts correlates with sensing and with judging beyond the .001 level.

Q14 inference using magnitude, differences and relationship giving equal weight to each in one's reasoning process correlates with low scores (field-independence) on the EFT and with intuition (MBTI) beyond the .01 level.

Q15 deductive reasoning correlates with field-dependence (low scores on the EFT) beyond the .001 level, and with thinking (MBTI) beyond the .01 level.

Field-independence (low scores on the Embedded Figures Test) correlated beyond the .001 level with high scores on the ACT on verbal, math, and total scores. The ACT verbal correlated with introversion (MBTI) beyond the .05 level of probability.
CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to investigate the differential characteristics of first year architecture students and pre-professional education students on the basis of field-dependent-independent cognitive style, learning styles as defined by cognitive mapping, personality characteristics, and verbal, math abilities.

The study evolved from a desire to replicate the research on field-dependence-independence in relation to architecture and education, to obtain an understanding of the concept of cognitive style and to juxtapose this approach from psychology with the "Educational Sciences" approach to cognitive style, and to examine the relation of personality type and academic ability to each concept.

This study sought to answer the following questions.

Do architecture students and education students differ significantly on selected personal characteristics:
1. field-dependence-independence cognitive style;
2. learning styles as defined by cognitive mapping;
3. personality characteristics of extraversion-introversion, sensing-intuitive, thinking-feeling, judging-perceiving; and

4. verbal abilities, math abilities, total abilities?

In this study architecture students were predominantly male and had a mean age of twenty-one. The pre-education students were predominantly female with a mean age of nineteen.

The results indicate there is a difference in psychological differentiation between architecture students and pre-education students. This cognitive and perceptual style is viewed as an underlying process of development toward greater psychological complexity. Psychological differentiation is manifested in cognition by global vs. analytical and in perception by field-dependent-independent. On the test of disembedding, the Embedded Figures Test, architecture students disembedded faster than pre-education students. Indeed architecture students disembedded almost three times as fast as the pre-education students. The literature on field-dependence-independence in relation to architecture was confirmed by this study to be true also for undergraduates in introductory architecture courses. Based upon the instrument used this can also be translated that architecture students were field-independent and the pre-education students were field-dependent. The scores
do not appear to be sex related since females in architecture were more field-independent than their male counterparts. The pre-education students showed the opposite tendency with the males scoring more field-dependent than the females. No conclusions are drawn from this other than the findings.

The pre-education, field-dependent, students were more extraverted, feeling and social than the field-independents who were more thinking and judging. The cognitive and perceptual psychological differentiations were consistent between the cognitive test and the learning style inventory based upon the interpretations of each category. Field-dependents were higher in weighting or filtering information in ways learned from one's family and from associates. This supports their preference for a social reference framework in cognition and perception and is consistent with their type preference on the personality inventory.

Field-independents were higher in the ability to gain meaning from numerical symbols, relationships, and measurements whether they are spoken or visual. They were stronger in reasoning processes which include definite rules and finding differences and similarities to draw conclusions and at deductive reasoning or logical proof. Again this supports their cognitive preference and perceptual style of analysis.
The interpretations given to the opposite ends of the continuum, field-dependence and field-independence, were supported by the results from the Q-Sort with the global and social preferences being field-dependents and the analytical preferences being field-independents.

There were significant differences in personality styles between the two groups. Eighty percent of the pre-education students emphasized the use of feeling, as opposed to thinking, as their process for decision making. Architecture students were more balanced between thinking and feeling.

There was also a significant difference in the ACT scores between the two groups with architectural students having the higher scores. A high score on the ACT was significant in relation to speed in disembedding giving possibility to an often mentioned theory in the literature that disembedding may be assessing a generalized superior ability.

In looking at the composite of correlations for the entire group personality characteristics of extraversion were related to empathy, ability to maintain positive communication, peer influence, family influence, and a need to define things to understand them. The senses as the preferred form of perception related to family influence on weighting of symbolic information and ability to synthesize into a meaningful whole.
Intuition was the preferred form of perception for sensitivity to the feelings of others, using one's own interpretation and deductive reasoning. Feeling was the decision making process for those most influenced by associates and family. Judging people were higher at the ability to synthesize into a meaningful whole.

Learning styles preferred by pre-education students show a higher ability to acquire meaning through hearing spoken words, for personal knowledge about oneself, to be more influenced by peer group, and to be influenced by members of the family. They would find it important to develop warm human relationships.

Learning styles preferred by architecture students indicate they feel more capable at the ability to find meaning in terms of numerical symbols, relationships, and measurements that are spoken; the ability to acquire meaning visually in terms of numerical symbols, relationships and measurements; to analyze, question or appraise in drawing a probability conclusion and to employ deductive reasoning.

Pre-education students perceive a world of interpersonal relationships and architecture students perceive a thinking analytical world where they are emotionally more self-sufficient. The values and processes are orthogonal each functioning in a different reality.
The relationships found in the results appear to have face value and to be "logical". The statistical analysis confirms the fit among the four instruments.

Conclusions

Architecture students and pre-education students differ on field-dependence-independence. Architecture students are field-independent and pre-education students are field-dependent. Females who choose architecture as a major are more field-independent than the males while males who choose education are more field-dependent than the females who choose this major. Students who feel competent at analytical tasks do seem to choose careers that utilize that ability. These are the people who prefer to work with facts and data and use deductive reasoning.

Pre-education students are more extraverted and more feeling oriented than architecture students. Again, these personality traits are factors in their choosing careers dealing with people where they perceive their ability for being verbal and developing close relationships is needed for success. These are the talkers who address their problems with words and feelings.

Architecture students had higher scores on verbal ability, math ability, and total ability. Architecture is considered a science and a difficult course of study.
Students chose this field if they felt they had the academic ability to succeed. Contrasted with this a career in education is considered easier as far as course work in math and science and attracts students with different abilities than academic excellence.

The results of this study do not confirm the MacKinnon study which found that all creative architects were intuitive. This raises the question of intervening variables between the first year in a course of study and being selected as a "creative" architect. Either only the intuitives reach the creative category or the variable was significant only for MacKinnon's population (MacKinnon, 1962).

The cognitive style test and the learning style inventory results were confirmed on many scales giving indication of the validity for each approach; test vs. self-analysis. Another interpretation would be that students understand their areas of competence and avoid their areas of difficulty.

**Recommendations**

It is recommended that further research with the Embedded Figures Test and Hill's Q-Sort Learning Style be conducted. Each holds promise for new learning about thought process and cognitive style and the approaches are quite different. Each holds value for career guidance.
The Embedded Figures Test gives pertinent information unavailable from other sources at this time.

It is recommended that students in other selected majors should be tested with the Embedded Figures Test to increase the body of knowledge on ways individual differences in field-dependence-independence predict career choice.

It is recommended that the Q-Sort be refined in the wording of questions and a careful study of the discriminating qualities of each question or statement in the inventory be conducted.

It is recommended that the Myers-Briggs be continued in Freshmen Early Experiencing and would probably be of value in architecture in assessing student characteristics and related program changes.

It is recommended that instruments be given early in a quarter to allow sufficient time for interpretation and the teaching of alternative learning styles and of the process of augmenting weaknesses by utilizing strengths.

It is recommended that the use of digital stopwatches with a capacity for timing splits be used for greater accuracy in administration of the Embedded Figures Test.

It is recommended that the Embedded Figures Test be considered as a screening test for acceptance to architecture for it appears to predict success about the same as the ACT.
APPENDIX A
This Q-Sort is a way of helping to identify the ways you learn best. It will be valuable only if you are careful and give thought to each of your answers.

Directions: There are 120 items on the next few pages. Each question may be answered by Usually, Sometimes, or Rarely. On the answer sheet provided, blacken the space that corresponds to your response for that item: A-Usually B-Sometimes C-Rarely.

Mark the space completely with pencil. If you change your response, be sure to erase completely. Be sure to blacken a response for each of the 120 items.

1. I understand a topic better if I examine it to learn how it differs from other topics.

2. I can predict my prospects for success in most situations.

3. I find it easier to win an argument when I state a premise (Blank is true) and give a conclusion to the premise which is inescapable. (Therefore, blank must be true.)

4. I am able to put people at ease in tense situations.

5. I know my anxiety threshold.

6. I have little need for others to help me make decisions.

7. In group discussions, I am the catalyst for reaching decisions.

8. My "best" decisions are made alone.

9. I can recognize who is on the phone just by listening for a few moments.

10. I set goals consistent with my needs and abilities.

11. I can convince others to do the things that I would like them to do.

12. Children find it easy to get along with me.

13. I can tell whether or not I will be able to get my work done.
14. Information should be analyzed in a number of ways before a conclusion is reached.

15. My written explanations are better than my spoken ones.

16. I prefer to be in lecture type classes.

17. I know what my physical responses will be to a particular task.

18. I can tell the difference between two closely related sounds.

19. In my choice of clothing, I usually wear contrasting colors.

20. I choose music to fit my mood.

21. People say I speak better than I write.

22. After I write a letter, I ask someone to read it to me so that I know that it sounds right.

23. I understand the daily news if I hear it on the radio.

24. I have no sympathy for people who break the law.

25. I do well on a test if it is about information I heard in a lecture.

26. I prefer to communicate with friends and colleagues by telephone than by writing notes to them.

27. When given a job to do, I prefer to work on it myself.

28. I am able to offer criticism without offending.

29. My friends tell me that I am understanding.

30. I avoid saying things which hurt the feelings of others.

31. When looking at something constructed by someone else (e.g. painting, a building, a piece of furniture) I like to figure out why the person created it as he did.

32. I prefer to read a paper myself rather than have someone read it aloud to me.

33. I prefer to read directions rather than have someone read them to me.
34. I understand the emotions of others.
35. When someone is frightened, I can be patient and calm rather than get angry with them.
36. Religion is a purely personal thing.
37. When given a problem to solve, I can come to the best solution by myself.
38. Random sounds interfere with my ability to concentrate.
39. I choose clothes for the way they look.
40. I score high on achievement tests which emphasize reading comprehension.
41. I make my own political choices.
42. I like to share ideas with friends and associates.
43. I would rather do things my way even if they don't conform to the expectations of my family or friends.
44. I regard my personal goals as most important.
45. Before taking a new job, I discuss it with my friends.
46. Sales people find the merchandise that I'm asking for.
47. I can tolerate the inability to concentrate which characterizes those who are newly "in love."
48. I often have to make a decision before I know enough about the situation.
49. I talk with my family before doing anything that might affect them.
50. Before voting in an election, I review choices with my family.
51. I make it a point not to let my work interfere with family plans.
52. I understand how a person feels when being punished.
53. I prefer verbal directions.
54. I enjoy art exhibits.
55. When shopping for clothes, I like to have a friend along to help me make choices.

56. I feel better acquainted with someone after seeing pictures of him rather than reading about him.

57. I do well in classes which rely heavily on textbooks.

58. I have no difficulty in understanding how to put puzzles together.

59. In play as well as work and life in general, I find it essential to "play by the rules".

60. I find it important to consult my family in planning vacations.

61. I can anticipate accurately how well I will do in a new situation.

62. I am able to tell which groups of instruments are playing at various times during a concert.

63. Characteristics for successful people are not the same as those for unsuccessful people.

64. I know my capabilities.

65. I enjoy activity more when my friends participate in it with me.

66. I find the reasoning patterns required in statistics rewarding to me.

67. I understand geometric theorems.

68. When shopping for clothes, if I find the article I had in mind at a fair price, I buy it without further comparison.

69. I "play the devil's advocate" with people to force them to look at other points of view.

70. I can tell if something is wrong with an engine by listening to it.

71. I enjoy outdoor activities more if my family is with me.

72. I consult with my immediate family before making important decisions.
73. I understand events better after discussing them with my friends.
74. I make personal decisions after discussing them with my friends.
75. The family that prays together stays together.
76. I am able to persuade people in disagreement to strive for agreement.
77. Peers involve me in solving problems.
78. I prefer to read articles which are accompanied by pictures or drawings.
79. The tone or inflection of a speaker’s voice gives additional meaning to what he says.
80. I don’t understand how people can appreciate a problem until they know as much about it as possible.
81. When I attack a problem, I approach it from as many angles as possible.
82. I tune the radio by sound, not by looking at the dial.
83. At parties, I am verbally able to stop arguments involving others before they go too far.
84. Life is simplified if you go by the rules.
85. I work best in a structured situation.
86. I avoid probability statements in solving problems.
87. I can identify musical notes well enough to recognize a tune the next time I hear it.
88. I prefer working in situations where standards and rules are stated explicitly.
89. I value my friends’ political opinions.
90. Knowledge flows logically from given premises.
91. I understand more easily by reading than by hearing.
92. A person can never know enough about life.
93. I try to understand why people break rules.
94. There's always a reason for a person's behavior.
95. I like to figure out how parts of a whole fit together.
96. I laugh with the person who laughs when he stubs his toe because I know it hurts.
97. I tend to see all parts of the world as being interconnected.
98. I find the type of reasoning demanded by the rules of mathematics suit my style of thinking.
99. I "think" in pictures and graphic models instead of words and phrases.
100. When I tune a radio, I pay close attention to the numbers on the dial.
101. Problem solving involves related variables.
102. I can program myself to handle boring tasks.
103. I would find it interesting to discover how people behave by evaluating things which make people tick (e.g. physiological, sociological, and psychological).
104. I enjoy games or puzzles in which the solution is deduced from information contained in the rules.
105. Holidays are different from other days of the year.
106. There are many facets to a problem as there are on a well cut diamond.
107. I learn a subject better when I can discuss it with my peers.
108. After I dictate a letter, I have to read it to be certain it is correct.
109. I find reasoning like this statement helps me to clarify my thoughts: "All men are mortal; Socrates is a man; Socrates is mortal."
110. The more I know about a problem, the more I want to know about it.
111. In evaluating the performance of others, I find it helpful to determine how this performance differed from another performance.
112. I don't find sufficient reason to change my mind on a subject once I identify the rule which applies.

113. I use jokes or humorous remarks to change the focus in different situations.

114. In evaluating the performance of others, I find it important to determine the standards which were set for them.

115. I have no difficulty in following a map.

116. I understand a lecturer better if I can see him while he talks.

117. I would join a particular religious group because my friends belong to it.

118. I can make more sense out of what a person means when he speaks to me rather than when he writes to me.

119. I take longer than others in coming to a conclusion because I want to know more about an issue than they do.

120. A story is easier to understand in a movie than in a book.
INDIVIDUAL INTERPRETATION OF COGNITIVE STYLE

NAME_________________________

Situations or tasks may require different elements for success. Apply your scores to assist you in these situations or tasks. A score of 40 is possible for each element of cognitive style: a score of 27 to 40 is a major element, 16 to 26 is a minor element, and 0 to 15 is negligible. For example: If TL is a major element then you will learn best by this method. If, however, QV is a major element then you would need visual pictures added to classroom lectures or textbooks to learn best.

SCORE ELEMENT

____ TL 1. Obtaining meaning from a word or graphic symbol by talking or listening.
____ VL 2. Obtaining meaning from written words or graphic symbols.
____ QA 3. Gaining meaning from sounds other than words.
____ QV 4. Gaining meaning from seeing things other than words or symbols.
____ EM 5. Ability to put oneself in another's place.
____ RG 6. Ability to establish realistic goals for oneself.
____ TR 7. Ability to communicate with others in a way that influences their goals or objectives.
____ A 8. Weighting or filtering symbolic information as one's associates do.
____ F 9. Weighting or filtering symbolic information in ways you have learned from your family.
____ I 10. Weighting or filtering symbolic information based on the idea that one's own ability to direct behavior is the best.
____ M 11. Use of rules and definitions to reason and draw conclusions.
____ D 12. Reasoning process which involves specific differences in the characteristics of objects, facts, events.
____ SC 13. Reasoning process which involves the similar characteristics of two or more facts, events, or objects.
____ RP 14. Reasoning process which includes definite rules and finding differences and similarities to draw conclusions.
____ LP 15. Deductive reasoning or logical proof.
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