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LEARNING STYLE AND THE ADULT LEARNER

BY

ELIZABETH LUCAS

A THESIS

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DATE October 3, 1989

ABSTRACT

The study's overall purpose was to determine whether similarities in three learning style variables, preferred perceptual mode, required amount of structure and tendency toward reflectivity or impulsivity, exist among adult learners. The researcher designed a 54-item inventory which sought to determine, for the entire sample, preferred perceptual mode, required amount of structure and tendency toward impulsivity or reflectivity. The study investigated whether the aforementioned three learning style components vary with age and level of study.

The inventory was administered to students enrolled in the Faculty of Education at the University of Alberta, in two - year diploma programs at Grant MacEwan Community College, and in college preparatory courses at Alberta Vocational Centre. Levels of study were designated as university (N=44), community college (N=38) and college prep (N=26). The researcher assigned the following four age categories: under 25 (N=29), 25 - 34 (N=29), 35 - 44 (N=36) and over 44 (N=14).

Calculation of percentages indicated the frequency of preferred perceptual mode, required amount of structure and tendency toward impulsivity or reflectivity for the entire sample, for each age group and for each level of study. A one-way Analysis of Variance determined differences in the three variables according to age and level of study.

Findings revealed psychomotor to be the most frequently preferred perceptual mode for the entire sample as well as for each of the age categories and levels of study. The only stastically significant difference ($P < .05$) was found for learning by viewing. It occurred

between students ages 25 - 34 and those over 44, and between the college prep level and both the university and community college levels. In the first instance, the younger group showed the stronger preference; in the latter, the college prep students were most in favour of learning by viewing.

A statistically significant difference was found for required levels of structure between students under 25 and those over 44, as well as between the university group and both the community college and college prep groups. The older students and those studying at the university level were least in need of externally imposed structure.

No significant differences in tendency toward impulsivity or reflectivity occurred either among age groups or levels of study.

Within the confines of its very limited sampling, the study does arrive at some conclusions about similarities in preferred perceptual mode, required amount of structure and tendency toward impulsivity or reflectivity among groups of adult learners. It does not, however, seek to discount, in any way, the importance of understanding the individual nature of each student's learning style.

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THE PROBLEM

INTRODUCTION OF THE PROBLEM

Learning style research is rooted in a commitment to better understanding the needs of individual students. The rationale for such work is inherent in Gary Price's (1983, p.49) definition of learning style:

> When people learn, they perceive and think. They also interact with resources, methods and environments. The tendencies and preferences that accrue from this personal experience bring about one's learning style---one's characteristic ways of processing information, feeling and behaving in learning situations.

Although most learning style research has concentrated upon children, adult educators are beginning to understand its implications for their students. They see learning style information as being beneficial to both adult students and their instructors.

Insights into how they learn should help increase adult learners' opportunities for academic success. According to Smith (1982, p.57), adult learning will be enhanced by an understanding of learning style because "a central task of learning how to learn is developing awareness of oneself as a learner." Unlike children, adults often arrive with preconceived ideas about their inefficiency as learners (Kidd, 1973). Dixon (1985) points out that many adults returning to school are relieved to learn they are different rather than poor learners, and they

are surprised to discover they have strengths not shared by all their classmates. Even (1987) identifies learning style as one of seven factors affecting adult learning.

Instructors of adults are advised that knowledge of learning style is helpful in "recognizing and selecting conditions under which adults with various characteristics are likely to learn effectively" (Knox, 1986, p.26). Brookfield (1986, p.31) contends that adults will benefit most from a "non threatening" learning environment where different learning styles are considered. Dixon's (1985) guidelines for helping adult learners use learning style information include helping individuals understand themselves as learners; encouraging individuals to expand their instructional approaches; creating an environment in which diversity can thrive and creating a climate in which collaboration exists. As early as 1976, Patricia Cross advised that no learning program should be designed on the expectation that all participants share a single learning style. Students in required classes, especially remedial classes, are penalized by the assumption that they will all use identical learning strategies with equal efficiency.

BACKGROUND TO THE PROBLEM

Instructors of adults are faced daily with the task of providing group instruction to students whose individual approaches to learning vary greatly. Knowledge of an individual's learning style enables an instructor to make the student's learning experiences more effective and, therefore, more rewarding. Because limited time and resources may prevent individual diagnoses for all class members, there is merit

in determining whether patterns of learning style similarity exist among groups of adult students. Examination of both learning style and adult education research yields three major areas worthy of consideration: perceptual modality, structure, reflectivity or impulsivity.

Perceptual Modality

Keefe (1979) explains that the perception of reality occurs in three basic ways: the visual (reading and viewing), the aural (hearing and speaking), and the psychomotor (doing). Messick (1976, p.22) concludes that while most adults are able to function in all three modalities, "with information from one clarifying and supplementing the other two," they do have a preference for one of these modes that will determine their thinking and learning styles.

Structure

In 1973, Roby Kidd recognized that because adult students experience learning in different ways, their learning environments should provide opportunities for both individualized and group learning. Hunt (1979, p.34) explains that a highly structured environment is "teacher-centred," includes "pre-organized material" and involves "very specific instructions and expectations." Environments having little structure are "more likely to be determined by the student, involve general instructions and include material which is not pre-organized" (Hunt, 1979, p.34). The importance of understanding the need for a variety of structures is emphasized when Smith (1982) points out that an environment where learners have too little autonomy may

leave them feeling insulted and unmotivated while, on the other hand, learners who are suddenly expected to take most or all of the responsibility for their own learning may become anxious and overwhelmed.

Reflectivity/Impulsivity

Smith (1982) and Knox (1986) explain that impulsive individuals will answer quickly, giving the first answer that occurs to them even though it may be incorrect, while reflective individuals will consider several alternatives before deciding upon an answer. This echoes Kagan's (1966) research concerning conceptual tempo. Smith (1982) suggests that impulsivity and reflectivity are "roughly analogous" to risk taking and caution. Other adult research (Whitbourne and Weinstock, 1979) has indicated that as adults grow older, they attempt to reduce the risk of error by taking longer to formulate answers or choose among alternatives.

Kagan (1966, p.18) differentiates between "expectancy of failure" and "anxiety over anticipated failure" among elementary school children and concludes that "a child who has been exposed to chronic failure may enter into a problem situation with a strong anticipation of failure, but minimum anxiety." This is particularly true of many adolescents who drop out of high school and later re-enter the education system as adult learners. The dimensions of impulsivity and reflectivity are, then, distorted by attitudes toward failure. Kagan's (1966, p.23) work with children also revealed that "reflective students persist longer with difficult intellectual tasks than their impulsive counterparts with the same verbal ability."

STATEMENT OF THE PROBLEM

The study's main purpose was to determine whether similarities in three areas of learning style, preferred perceptual mode, required amount of structure and tendency toward reflectivity or impulsivity, exist among adult learners.

The aforementioned areas of learning style among adult learners were explored through the following sub-problems:

1. With what frequency do subjects indicate a preference for each of the following perceptual modes: visual, aural, psychomotor?
2. What are the required levels of structure indicated by subjects?
3. To what degree do subjects indicate tendencies toward impulsivity or reflectivity?
4. Do preferred perceptual mode, required level of structure, and tendency toward impulsivity or reflectivity vary according to age?
5. Do preferred perceptual mode, required level of structure and tendency toward impulsivity or reflectivity vary according to level of study?
6. Will analysis of item responses provide further insights into the learning style of each of the levels of study?

INSTRUMENT AND LEVEL OF ACCEPTANCE

The researcher constructed a 54-item "Learning Style Inventory" which was administered to adult students attending evening classes at the University of Alberta, Grant MacEwan Community College and Alberta Vocational Centre. The inventory items investigated three learning style components: (a) preferred perceptual modality, (b) required amount of structure (c) tendency toward reflectivity or impulsivity. Responses were recorded on a five-point Likert-type scale ranging from strongly disagree to strongly agree. The inventory's format was modelled upon the Learning Style Inventory (Dunn et al., 1987) and the Productivity Environmental Preference Survey (Dunn et al., 1986). Items dealing with preferred perceptual modality are identical to, or modifications of, those contained in the two aforementioned instruments. The remaining items have been devised solely for this instrument and are grounded in the research of David Hunt (1971, 1978, 1979) and Jerome Kagan (1965, 1966).

The study used an acceptance level of $p < .05$ for judging acceptance or rejection of statistical significance.

DELIMITATIONS

The study did not attempt to explore any other factors that affect learning, such as intellectual ability, past learning experience, motivation, or self-concept. Students were not asked to indicate whether English was a first or second language, nor were any course grades examined.

The study was limited to adults attending evening classes during fall, 1988, at three institutions (University of Alberta, Grant MacEwan Community College and Alberta Vocational Centre) located in Edmonton, Alberta. The participants completed the "Learning Style Inventory" only once, and there were no follow-up interviews to clarify contradictory or unusual responses.

DEFINITION OF TERMS

Following are definitions of the terms used in the thesis.

Adult Learner

Nominal definition:

> The study accepts, as its nominal definition, the definition proposed by Shrafritz et al. (1988, p.17) which states that an adult learner is "an adult who is enrolled in any course of study, whether special or regular, to develop new skills or qualifications, or to improve existing skills or qualifications."

Operational definition:

> The study's operational definition of adult learner is an adult who is enrolled in one of the following:
>
> (a) courses within the Faculty of Education at the University of Alberta
>
> (b) courses within two-year programs leading to diplomas at Grant MacEwan Community College
>
> (c) courses within the college preparatory program

at Alberta Vocational Centre

Perceptual Modality

Nominal definition:

The study's nominal definition of perceptual modality is drawn from the work of Smith (1982) and Keefe (1979). Smith (1982, p.64) explains that "sensory modalities pertain to people's relative reliance on the senses in experiencing and organizing." Keefe (1979, p.64) expands upon this with his contention that "there are three basic ways by which people perceive reality: the visual (reading and viewing), the aural (hearing and speaking), and the psychomotor (doing)."

Operational definition:

The operational definition of perceptual modality is the score achieved on each of the following groups of items (sub-tests) within the learning style inventory: visual (reading) 1,16, 34 and 43; visual (viewing) 6 and 54; aural 10, 16, 20, 27 and 34; psychomotor 15, 17, 26, 31, 37, 41, 46 and 50.

Structure

Nominal definition:

The study's nominal definition of structure combines the work of Smith (1982) and Hunt (1979). The former describes structure as having "to do with the imposition of rules, guidelines, and prescriptions for carrying out learning activities" (Smith,

1982, p.65). Hunt (1979, p.34), who sees structure as required rather than preferred, says its "most important feature or degree ... is how much the teacher is responsible for the learning activity (the more, the higher the structure)."

Operational definition:

The study's operational definition of structure is the score achieved out of a possible 95 on the following "Learning Style Inventory" items: 2, 5, 7, 9, 11, 12, 21, 22, 25, 28, 29, 33, 38, 39, 42, 47, 49 and 51. Respondents having the highest scores are least in need of externally imposed structure in the form of a teacher controlled learning environment.

Impulsivity

Nominal definition:

The study accepts, as its nominal definition, Kagan's (1966) identification of impulsivity as one of the two dimensions of conceptual tempo, which is the length of time required to respond to a problem when there are several alternative answers. Kagan (1966) further explains that impulsive students make decisions quickly, and often incorrectly, because their desire for quick success outweighs their anxiety about being wrong.

Operational definition:

The study's operational definition of impulsivity is the score achieved out of a possible 90 on the

following "Learning Style Inventory" items: 3, 4, 8, 13, 14, 18, 19, 24, 30, 32, 35, 36, 40, 44, 45, 48, 52 and 53. High scores indicate a strong tendency toward impulsivity.

Reflectivity

Nominal definition:

The study accepts, as its nominal definition, Kagan's (1966) identification of reflectivity as one of the two dimensions of a learner's conceptual tempo, which is the length of time required to respond to a problem when there are several answers. Kagan (1966) contends that reflective students analyze and try to understand all aspects of a situation before making a decision. They are more anxious about making an error than achieving quick success.

Operational definition:

The study's operational definition of reflectivity is the score achieved out of a possible 90 on the following "Learning Style Inventory" items: 3, 4, 8, 13, 14, 18, 19, 24, 30, 32, 35, 36, 40, 44, 45, 48, 52 and 53. Low scores indicate a strong tendency toward reflectivity.

SUMMARY

Learning style research attempts to understand the ways in which individual students perceive and process information and how they

respond to their particular learning environments. It has, for the most part, involved children. Increasing numbers of adult learners are entering the education system. They are often unsure about their ability to learn and their instructors are faced with trying to plan effective programming for this very heterogeneous clientele. The theories of both learning style and adult education identify three critical areas of learning style: perceptual modality, structure and impulsivity and reflectivity.

The study explored these areas through a "Learning Style Inventory" designed by the researcher.

CHAPTER 2

REVIEW OF RELATED LITERATURE

Chapter 2 provides a review of research that defines mastery learning and learning style; differentiates between cognitive style and learning style, and between cognitive style and intellectual ability; explores the learning style theories of David Kolb, Anthony Gregorc, Kenneth and Rita Dunn, and David Hunt, and describes their respective instruments for determining learning style.

MASTERY LEARNING

Because of the relationship that appears to exist between mastery learning and learning style, some knowledge of mastery learning will help in understanding learning style. One of the most obvious differences among students, the rate at which they learn, is addressed through mastery learning, a concept generated by John Carroll's (1963) proposed "Model of School Learning." This model is unique in that it bases its description of the school learning process on the assumption that learning will occur. Five elements constitute the model: aptitude, defined as the time needed to learn a specific task under optimal instructional conditions; ability to understand instruction; perseverance, defined as the amount of time the learner is willing to actively engage in learning; opportunity, defined as the time allowed for learning; and quality of instruction, defined as the the degree to which the instruction allows the student to achieve mastery within the amount of time required by his aptitude.

Crucial to the model's success is an acceptance of the interaction between the learner's ability to understand instruction and the quality of instruction. Carroll (1963) shifts responsibility for "general intelligence" and "verbal ability," the two factors usually associated with ability to learn, to quality of instruction. Instructors must organize and present the learning task in such a way that it can be learned as quickly and as well as possible. Learners must be allowed sufficient "sensory contact" with the material to be learned. Instructors must present the learning task in a series of steps with each one preparing the learner for the next. Mastery learning, then, with its contention that "if the proper conditions can be provided, perhaps 90 to 95 percent of the students can actually master most objectives to the degree now only reached by good students" (Gagné & Briggs, 1974 p.165), is a modified application of Carroll's "Model of School Learning."

LEARNING STYLE

Learning style, defined by UNESCO'S (1979, p.51) Terminology of Adult Education as " the sum of the ways of problem solving, thinking and learning habitually used by an individual," is one predictor of the mode of learning most beneficial to each student (Gagné and Briggs, 1974). The tendency to incorrectly use the terms learning style and cognitive style synonomously has been a source of confusion within the literature. Rita Dunn (1984, p.11) observes that prior to the mid-seventies, researchers concentrated almost exclusively upon "cognitive style," a "concern with how the mind actually processed

information or was affected by each individual's perceptions." Cognitive behavior, however, accounts for only one of the three components of learning style identified by Keefe (1979). Also included are affective and physiological behaviors.

Affective styles involve those areas of personality dealing with attention, emotion and valuing and, because they cannot be directly observed, they are usually inferred from an individual's interaction with the environment. They are a "product of learner personality, cultural environment, parental and peer pressures and school influences" (Keefe, 1979, p.11). Keefe further points out that the school itself, the subject matter and the teaching methods all determine a student's motivation. At the same time, students are influenced by their general level of curiosity, their need for structure, their desire for excellence and their personal interests.

Physiological styles, according to Keefe (1979), differ from the other two in that they are biologically based modes of response. Sex related differences, health related behaviors, time rhythms, need for mobility and environmental elements are factors in determining physiological styles. Physiological styles are probably those most easily observed in a classroom setting; a student who is ill, hungry, or unable to remain seated for any length of time soon becomes obvious to his teacher.

COGNITIVE STYLE

According to Keefe (1979), the four approaches to cognitive style with the greatest potential for improving learning are perceptual modality preferences, field dependence vs. field independence, conceptual tempo and leveling vs. sharpening. Following are brief explanations of each.

Perceptual Modality

Keefe (1979) explains that the perception of reality occurs in three basic ways: the visual (reading and viewing), the aural (hearing and speaking) and the psychomotor (doing). As most learners mature, the evolution of perceptual preference seems to be from the psychomotor to the visual to the aural. A dominant preference usually forms early in life and remains throughout with relatively little change.

Field Dependence vs. Field Independence

Field dependence and field independence, the result of perception research, were first described by Dyk, Faterson, Goodenough and Karp (1962). Field dependent learners are less able to perceive parts separately from their field or context; items within a field often become fused with the entire field. On the other hand, a field independent learner is much more able to perceive items as discrete or separate from the surrounding organized field (Ramirez and Castanada, 1974). Witkin et al. (1977), whose work with the Embedded Figures Test had led initially to these distinctions, contend that someone who tends to be field independent will restructure or reorganize an existing

field's organization, while a field dependent person will accept the existing field's organization. If there is no existing structure, the field independent learner will impose one; the field dependent learner will leave things as they are.

Conceptual Tempo

A learner's conceptual tempo describes the length of time required to respond to a problem when there are several alternative answers (Kagan, 1965). "Impulsive" learners give the first answer that occurs to them, and these answers are often inaccurate. "Reflective" learners, on the other hand, take longer to respond. Because of the extra time spent considering alternatives and verifying answers, the "reflective" learner's answers are more often accurate. Kagan's (1965, p.140) work further showed the stability of a "reflective" or "impulsive" disposition through showing a "generality of this attitude across varied tasks."

Leveling vs. Sharpening

Gardner et al. (1959, p.22), in their report on the earlier 1950's research of Holzman and Klein, describe the leveling-sharpening differentiation as a "principle of personality organization" that explains "consistent individual differences in perception and cognition." At first glance, leveling and sharpening seem merely to be other terms for field dependence and field independence. Levelers have a "low degree of articulation of stimulus fields," while sharpeners appreciate a field's "maximal complexity and differentiation" (Gardner et al., 1959, p.22). Their only characteristic difference is not,

however, their degree of ability to extract "figure from ground." Through their extensive work with "time error" tests, Holzman and Klein, discovered the value of leveling and sharpening as "modes of organizing a sequence of stimuli; leveling implied a low level of articulation in a sequence of stimuli, whereas sharpening implied a high level of articulation" (Gardner et al., 1959, p.23).

COGNITIVE STYLE VERSUS INTELLECTUAL ABILITY

Clarification of the differences between cognitive style and intellectual ability is a recurring concern throughout the literature and particularly in the the work of Samuel Messick (1976). He concludes that the two are related, but different from each other in the following specific ways (Messick, 1984). Intellectual ability refers to content, component processes and level of cognition; it is concerned with the questions what and how much. Cognitive styles, on the other hand, describe the mode of cognition; they address the question how. Abilities measure specific innate capacities and are "value directional-- more of an ability is better than less," while styles are concerned with manner or preference of performance and are "value differentiated"-- each extreme style has learning adaptive value in differing circumstances" (Messick, 1984, p.64).

Witkin et al. (1977) identify the following characteristics of cognitive style. Cognitive styles are concerned with the form rather than the content of cognitive activity. They refer to individual differences in how we perceive, think, solve problems, learn and relate to others. Cognitive styles cut across the boundaries

traditionally used when describing the human psyche and are stable over time. Cognitive styles are bipolar in that each pole has adaptive value under specified circumstances and, therefore, may be seen positively in relation to those circumstances. Messick (1984) further claims that because cognitive styles are made up of perceptual/cognitive and intellectual domains, and because they are involved in a learner's personality and social functioning, they offer a much more complete description than can be gained from intellectual abilities alone. Knowledge of someone's cognitive style should, then, help in guiding his learning in various subject matter areas, in establishing teacher - student interactions and in explaining social behavior within the classroom.

LEARNING STYLE RESEARCH

The existing body of learning style research is unwieldy and defies immediate and concise classification. One useful framework for analysis of some of the theory, as proposed by Lawrence (1982), is based upon Carl Jung's description of personality types. Jung's work "calls attention to subtle variations in people, yet keeps focused on simple concepts of personality," and while learning style is far less fundamental than personality type, its "constructs are much more intelligible and useful against a backdrop of type" (Lawrence, 1982, p.98). Lawrence (1982, p.93) offers the following summary of Jung's concepts as they are represented in the Myers-Briggs Type Indicator:

> Psychological types are patterns in the way people prefer to perceive and to make judgments. In Jung's theory , all

> conscious mental activity can be classified into four mental processes--two perception processes: sensing and intuition; and two judgment processes: thinking and feeling. What comes into consciousness, moment by moment, comes either through the senses or through intuition. Perceptions must be used to remain in consciousness. They are used, sorted, weighed, analyzed, evaluated and assigned into action by the two judgment processes: thinking and feeling.

The dynamics of Jung's theory are such that the "two kinds of perception--sensing and intuition are polar opposites of each other. Similarly, thinking judgment and feeling judgment are polar opposites" (Lawrence, 1982, p.94).

Two well known learning style researchers, David Kolb and Anthony Gregorc, both of whom have devised learning style instruments, rely upon Jung's "quaternary design" to represent the tensions at work in the learning process. Both men openly acknowledge their debt to Jung.

David Kolb

Kolb seeks to redress the imbalance in our understanding of the learning process. He maintains that we have "lost touch with our own experience as the source of personal learning and development," thereby increasing the loss of equilibrium already created by the erosion of our "scientific centredness" (Kolb, 1984, p.2). Kolb's (1984) learning style research has at its core the theory of experiential learning and is based upon a composite of elements from the work of Lewin, Dewey and Piaget.

The experiential learning model is one that is "consistent with the structure of human cognition and the stages of human growth and development," and because it incorporates a "dual-knowledge theory: the empiricists' concrete experience, grasping reality by the process of

direct apprehension, and the rationalists' abstract conception, grasping reality via the mediating process of abstract conceptualization," the model "allows users to identify differences among individual learning styles and corresponding learning environments" (Kolb, 1984, p.101).

Four stages constitute the Experiential Learning Model.

(Kolb, 1985b, p.2)

Illustration omitted due to copyright regulations.

A learning style is a combination of these "four basic modes" (Kolb, 1985a). The model of experiential learning is a dynamic one, pitting orientations and energies against each other; therefore, individuals may often feel pulled in several directions during a single learning experience. The two dimensions concrete experience/abstract

conceptualization and active experimentation/reflective observation embody "two dialectically opposed adaptive orientations" (Kolb, 1984, p.41). The "transactions among these four adaptive modes" and the ways in which the dialectical tensions are resolved form the "structural bases of the learning process." "Knowledge results from the combination of grasping experience and transforming it" through the process of "learning" (Kolb, 1984, p.41). Abstract/Concrete is the dialectic of "prehension," the grasping of experience. There are two forms of prehension. "Comprehension" is the grasping of experience through "conceptual interpretation and symbolic representation," while "apprehension" is the grasping of experience through the "tangible felt qualities of immediate experience"(Kolb, 1984, p.41). "Transformation" occurs via the active/reflective dialectic through either reflection, a process Kolb terms "intention," or "active external manipulation of the external world," otherwise known as "extension" (Kolb, 1984, p.41).

Kolb's Learning-Style Inventory (1985a), used largely within industrial organizations, relies upon the interactions among the four basic modes to identify four kinds of learners: accommodators, assimilators, convergers and divergers. Accommodators are "action-oriented, hands-on" learners who grasp experience concretely and transform it through active experimentation (extension); their decisions are based on intuition rather than analysis (Kolb, 1985a, p.7). Assimilators are idea rather than people oriented; they prefer working with information and theory. These learners grasp experience through abstract conceptualization and transform it reflectively or intentionally. Convergers are interested in the practical application of theory and excel at technical problem solving. They grasp experience

through abstract conceptualization and transform it through active experimentation (extension). Divergers are happiest when observing concrete situations, and considering all possibilities, but they are often reluctant to act. They grasp experience concretely and transform it reflectively (intentionally) (Kolb, 1984, 1985b).

Anthony Gregorc

Gregorc's research has a "grass roots" quality in that it grew from his decade of experience as a school administrator during which he noted time and again that "children and adults varied in their means and capacities of learning any given content" (Gregorc, 1982a, p.45). He spent much of that time gathering information about learning, through observing and interviewing, but he needed a way to formalize his study methods. The objective of Gregorc's research was to identify how individuals learn and to determine why they learn as they do. He set about developing a "scientifically credible method which would encourage an individual to reflect upon his learning experiences and divulge his perceptions of these experiences and their effect upon him." The research approach most appropriate was phenomenology, "the study of overt behavior and probable underlying causes" (Gregorc, 1982a, p.45). Over 400 people participated in the research through either taped interviews or written documents. Some documents were produced by participants; others by Gregorc described what had happened in interviews or in classroom or office settings. Anonymity was guaranteed for all participants and the only selection criterion was their willingness to share perceptions about their own learning. The interviews focused upon both the learner's "actual experiences, i.e.

specific behaviors and situational characteristics" and on his "reflection on his experiences" (Gregorc, 1982a, p.45).

From this work came the ORGANON System, a system of thought based upon the principle that life's essential purpose is to "realize and actualize one's individuality, spirituality and collective humanness" (Gregorc, 1982a, p.v). The mind determines how to achieve these goals by choosing whether or not "to align elements of the psychic life with the outer world." If harmony exists between an individual's psychic life and the world around him, he will enjoy fulfillment, satisfaction and peace. If harmony and alignment do not exist, however, the aforementioned conditions will not occur (Gregorc, 1982a, p.v).

Within the larger context of the ORGANON System, Gregorc developed his concept of learning style in terms of "Mediation Ability Theory" which states that the "human mind has channels through which it receives and expresses information most efficiently and effectively" (Gregorc, 1982a, p.5). The skill and capacity to use these channels are called "mediation abilities" and their manifestation is "popularly termed style" (Gregorc, 1982a, p.5) The Transaction Ability Inventory (1978), later revised to become the Gregorc Style Delineator (1982), was ultimately designed to "reveal two types of mediation abilities: perception and ordering" (Gregorc, 1982a, p.5). Their definitions are straightforward. Perceptual abilities are the means whereby individuals grasp information; this occurs either through "abstractness" or "concreteness." Ordering abilities describe the ways in which information is arranged, systematized, referenced or even disposed of, and the two "qualities" operating here are "sequence" and "randomness." The inventory, through measuring preferences for

abilities and combinations thereof, succeeded in identifying four learning styles: abstract sequential (AS), abstract random (AR), concrete sequential (CS) and concrete random (CR). Following are very brief descriptions of each of the modes: abstract sequential (AS) is "characterized by excellent decoding skills in the areas of written, verbal and image symbols"; abstract random (AR) is characterized by "attention to human behavior and an extraordinary ability to sense and interpret vibrations"; concrete sequential (CS) is characterized by "extraordinary development" of the the senses and a "finely tuned ability to derive information through direct, hands-on experience"; concrete random (CR) is "characterized by an experimental attitude and accompanying behavior" (Gregorc and Ward, 1977, pp.22-23).

DIRECT VERSUS INTERMEDIATE ASSESSMENT

Other learning style researchers have chosen to look directly at the learner's classroom performance and the instructional techniques to which he best responds. They vary in the degree to which they rely upon the students' descriptions of their own learning styles, but their assessments avoid the intermediate step of interpreting how certain "psychological concepts or characteristics" apply in a learning environment (Renzulli and Smith, 1978).

Rita and Kenneth Dunn

In the late 1960s, Rita and Kenneth Dunn began their learning styles research as part of a project to help youngsters who were experiencing difficulty in learning to read. Accountability, a

prominent theme in their early writing, reinforces the practicality of learning style as a way of helping students termed educationally disadvantaged. Schools could no longer reasonably expect to successfully ascribe poor student achievement to external factors. The Dunns' analysis of "eighty years of research" led to the conclusion that learners are affected by four specific areas: immediate environment (sound, light, temperature and design), own emotionality (motivation, persistence, responsibility and need for structure or flexibility), sociological needs (self, pair, peer, team, adult or varied), and physical needs (perceptual strengths, intake, time and mobility) (Dunn and Dunn, 1978, p.5).

The Dunns and Gary Price, with whom they developed their Learning Style Inventory (Grades 3 through 12) and the Productivity Environmental Preference Survey (adult version), link diagnosis with prescription of specific teaching approaches. The area of perceptual modality is pivotal to the Dunns' research. They challenged the assumptions that have resulted in an estimated 90 percent of instruction occurring through lecture and question and answer methods, despite the reality that only between two and four out of ten students will learn best by listening (Dunn and Dunn, 1978). Before the 1960s, no attention was given to determining whether individuals were best able to learn through their auditory or visual perceptions. Researchers were unaware "that some people learn by touching (tactual) and others require experiential or whole body (kinesthetic) experiences in order to learn and to retain what was learned" (Dunn and Dunn, 1978, p.13). Some students learn best through a combination of two or more senses.

The importance of considering youngsters' perceptual modality strengths when teaching them to read was verified through studies conducted by Carbo (1980), Urbschat (1977) and Wheeler (1983) which revealed that students "whose perceptual strengths were tactual/kinesthetic -- rather than auditory or visual -- did not learn well through either phonics or word recognition reading approaches. Such youngsters achieved statistically better when taught tactually" (R.Dunn, 1985, p.15). Youngsters who learn best through their tactual sense require a sense of touch in order to make the connection between "word formations and meanings." They should be allowed to trace, write, mould, piece together, select by feel and paste words and letters in a variety of materials. Children who rely upon their kinesthetic sense will find little meaning in words unless they are a part of actual experience (Dunn and Dunn, 1978, pp.13-14).

Following are several other Dunn and Dunn (1978) findings. Individuals' abilities to concentrate will vary depending upon their different reactions to levels of sound, light, temperature and type and arrangement of furniture. Some students may concentrate more efficiently and feel less anxious if they are allowed to eat, drink, chew gum or move around in the classroom setting. Not all students learn equally well at all times of the day. Students respond differently to the sociological dynamics of learning. While some students become anxious in a teacher-dominated environment, others may be unable or unwilling to learn from their peers. Students will vary in the amount of structure they require for efficient learning. Dunn and Dunn (1978, p.11) define structure as the "establishment of specific rules for working on and completing an assignment"; structure defines

time spans, limits choices and determines the "mode of either learning, responding, or demonstrating achievement."

The Dunns discovered that, because students differ in their willingness or ability to persist until a task is completed, it is best if the lengths and types of assignments are varied. Students with short attention spans may be best served by a form of self-pacing wherein objectives are clearly spelled out and completion is expected, but the time period is flexible. Students who persist, with a minimum of supervision, until they complete a task to the best of their ability are perceived as being "responsible." An "irresponsible" student will, on the other hand, lose interest at the first sign of difficulty and turn his attention to non-productive or disturbing activities. If students can meet the expectations placed on them without fearing embarrassment or failure, they are much more likely to behave "responsibly."

For Dunn and Dunn, the key to alleviating many learning problems lies in addressing students' perceptual strengths and weaknesses. The disadvantage and discomfort experienced by many students in classrooms where instruction involves only the visual and auditory perceptual modes is further documented in the following description of "poor readers" as needing "intake and mobility", being "adult rather than self-motivated", having "reduced persistence" and "nonconforming" behavior and having "an increased need to learn tactually and kinesthetically" (Dunn, 1984, p.15).

David Hunt

David Hunt's research enjoys the respect of some of learning style theory's most outspoken critics (Davidman, 1984). Hunt (1981, p.647) dislikes the attention paid to "competing definitions of learning style" when the more basic issues lie in the need to match learning style theory with teaching strategies. He has also worked to dispel what he describes as the myths of novelty, unlimited resources and unwarranted faith in the power of science that accompany much learning style research. Hunt (1985, p.2) defines learning style as "nothing more than a formal attempt to capture what goes on in effective communication," a process that he breaks into two steps: "reading and flexing." Within this context, "reading and flexing are like perception and action, one leading to, or occurring simultaneously with, the other" (Hunt, 1985, p.2). Learning style results then in a network of "matching statements of the 'if then' variety"; for example, "if a person experiences events spatially, then I will use maps, globes and atlases to communicate" (Hunt, 1985, p.3). Hunt (1981) credits teachers experienced in classroom observation for their important role in discovering and implementing the most appropriate matches.

According to Hunt (1979, p.27), a student's learning style describes him "in terms of those educational conditions under which he is most likely to learn." Hunt (1979, p.28) focuses on "conceptual level," which has as one of its dimensions "increasing self-responsibility," as the primary variable in determining a student's "requirements in an educational environment." The instrument designed for assessing conceptual level is the Paragraph Completion Method (Hunt, Butler, Noy and Rosser, 1978). Learners with

a low conceptual level (CL) are "categorical, dependent on external standards and incapable of generating their own concepts." They contrast sharply with high CL learners who are "capable of generating new concepts, having a greater degree of internal standards and taking on different perspectives" (Hunt, 1971, pp.43-44). Students who are low in CL will learn most effectively in a "highly structured environment," while those with a high CL may learn best in a "low structure environment, or learn equally well in a variety of environments" (Hunt, 1982, p.89). Highly structured environments are teacher-centred, include pre-organized material and involve very specific instructions and expectations. Educational environments that are low in structure are more likely to be determined by the student, involve general instructions and include material that is not pre-arranged (Hunt, 1979). For instance, the lecture method is highly structured, while the discovery approach is an example of low structure. More subtle examples of the application of structure are found in the sequencing of rules and examples during the introduction of new material. In a highly structured format, a rule is presented, followed by an example. An example presented by itself represents low structure (Hunt, 1971).

Hunt's (1971) strategies for matching learning style with environment differ from those of several researchers in that they are based on the principle of compensation rather than preference. His system classifies learners as needing very much structure, much structure and less structure. Learners who require maximum (very much) structure are characterized by short attention span, constant activity, and frequent physical and verbal fights. They cannot function in groups

or discussions and will guess at a problem's solution rather than think it through. They will try the rules often and look to their peers for approval. These students work only because the teacher says they must. Learners who need much structure take on the role of the "good student"; they work neatly and provide the right answers. It is important that the teacher be constantly present as they often seek teacher approval. In fact, these students cannot readily adjust to different teachers, visitors or schedule changes. They prefer to work alone at their desks. Learners belonging to this group are confused by choices.

Learners who need less structure seem much more actively involved in their own learning (Hunt,1979). They like to ask questions, volunteer information, discuss and argue. Unafraid of making mistakes, they are enthusiastic and eager to solve things on their own. They are imaginative, open to alternatives and often digress and follow tangents. These learners dislike detail and working sequentially. They may initially seem self-centred and unconcerned about the responses of others-- even teacher rewards.

The relationship between a student's conceptual level and his ability or intelligence is a complex, but "relatively distinct" one. Students who require structure will have a "wide range of ability" and, in fact, many students with high ability need structure. Low ability students are less likely, however, to function well with little structure. "Therefore, learning style and ability show a low, but significant relation, yet they are distinct from one another. Further, the relation decreases as students grow older" (Hunt, 1979, p.30). Despite Hunt's contention that teachers are the best assessors of learning style, he does point out that they often equate learning style

with ability. This is especially true with younger students when there is a tendency to assume that those with high verbal ability will require little structure.

DESCRIPTIONS OF LEARNING STYLE INSTRUMENTS

Following are descriptions of the most recent revisions of five of the best known instuments for measuring learning styles. It is important to preface the information with the reminder that the experts stress the need for caution when interpreting results and suggest guidelines for supplementing findings.

Kolb (1985b, p.9) advises that the Learning-Style Inventory profile be interpreted during discussion with the respondents, resulting in an opportunity to explore the relationship between the "learning orientation, as measured by the LSI, and the specific learning context(s) the respondent had in mind while completing the inventory," and to gain a more complete picture of subject area achievement and learning preferences.

Gregorc (1982a) explains that his Style Delineator shows relative rather than absolute abilities and capacities, and a high score in a given area may indicate abilities and capacities that have not yet been developed or refined. Because the Style Delineator, does not include individual goals, desires or motivation, it should not be the sole criterion for a particular educational diagnosis or career choice. There are, according to Gregorc (1982a), no guarantees that school or job success will naturally follow matching one's environment to his dominant style. At the same time, scores may not be correct for reasons

ranging all the way from simple arithmetic errors to candidates' responses that do not reflect how they are, but rather how they feel they should be.

Dunn, Dunn and Price (1987) appear more confident of the the accuracy of results generated by their instruments, the Learning Style Inventory (1987) and Productivity Environmental Preference Survey (1986). This may be due, in part, to the directness of their content and format. Dunn et al. (1987, p.11) advise LSI administrators that "teachers should discuss the individual profile with each student and explore potential alternatives for maximizing learning based on that individual's preferences." This is similar to an earlier recommendation (Dunn et al., 1982, p.5) that, following completion of the PEPS, the supervisor should "discuss the individual's profile with each employee and explore potential alternatives for maximizing productivity based on that worker's needs." This approach, consistent throughout the Dunn, Dunn and Price work, has drawn some criticism for its failure to urge the teacher to "explore the meaning of the student's responses" on an instrument where "the selection and phrasing of the inventory questions demand such probing" (Davidman, 1981, p.5). Since the Dunn et al. approach is so highly prescriptive, the criticism may have some merit.

Throughout his research, David Hunt (1985, p.1) has credited experienced teachers with being able to assess their students' learning styles through classroom observation; in fact, he suggests that learning style's unnecessary "myth of novelty cuts teachers off from what they already know and are doing." In earlier work, Hunt (1979) lists teachers and learning style instruments, parents, peers and the

student himself as possible sources of learning style information. The instruments are, for the most part, regarded even by their designers as relevant and important, yet imperfect, criteria for education and career decision making.

Learning-Style Inventory (Kolb)

Three objectives determine the basis of LSI 1985, which "is designed to help individuals assess their ability to learn from experience" (Kolb, 1985b, p.1). It is short and direct, thereby making it suitable both for reasearh and for increasing individuals' awareness of how they learn. Secondly, the test items, according to Kolb (1985b, p.3), require responses similar to those called for in learning situations where need exists to resolve the "tensions between the abstract-concrete and active-reflective orientations." Finally, there is every intention that the test's measures will "predict behavior in a way consistent with the theory of experiential learning" (Kolb, 1985b, p.3).

The LSI is essentially self-administering and requires approximately ten minutes for completion. Instructions to respondents, often persons from business and industry, explain that it describes the way they "learn" and "deal with ideas and day-to-day situations" (Kolb, 1985a, p.2). There are twelve items in the inventory, and each contains four sentence endings which correspond to one of the four learning modes: concrete experience (characteristic word feeling), reflective observation (watching), abstract conceptualization (thinking), and active experimentation (doing). Item 6 exemplifies both structure and content (Kolb, 1985a, p.3):

When I am learning	__ I am an intuitive person	__ I am an observing person
	__ I am a logical person	__ I am an active person

Respondents are reminded that there are no right or wrong answers. They must rank each of the four sentence endings and avoid assigning equal values within a set. Scores are determined by adding each of the four columns, with each column representing one of the four learning styles. Raw scores in each column range from 12 to 48. Combination scores are calculated by subtracting the totals of the columns representing polarities: AC - CE and AE - RO. These will range from +36 to -36. After plotting the scores on the accompanying grid, the respondent has a graphic indication of whether he is a converger, diverger, assimilator or accommodator.

Based on 268 respondents, the LSI 1985 Technical Specifications claims strong internal reliability of the four basic scales and the two combined scores. Kolb (1985b p.4) cites reliabilities ranging from .73 to .88 on Cronbach's Standardized Alpha. Since the items are not scored dichotomously, the Alpha is the "appropriate method for computing reliability" (Borg and Gall, 1983, p.285). A criticism of Kolb's original reliability study was its failure to include Spearman rank order coefficients, "the appropriate reliability coefficient for data based on rank ordering the desired styles" (Moore and Sellers, 1982, p.231).

Style Delineator (Gregorc)

The Style Delineator's guiding objective, according to Gregorc (1982a, p.45), is "to identify both how individuals learn and why they learn as they do." It is "designed to reveal two mediation abilities: perception and ordering" (Gregorc, 1982a, p.5).

The instrument is a word matrix comprised of ten columns, each containing four words. Respondents are asked to rank the words according to how well they describe their basic selves. A four indicates the word that is most descriptive; a one indicates the least descriptive. Since there are no correct answers, respondents are urged to "react to their first impressions" (Gregorc, 1982a, p.9). Scores indicating preference for one of the four styles (concrete sequential, abstract sequential, abstract random, or concrete random) are calculated by adding first horizontally and then vertically. Graphs are provided for charting individual profiles showing orientation in each of the four areas. A score of 27-40 indicates the most powerful mediation qualities, while a score of 10-15 shows those that are weakest. An intermediate score of 16-26 suggests, according to Gregorc (1982a, p.14), a "moderate ability and capacity to transact in the channel indicated." Balanced scores in all areas usually reveal an equal distribution of ability in each of the four channels.

Gregorc (1982a) justifies using words in his inventory because they, unlike descriptive phrases, may evoke a whole range of responses without suggesting content specific situations. The words include different parts of speech and are not parallel in structure. This facilitates the desired tapping of the unconscious that will discourage logical processing and allow a "natural response to the impact of a

word" (Gregorc, 1982a, p.46). Many were involved in the painstaking task of word selection, first for the Transaction Ability Inventory (1978), and then for the Style Delineator (1982). The initial instrument drew upon the vocabularies of educators for words strong in "connotative values" and "intellectual and emotional impact" (Gregorc, 1982a, p.45). In the interest of serving a wider clientele, the Style Delineator (1982) contains words contributed by sixty adults from private industry.

The Style Delineator's internal consistency is related to both its construct validity and its reliability. Gregorc (1982b) presents two definitions, operational and theoretical, for each of his four constructs (CS, AS, CR, and AR). Theoretical definitions give detailed outlines of the attributes of individuals in each of the four categories, while operational definitions describe the specific word choices of each group. For example, concrete sequential persons see themselves as more "objective" than "sensitive, evaluative or intuitive" (Gregorc, 1982b, p.10). A minimum of sixty percent of word choices from a particular category places an individual within it.

Alpha coefficients show a high degree of internal consistency, ranging from .89 to .93, for each of the four scales. Test - retest reliabilities, over times ranging from six hours to eight weeks, show an alpha coefficient test - retest correlation ranging from .85 to .88.

Predictive validity studies are based upon respondents' assessments of the degree of accuracy with which the categories describe them. Assuming that individuals possess the necessary self-awareness to complete such an exercise, the following results are impressive. Gregorc (1982b) cites a study involving 475 respondents who, after

completing the Style Delineator (1982b, p.23), were given lists of characteristics fitting their particular classifications. They were asked to rank on a scale of one to five the accuracy of each characteristic. Thirty-one per cent (146) strongly agreed; 58% (278) agreed; 10% (47) were unsure; 1% (4) disagreed and none strongly disagreed.

Learning Style Inventory (Dunn, Dunn and Price)

Dunn et al. (1987, p.5) claim theirs to be the "first comprehensive approach to the assessment of an individual's learning style in grades three through twelve." Two versions of the LSI exist: one for grades three and four and another for grades five through twelve. Each contains 104 items dealing with student preferences concerning environmental, emotional, sociological and physical needs. Students may complete the inventory in writing, on tape, orally, by computer or through any combination of these media. Ideally they are advised to treat the items as though they were "explaining how they would work or study best when trying to learn new and/or different information or skills" (Dunn et al., 1987, p.10).

Average completion time for the LSI is from 20 to 30 minutes and it may be done in more than one sitting. The original LSI true - false format has been revised to a five-point Likert-type scale (strongly disagree to strongly agree) for grades five through twelve and a three-point Likert-type scale (true, uncertain, false) for grades three and four. Dunn et al. (1987, p.6) advise that students be "encouraged to give immediate reactions to each question on a feeling basis." The authors concede that many of the questions are "highly subjective and

relative," but this makes them even better indicators of how students learn differently from their peers.

Students receive computerized individual profiles of their learning style. These include a raw score, a standard score, LSI area and a graph showing the relative location of standard scores in each area. Standard score calculations are based upon the LSI scores of more than 500,000 students. A standard score of 60 or better indicates a high preference for an area; while a score of 40 or lower indicates a low preference. Areas showing in the 40 to 60 range are not considered critical to learning because they will "vary depending on the situation" (Dunn et al., 1987, p.12). Group summaries are also provided to enhance classroom grouping strategies.

Internal consistency scores are calculated for each student, based upon responses to questions repeated throughout the inventory. A score of 70%, indicating that responses to 70% of the item pairs agree, represents an acceptable internal consistency. If internal consistency is less than 70%, Dunn et al. (1987) advise that the student redo the LSI. Reasons for a low consistency should be fully explored. They may include lack of motivation, interest, self-esteem or inability to concentrate.

The LSI's reliability and validity are referred to (Dunn et al., 1987), but the only reliability fully explained is that of internal consistency, as measured by Hoyt's Analysis of Variance Procedure. According to Borg and Gall (1984, p.285), this method provides exactly the same results as the Kuder-Richardson formula K-R 20 and "yields a lower coefficient than other methods," thus providing a "minimum estimate" of reliability. Research based upon 1,982 students in grades

five through twelve revealed that 19 of the 22 areas had relialibilities equal to or greater than .6 (Dunn et al., 1987, p.31). The only mention of test-retest reliability refers to 1983 findings that show a Pearson Product Moment Correlation reliability score of .929 between an initial test and retest of the LSI in the area of time of day preference for 169 fourth, fifth and sixth graders (Dunn et al. 1987, p.31).

Productivity Environmental Preference Survey (Dunn, Dunn and Price)

This instrument, the LSI's counterpart for adults, first appeared in 1979 and was revised in 1982. Its designers herald it as the "first comprehensive approach to the diagnosis of an adult's individual productivity and learning style," and they further recommend it as "an important and useful step toward analyzing the conditions under which an adult is most likely to produce, achieve, create, solve problems, make decisions or learn" (Dunn et al., 1982, p.1). The inventory contains 100 items dealing with adult preferences for those same elements upon which the LSI is based.

With the exception of the computer option, testing conditions are identical to those for the LSI. Answers are given on a five-point Likert-type scale, a revision from the 1979 version's true-false format which "improves each item's discriminatory ability and permits greater flexibility for the respondents" (Dunn et al., 1982, p.21). Completion time ranges from 20 to 30 minutes. Results are provided in individual profiles along with group summaries, but their interpretation is extended to include both occupational and educational performance.

As with the LSI, most of the reliability work focuses on internal consistency. Hoyt's Analysis of Variance shows that 68% of the

reliabilities are equal to or greater than .60 (Dunn et al., 1982, p.19). Areas having reliabilities > .75 include preferences for sound, light, auditory learning, intake, mobility, formal design, and morning as a time for working and learning.

Paragraph Completion Method (Hunt)

The PCM is unique in that it is semi-projective rather than self-reporting, based upon Hunt's objective to assess Conceptual Level by determining how people think. Hunt et al. (1978) explain that students are asked to write at least three sentences in response to each of the following six topics:

What I think about rules...
When I am criticized...
What I think about parents...
When someone does not agree with me...
When I am not sure...
When I am told what to do.

The PCM's language skill requirements make it unsuitable for students below grade six or for those having language difficulties. Persons administering the instrument provide general guidelines for expanding on each of the stems, but the amount of direction will vary depending on the respondents' ages. Students from grades six to thirteen are allowed three minutes for each item, while adults are expected to respond in two minutes. Hunt et al. (1978) justify the structure of the PCM with the explanation that no satisfactory ways of objectively assessing conceptual level have yet been established. Hunt (1985, p.1) describes self-reporting measures as "systemantic versions of your own self-judgement, not mental X-rays." They do not provide the thought sample necessary for determining how one thinks.

Scoring the PCM is a complex process wherein judges are constantly expected to look beyond content and to consider the answer's thought structure. Preparation for judging PCM responses begins with an understanding of conceptual level's two basic components: "increasing conceptual complexity as indicated by discrimination, differentiation, and integration and increasing interpersonal maturity as indicated by self-definition and self-other relations" (Hunt et al., 1978, p.3). The comprehensive manual which describes the procedure first presents a description of the general thinking characteristics of each conceptual level, followed by sample answers for each item reflecting these characteristics. On the basis of 26 studies, Hunt et al. (1978) report a median inter-rater coefficient of .86, and they include 40 responses so that beginning evaluators may assess agreement level comparisons.

Arriving at a CL score involves two stages. Each response receives a score ranging from 0 to 3 and a total is calculated by averaging the three highest scores. Hunt et al. (1978, p.37) explain that, because people may receive a low score on one or two items because of a "temporary lack of interest" and because "it is difficult, if not impossible to simulate high scores," the person is not required to "demonstrate a high level of conceptual thinking" every time. When subjects have a very low CL, however, a more accurate picture may be gained by averaging all six scores. Hunt et al. (1978, p.38) caution that because CL is a "developmental variable," its score has an "absolute rather than a relative meaning." The four categories of learning style, according to the need for structure and the corresponding CL scores are as follows: much structure (0-1.0), some

structure (1.2-1.4), less structure (1.5-1.9) and little structure (2.0+).

Because of the unique nature of CL, the PCM falls outside the usual reliability and validity studies. The standard measures of internal consistency do not apply. Hunt et al. (1978, p.42) report test-retest reliability coefficients ranging from .45 to .56 for students in grades six to thirteen over one year intervals. A single study involving 36 college students resulted in a test-retest coefficient of .67 for a three-month period. Validity of a developmental construct such as conceptual level can only be legitimately established through a longitudinal study. Cross-sectional studies provide some information, but cannot reflect the development that occurs within a person .

SUMMARY

Chapter 2 provided an exploration of the concept of learning style. It explained the essential components of learning style and attempted to clarify the theory by differentiating between learning style and cognitive style, and between cognitive style and intellectual ability.

The second portion of the chapter emphasized that, within the rather broad spectrum of learning style, there are several specific theoretical approaches. The work of researchers who have developed instruments for determining learning style was examined. The Kolb (1985) and Gregorc (1982) instruments are based upon complex theories of learning and identify traits or ideas which must then be interpreted for application to learning situations. A more direct and highly prescriptive approach is taken by Kenneth and Rita Dunn and Gary Price

(1986, 1987), using self-reporting instruments that emphasize preferred perceptual mode. David Hunt's Paragraph Completion Method (1978) measures conceptual level, the factor which determines the amount of structure a student requires in his learning environment.

The existing body of learning style research includes a wide variety of theoretical approaches, all of which are committed to enhancing individual learning. The literature supported the merit of further research and shaped the focus and format of the instrument designed for the study.

Chapter 3

METHODOLOGY

The purpose of the study was to determine whether similarities in three areas of learning style, preferred perceptual mode, required amount of structure and tendency toward reflectivity or impulsivity exist among adult learners. Through sub-problems, the study sought to explore variation in preferred perceptual mode, required amount of structure and tendency toward reflectivity or impulsivity according to age and level of study. The levels of study selected were university, community college and upgrading in preparation for community college.

INSTRUMENTATION

A review of the literature prompted the decision to construct a learning style inventory focusing upon three areas: (a) preferred perceptual modality, (b) required amount of structure and (c) tendency toward reflectivity or impulsivity. The inventory included 54 items, each requiring a response on a five-point Likert-type scale ranging from strongly disagree to strongly agree. Its format was modelled upon the Learning Style Inventory (Dunn et al., 1987) and the Productivity Environmental Preference Survey (Dunn et al., 1986). Items dealing with preferred perceptual modality were identical to or modifications of those contained in the two aforementioned instruments. The remaining items were devised solely for this

instrument and were grounded primarily in the research of David Hunt (1971, 1978, 1979) and Jerome Kagan (1965, 1966).

Some advantages of both the instrument and its administration were the following:

1. An inventory is an efficient way to collect data. It is inexpensive and requires much less time than such methods as interviewing and observing.
2. An inventory calls for responses to items describing specific aspects or activities of learning. It avoids the psychological interpretation required by several of the established instruments.
3. The five-point Likert-type scale, unlike a true/false or even a three-point scale, allows for various shades of response. This is desirable given the task's subjectivity.
4. Administering the inventory during class time assures its return.
5. Administering the inventory to classes with whom the researcher has no other contact should help to eliminate attempts of the respondents to please the researcher.

On the other hand, there were limitations inherent in the research strategies employed. Following is an outline of some of these:

1. With any self-reporting inventory there is always the danger that, despite assurances that no one answer is better than another, responses may not be honest.
2. The items may lack reliability and validity.
3. Although words such as "usually " and "rarely" may help to elicit the best individual response, their openness to

interpretation could ultimately taint the findings.

4. An inventory may discriminate against all respondents whose preferred perceptual modality is not visual (reading).
5. Respondents who read slowly may hurry through the inventory to avoid embarrassment at being slow to finish.

ASSUMPTIONS

The data gathering activities were based upon several assumptions. The first of these was that the inventory being used to collect the data was both reliable and valid. Secondly, the study assumed that the sample was representative of the entire adult student population. A third assumption was that respondents answered honestly, describing how they are, rather than how they think they should be.

SUBJECTS

The subjects who completed the "Learning Style Inventory" were enrolled in evening classes at the University of Alberta, Grant MacEwan Community College and Alberta Vocational Centre. The sample, selected from the aforementioned population, was comprised of 108 respondents who were attending classes at the institutions. The inventory was administered during class time in October, 1988. Respondents remained anonymous and were asked to indicate only their sex, age and programme or faculty of study.

The institutions were chosen because they represent three distinct levels of study. The classes provided a convenient sample of adult learners; each student in attendance completed an inventory. The researcher chose evening classes in an attempt to reach mature students studying part-time. The sample was distributed across the three institutions in the following manner:

University of Alberta	44
Grant MacEwan Community College	38
Alberta Vocational Centre	26

VALIDATION

The researcher's thesis supervisor first reviewed the inventory to assess its face validity. It was then administered to three Grant MacEwan students ages 19, 28 and 45 to determine

1. the length of time required for completion
2. clarity of the instructions
3. clarity of format
4. clarity of the inventory items

All three respondents completed the inventory in just under fifteen minutes. In discussions immediately following completion, they indicated areas of confusion arising from wording and ordering of items.

The supervisor of Grant MacEwan Community College's Department of Research and Evaluation then reviewed the inventory. Her recommendations concerned format and layout. The revised version

of the inventory reflects the changes suggested by both the students and the staff member.

COLLECTION OF DATA

During October, 1988 the evening classes completed the inventory during class time. Data collection began on October 6 and ended on October 20. The inventory is contained in Appendix A.

SCORING OF DATA

Each inventory was given a number and a code to indicate the respondent's age and level of study. The researcher assigned the following age categories:

1 = under 25

2 = 25 - 34

3 = 35 - 44

4 = over 44

Levels of study were designated as follows:

1 = University of Alberta

2 = Grant MacEwan Community College

3 = Alberta Vocational Centre

The responses for each item on each inventory were then transposed to a summary sheet and submitted to the University of Alberta's Department of Educational Research for analysis.

In preparation for item analysis, the 54 items were divided into six sub-tests:

Visual Preference -- Reading

Visual Preference -- Viewing

Aural Preference

Psychomotor Preference

Structure

Impulsivity/Reflectivity

The nineteen Structure items were divided into two groups: eleven indicating a high level of internal structure (i.e. the ability to structure one's own learning environment) and eight indicating a low level of internal structure (i.e., the need for externally imposed structure in the learning environment) Within the impulsivity sub-test, eleven items were classified as describing impulsive behavior, while seven items described reflective behavior. For the purposes of scoring, reverse weighting was assigned to items indicating a low level of internal structure and reflective behavior.

ANALYSIS OF DATA

The SPSS-x statistical programs were used to analyze the data.

A Lertap Item Analysis was performed to determine Hoyt's Estimate of Reliability for each of the sub-tests. The results were as follows:

Visual Preference -- Reading	.78
Visual Preference -- Viewing	.72
Aural Preference	.69
Psychomotor Preference	.51
Structure	.50

Impulsivity/Reflectivity .67

For each sub-test, descriptive statistics were provided according to age and level of study. A one-way Analysis of Variance, followed by a Scheffé test, compared responses to each sub-test according to age and level of study.

SUMMARY

The "Learning Style Inventory," devised by the researcher, was completed by 108 adult students enrolled in evening classes: 44 from the University of Alberta, 38 from Grant MacEwan Community College and 26 from Alberta Vocational Centre. Respondents indicated their sex, age and programme or faculty of study. The 54 items were divided into six sub-tests and subjected to a Lertap item analysis to determine Hoyt's Estimate of Reliability for each sub-test. Descriptive statistics and a one-way Analysis of Variance completed the data analysis.

CHAPTER 4

RESULTS

Chapter 4 presents the findings generated by the "Learning Style Inventory." It begins with a brief summary of demographic data of the respondents. These are followed by a discussion of the findings related to the six sub-problems that guided the study:

1. With what frequency do subjects indicate a preference for each of the following perceptual modes: visual, aural, psychomotor?
2. What are the required levels of structure indicated by subjects?
3. To what degree do subjects indicate tendencies toward impulsivity or reflectivity?
4. Do preferred perceptual mode, required level of structure, and tendency toward impulsivity or reflectivity vary according to age?
5. Do preferred perceptual mode, required level of structure and tendency toward impulsivity or reflectivity vary according to level of study?
6. Will analysis of item responses provide further insights into the learning style of each of the levels of study?

PROFILE OF SUBJECTS

Table 1

Demographic Data

	University		Community College		College Prep		Total
	Male	Female	Male	Female	Male	Female	
Under 25	1	1	10	11	3	3	29
25-34	3	7	3	6	5	5	29
35-44	12	9	1	7	1	6	36
over 44	4	7	0	0	2	1	14
Total	20	24	14	24	11	15	108

A total of 108 students, 45 males and 63 females, attending the University of Alberta, Grant MacEwan Community College and Alberta Vocational Centre completed the "Learning Style Inventory."

The university students were enrolled in EDADU 461, a senior undergraduate course required for a graduate diploma in postsecondary and adult education. Most of these students, with a mean age of 39.4 years, had several years of teaching experience.

The community college students, whose mean age was 25.7 years, were attending Grant MacEwan Community College, a government and tuition funded postsecondary institution located in Edmonton. The students surveyed were enrolled in EN100.3 (Communications), a required course in all of the college's diploma programs. Although other forms of communication are included, EN100.3 is primarily an expository writing course designed to enable students to write clearly and correctly. Prequisites for the course are (a) a grade of 60 or better in English 30; (b) successful completion of the college's skills appraisal tests; or (c) successful completion of the college preparatory courses (EN088

and EN089). Twenty of the students were engaged in business studies with the majority (17) enrolled in the Management Studies Diploma Program. Eight students were non-program, while seven were pursuing studies in areas of health and community services. Two fibre arts majors and one arts and science student completed the group of 38.

Alberta Vocational Centre, a provincial institution, devoted to adult education, is admininstered by Alberta's Department of Advanced Education. The students who participated in the study were enrolled in college preparatory courses. These are sponsored jointly with Grant MacEwan Community College and allow students to upgrade reading, writing and math skills to levels required by community college courses. College preparatory courses are offered at two levels, 088 and 089, with 088 providing the more basic skills. Student placement in these courses is determined by testing.

The 26 students from A.V.C. were divided evenly between two courses: EN088 (Basic Writing Skills) and RD088 (Reading Development I). EN088 is a course designed to improve grammar, punctuation, spelling and vocabulary; it focuses on writing correct sentences and coherent well-developed paragraphs. The objectives of RD088 are to remedy deficiencies in word attack skills, word knowledge, reading comprehension and thinking skills. The mean age of the college prep sample was 31.8 years.

PERCEPTUAL PREFERENCE

Sub-Problem 1

With what frequency do subjects indicate a preference for each of the following perceptual modes: visual, aural, psychomotor?

Tables 2 and 3 indicate that all respondents, regardless of age or level of study showed a strong preference for psychomotor learning.

Table 2

Perceptual Preference by Age

	Visual Reading	Visual Viewing	Aural	Psychomotor	Double Preference
Under 25 N=29	17.24	17.24	24.14	37.93	3.45
25-34 N=29	10.34	34.48	6.90	41.38	6.90
35-44 N=36	16.67	22.22	2.78	52.78	5.56
Over 44 N=14	21.43	7.14	14.29	50.00	7.14

Table 2 indicates percentages.

Table 3

Perceptual Preference by Level of Study

	Visual Reading	Visual Viewing	Aural	Psychomotor	Double Preference
University N=44	20.45	15.91	9.09	47.73	6.82
Community College N=38	15.79	21.05	15.79	42.11	5.26
College Prep N=26	7.69	34.62	7.69	46.15	3.85

Table 3 indicates percentages.

The findings confirmed the well documented respect for doing and problem solving of adults who often return to school to increase their proficiency or their capability to perform specific tasks (Knox, 1986). Because life experiences have taught them the importance of being able to demonstrate knowledge through performance, their learning is often "most effective if carried on under conditions similar to where the knowldege, skill or attitude is to be practiced" (Kidd, 1973, p.257). On a simpler level, responses might be attributed to the old adage that "practice makes perfect," a belief adhered to by many adult learners (Brookfield, 1986).

Reading was preferred by a relatively small percentage of the respondents, with the strongest showings in the over 44 category and at the university level of study. Aural learning was the least preferred mode except among those under 25 and over 44. The college prep students showed the least preference for learning by reading and listening, the traditonal modes of learning.

Any discussion of the viewing results must recognize that two items can provide very little information about learning behavior; yet it may be worth noting that 34.62% of the college prep sample indicated viewing films and videos as their preferred way of learning.

Of the six students who indicated a double preference for two perceptual modes, four were equally in favour of visual (reading) and psychomotor, while two, aged 25 - 34, favoured visual (viewing) and psychomotor. The two students having an equal preference for viewing and psychomotor were part of the university sample. Of the four equally at ease with reading and psychomotor, one attended university, two community college and one college prep.

STRUCTURE LEVELS

Sub-Problem 2

What are the required levels of structure indicated by subjects?

Tables 4 and 5 show the range of scores on the structure sub-test for each of the age groups and levels of study. Persons having the highest scores (out of a total of 95) require the least amount of externally imposed structure in their learning environments. Those having the lowest scores require the most externally imposed structure in their learning environments.

Table 4

Structure Levels by Age

	Score achieved out of a possible 95							
age	46-50	51-55	56-60	61-65	66-70	71-75	76-80	81-85
Under 25 N=29	3.45	31.03	44.83	17.24	3.45	0.00	0.00	0.00
25-34 N=29	3.45	13.79	37.93	37.93	6.90	0.00	0.00	0.00
35-44 N=35	2.78	22.22	25.00	27.78	13.89	8.33	0.00	0.00
Over44 N=14	0.00	21.43	21.43	35.71	7.14	7.14	0.00	7.14

Table 4 indicates percentages.

Table 5

Structure Levels by Level of Study

	Score achieved out of a possible 95							
Group	46-50	51-55	56-60	61-65	66-70	71-75	76-80	81-85
University N=44	2.27	13.64	22.73	31.82	18.18	9.09	0.00	2.27
Community College N=38	2.63	21.05	47.37	28.95	0.00	0.00	0.00	0.00
College Prep N=26	3.85	38.46	30.77	23.08	3.85	0.00	0.00	0.00

Table 5 indicates percentages.

The range of scores (46 - 70) was identical for respondents under 25 and between 25 and 34. Those between the ages of 35 and 44 exhibited a slightly wider range (46 - 75), while the greatest variation (51-85) was among those over 44.

The community college sample proved the most homogenous group with a range of 46 - 65; a large majority, 97.37%, scored between 51 and 65.

College prep totals ranged between 46 and 70 with 92.30% falling in the 51 - 65 range. The university sample showed the greatest diversity with scores ranging from 46 - 85; 68.19% scored between 51 and 65.

IMPULSIVITY/REFLECTIVITY

Sub-Problem 3

To what degree do subjects indicate tendencies toward impulsivity or reflectivity?

Tables 6 and 7 show the range of scores on the impulsivity/reflectivity sub-test for each of the age groups and levels of study. Persons having the highest scores (out of a total of 90) are most likely to answer immediately or relatively quickly. They are most willing to take risks. Those having lower scores are more reflective, and will consider the alternatives more carefully before making a decision. Theirs is a more cautious approach.

Table 6

Impulsivity/Reflectivity by Age

	Score achieved out of a possible 90									
	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-70	71-75
Under 25 N=29	0.00	0.00	0.00	0.00	10.34	20.69	34.48	20.69	13.79	0.00
25-34 N=29	0.00	0.00	0.00	0.00	20.69	13.79	34.48	17.24	13.79	0.00
35-44 N=35	2.78	0.00	2.78	0.00	11.11	30.56	25.00	11.11	8.33	8.33
Over44 N=14	0.00	0.00	0.00	7.14	7.14	7.14	42.86	21.43	14.29	0.00

Table 6 indicates percentages.

Table 7

Impulsivity/Reflectivity by Level of Study

	Score achieved out of a possible 90									
	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-70	71-75
University N=44	0.00	0.00	2.27	0.00	15.91	15.91	34.09	18.18	9.09	4.55
Community College N=38	2.63	0.00	0.00	0.00	10.53	21.05	28.95	18.42	15.79	2.63
College Prep N=26	0.00	0.00	0.00	3.85	11.54	26.92	34.62	11.54	11.54	0.00

Table 7 indicates percentages.

All respondents in both the under 25, and 25 to 34 age groups scored in the 46 - 70 range. Those over 44 had scores ranging from 41 - 70, with 92.86% scoring between 46 and 70. The largest spread occurred for those between the ages of 35 and 44. Their totals ranged all the way from 26 to 75, but the majority, 86.11%, fell within the 46 - 70 range.

There was little difference in the scores for the three groups according to level of study. The university scores ranged between 36 and 75, with 93.18% falling between 46 and 70. For the community college sample, the range was broader, 26 - 75, but 94.74% of the candidates scored in the 46 - 70 range. The range, 41-70, was narrower for college prep students, with 96.15% scoring between 46 and 70.

LEARNING STYLE COMPARISON BY AGE

Sub-Problem 4

Do preferred perceptual mode, required level of structure, and tendency toward impulsivity or reflectivity vary according to age?

Tables 8 - 13 inclusive provide Anova summaries by age for each area of learning style investigated in the study. Statistically significant differences occurred only for learning by viewing (Table 9) and required level of structure (Table 12).

Table 8

Anova Summary for Visual (Reading) Results by Age

Source of variation	Sum of squares	Degrees of freedom	Mean squares	F ratio	F probability
Between Groups	68.46	3	22.82	2.19	.094*
Within Groups	1083.51	104	10.42		
Total	1151.97	107			

* $p > .05$

Note: Mean Scores are

under 25 = 12.07
25-34 = 12.55
35-44 = 13.97
over 44 = 13.50

There was no significant difference in preference for reading among the four age categories.

Table 9

Anova Summary for Visual (Viewing) Results by Age

Source of variation	Sum of squares	Degrees of freedom	Mean squares	F ratio	F probability
Between Groups	29.00	3	9.67	3.96	.01*
Within Groups	253.55	104	2.44		
Total	282.55	107			

* $p < .05$

Note: Mean Scores are

under 25 = 6.28
25-34 = 7.28
35-44 = 6.58
over 44 = 5.64

There was a significant difference in preference for viewing among the age groups. When the Scheffé procedure was carried out to determine which groups differed, it was found that those between the ages of 25 and 34 were significantly higher than those over 44. The younger students, with their higher mean, were more in favour of learning by viewing.

Table 10

Anova Summary for Aural Results by Age

Source of variation	Sum of squares	Degrees of freedom	Mean squares	F ratio	F probability
Between Groups	36.34	3	12.11	1.09	.36*
Within Groups	1161.09	104	11.16		
Total	1197.43	107			

* $p > .05$

Note: Mean Scores are

under 25 = 15.35
25-34 = 16.28
35-44 = 14.94
over 44 = 14.71

There was no significant difference in preference for aural learning among the four age groups.

Table 11

Anova Summary for Psychomotor Results by Age

Source of variation	Sum of squares	Degrees of freedom	Mean squares	F ratio	F probability
Between Groups	56.12	3	18.71	1.83	.15*
Within Groups	1065.06	104	10.24		
Total	1121.18	107			

* $p > .05$

Note: Mean Scores are

under 25 = 29.48
25-34 = 31.34
35-44 = 30.89
over 44 = 30.86

There was no significant difference in preference for psychomotor learning among the four age groups.

Table 12

Anova Summary for Structure Results by Age

Source of variation	Sum of squares	Degrees of freedom	Mean squares	F ratio	F probability
Between Groups	369.14	3	123.05	3.75	.01*
Within Groups	3416.60	104	32.85		
Total	3785.74	107			

* $p < .05$

Note: Mean Scores are

under 25 = 57.24
25-34 = 59.62
35-44 = 60.58
over 44 = 63.14

There was a significant difference in the levels of structure required by the four age groups. The Scheffé procedure indicated that the significant difference was between those under 25 and those over 44. The older respondents, with the higher mean score, were more able to structure their own learning environments and, therefore, needed less externally imposed structure.

Table 13

Anova Summary for Impulsivity/Reflectivity Results by Age

Source of variation	Sum of squares	Degrees of freedom	Mean squares	F ratio	F probability
Between Groups	69.29	3	23.10	.44	.73*
Within Groups	5496.45	104	52.85		
Total	5565.74	107			

* $p > .05$

Note: Mean Scores are

under 25 = 58.86
25-34 = 57.41
35-44 = 56.92
over 44 = 58.36

There was no significant difference in tendency toward impulsivity or reflectivity among the four age groups.

LEARNING STYLE COMPARISON BY LEVEL OF STUDY

Sub-Problem 5

Do preferred perceptual mode, required level of structure and tendency toward impulsivity or reflectivity vary according to level of study?

Tables 14 - 19 inclusive provide Anova summaries by level of study for each of the areas of learning style investigated in the study. Statistically significant differences occurred only for learning by viewing (Table 15) and required level of structure (Table 18).

Table 14

Anova Summary for Visual (Reading) Results by Level of Study

Source of variation	Sum of squares	Degrees of freedom	Mean squares	F ratio	F probability
Between Groups	29.66	2	14.83	1.39	.25*
Within Groups	122.30	105	10.69		
Total	1151.96	107			

* $p > .05$

Note: Mean Scores are

university = 13.48
college = 12.32
college prep = 13.27

There was no significant difference in preference for reading among the three groups indicating levels of study.

Table 15

Anova Summary for Visual (Viewing) Results by Level of Study

Source of variation	Sum of squares	Degrees of freedom	Mean squares	F ratio	F probability
Between Groups	25.40	2	12.70	5.19	.007*
Within Groups	257.15	105	2.45		
Total	282.55	107			

* $p < .05$

Note: Mean Scores are

university = 6.25
college = 6.34
college prep = 7.42

There was a significant difference in preference for viewing among the levels of study. The Scheffé procedure indicated that a significant difference existed between the college prep sample and both the community college and university samples. The college prep students, with the highest mean score, were sigificantly more in favour of learning by viewing.

Table 16

Anova Summary for Aural Results by Level of Study

Source of variation	Sum of squares	Degrees of freedom	Mean squares	F ratio	F probability
Between Groups	26.13	2	13.06	1.17	.31*
Within Groups	1171.31	105	11.16		
Total	1197.44	107			

* $p > .05$

Note: Mean Scores are

university = 14.86
college = 15.47
college prep = 16.11

There was no significant difference in preference for aural learning among the three levels of study.

Table 17

Anova Summary for Psychomotor Results by Level of Study

Source of variation	Sum of squares	Degrees of freedom	Mean squares	F ratio	F probability
Between Groups	4.37	2	2.19	.21	.81*
Within Groups	1116.81	105	10.64		
Total	1121.18	107			

* $p > .05$

Note: Mean Scores are

university = 30.66
college = 30.39
college prep = 30.92

There was no significant difference in preference for psychomotor learning among the three levels of study.

Table 18

Anova Summary for Structure Results by Level of Study

Source of variation	Sum of squares	Degrees of freedom	Mean squares	F ratio	F probability
Between Groups	764.08	2	382.04	13.28	.00*
Within Groups	3021.66	105	28.78		
Total	3785.74	107			

* $p < .05$

Note: Mean Scores are

university = 62.95
college = 57.82
college prep = 57.19

There was a significant difference in the levels of structure required by the three levels of study. The Scheffé procedure revealed that the significant difference was between the university group and both the community college and college prep samples. The university respondents, with the highest mean score, were most able to structure their learning environment and were, therefore, least in need of externally imposed structure.

Table 19

Anova Summary for Impulsivity/Reflectivity Results by Level of Study

Source of variation	Sum of squares	Degrees of freedom	Mean squares	F ratio	F probability
Between Groups	30.78	2	15.39	.29	.75*
Within Groups	5534.96	105	52.71		
Total	5534.96	107			

* $p > .05$

Note: Mean Scores are

university = 57.55
college = 58.45
college prep = 57.12

There was no significant difference in tendency toward impulsivity or reflectivity among the three levels of study.

ITEM RESPONSE ANALYSIS BY LEVEL OF STUDY

Sub-Problem 6

Will analysis of item responses provide further insights into the learning style of each of the levels of study?

Perceptual Preference Items

Tables 20 - 26 inclusive indicate the frequency of responses to individual items for each of the levels of study.

Table 20

Visual Perceptual Preference

Reading

	UNIVERSITY N=44			COMMUNITY COLLEGE N=38			COLLEGE PREP N=26		
ITEM Number	A	U	D	A	U	D	A	U	D
1	56.82	25.00	18.18	39.47	26.32	34.21	73.08	7.69	19.23
16	43.18	29.55	27.27	28.95	26.32	44.74	38.46	26.92	34.62
34	50.00	29.55	20.45	44.74	18.42	36.84	34.62	23.08	42.31
43	45.45	27.27	27.27	36.84	28.95	34.21	61.54	23.08	15.38

Table 20 indicates percentages.

A = AGREE AND STRONGLY AGREE
U = UNDECIDED
D = DISAGREE AND STRONGLY DISAGREE

1. I prefer to learn new material by reading.

16. I learn better by reading than by listening.

34. I learn better when I read instructions than when someone tells me what to do.

43. I remember best things I have read.

In Table 20, the high percentage (73.08%) of college prep students who agreed with item 1 was unexpected given both the general overall results and the non-academic orientation of many of these students. Their involvement in reading and writing courses might have compelled them to answer positively, despite both written and oral assurances that no one answer was better than another. Some students, on the other hand, might have been influenced by the item's placement at the beginning of the inventory.

College prep responses to items 16 and 34 were not consistent with responses to items 1 and 43. Inaccurate reading, through haste or carelessness, may have led to misinterpretation of items 16 and 34.

Table 21

Visual Perceptual Preference

Viewing

	UNIVERSITY N=44			COMMUNITY COLLEGE N=38			COLLEGE PREP N=26		
ITEM Number	A	U	D	A	U	D	A	U	D
6	38.64	38.64	22.73	42.11	34.21	23.68	92.31	7.69	00.00
54	34.09	34.09	31.82	42.11	28.95	28.95	38.46	34.62	30.77

Table 21 indicates percentages.

A = AGREE AND STRONGLY AGREE
U = UNDECIDED
D = DISAGREE AND STRONGLY DISAGREE

6. I remember best things I have seen in films or videos.

54. I prefer to learn new material from films or videos.

In Table 21, college prep responses to items 6 and 54 proved contradictory. There are at least two possible explanations for this discrepancy. Firstly, because so much time is spent viewing for entertainment purposes, many students could have responded in a general sense to the idea of remembering, thereby removing it from their perceived context of learning. Secondly, some students might have been trying to avoid the stigma that could be attached to an acknowledged preference for learning by viewing films and videos.

Table 22

Aural Perceptual Preference

Listening and Lecture

	UNIVERSITY N=44			COMMUNITY COLLEGE N=38			COLLEGE PREP N=26		
ITEM Number	A	U	D	A	U	D	A	U	D
10	36.36	29.55	34.09	47.37	26.32	26.32	46.15	38.46	15.38
20	56.82	22.73	20.45	50.00	15.79	34.21	65.38	15.38	19.23
27	38.64	27.27	34.09	31.58	39.47	28.94	46.15	19.23	34.62

Table 22 indicates percentages.

A = AGREE AND STRONGLY AGREE
U = UNDECIDED
D = DISAGREE AND STRONGLY DISAGREE

10. I remember best things I have heard.

20. I prefer to learn new material in a lecture.

27. I prefer to learn new material by listening to a lecture or tape.

In Table 22, the discrepancy between responses to items 20 and 27 requires some explanation. Examination of the inventories showed that answers were contradictory (i.e., agree vs. disagree or agree vs. undecided) for 14 (31.82%) university students, 11 (28.95%) community college students and 9 (34.62%) college prep students. Item 20, with its reference to learning in a lecture, might have suggested a particular class setting rather than learning by listening. In item 27, listening to a tape or lecture could have been perceived as a solitary activity quite different from attending a lecture.

Table 23

Aural Perceptual Preference

Listening and Reading

	UNIVERSITY N=44			COMMUNITY COLLEGE N=38			COLLEGE PREP N=26		
ITEM Number	A	U	D	A	U	D	A	U	D
16	43.18	29.55	27.27	28.95	26.32	44.74	38.46	26.92	34.62
34	50.00	29.55	20.45	44.74	18.42	36.84	34.62	23.08	42.31

Table 23 indicates percentages.

A = AGREE AND STRONGLY AGREE
U = UNDECIDED
D = DISAGREE AND STRONGLY DISAGREE

16. I learn better by reading than by listening.

34. I learn better when I read instructions than when someone tells me what to do.

The community college and college prep responses to items 16 and 34, in Table 23, reflected fairly closely responses to item 10 (I remember best things I have heard) in Table 22. The higher percentage of the university sample who preferred written instructions (item 34) might have envisioned more complex tasks performed either over longer periods of time, or well after the assignment had been given.

Table 24

Psychomotor Perceptual Preference

Doing, Problem Solving

	UNIVERSITY N=44			COMMUNITY COLLEGE N=38			COLLEGE PREP N=26		
ITEM Number	A	U	D	A	U	D	A	U	D
17	61.36	18.18	20.45	52.63	34.21	13.16	96.15	00.00	3.85
31	100	00.00	00.00	100	00.00	00.00	96.15	3.85	00.00
37	81.82	13.64	4.55	81.57	18.42	00.00	84.62	15.38	00.00
50	97.73	2.27	00.00	97.30	00.00	2.70	96.15	00.00	3.85

Table 24 indicates percentages.

A = AGREE AND STRONGLY AGREE
U = UNDECIDED
D = DISAGREE AND STRONGLY DISAGREE

17. I prefer tasks that I must work through carefully one step at a time.

31. I remember what I learn best if I go through each step of the task.

37. I learn best when I'm actually doing or practicing what I'm learning.

50. I remember how to do a task best by actually doing it.

Table 24 shows overwhelming agreement among respondents with items 31, 37 and 50 which confirms Brookfield's (1986, p.28) contention that adults perceive practice as being important for the "reinforcement of learning."

Table 25

Psychomotor Perceptual Preference

Making, Experimenting

	UNIVERSITY N=44			COMMUNITY COLLEGE N=38			COLLEGE PREP N=26		
ITEM Number	A	U	D	A	U	D	A	U	D
15	68.18	11.36	20.45	68.42	13.16	18.42	57.69	34.62	7.69
41	47.73	31.82	20.45	68.42	26.32	5.26	73.08	15.38	11.54

Table 25 indicates percentages.

A = AGREE AND STRONGLY AGREE
U = UNDECIDED
D = DISAGREE AND STRONGLY DISAGREE

15. I like building or making new things.

41. I prefer courses that allow me to do experiments.

The overall frequency of undecided responses to items 15 and 41, as shown in Table 25, is, to some extent, puzzling. Of the university and community college samples, 31.82% and 26.32% respectively, were undecided about courses that allowed them to do experiments. One possible explanation might be that the item seemed so general that participants preferred to make a non-committal response. On the other hand, they could lack sufficient experience with such courses to make a decision.

The high proportion of college prep students (34.62%) who were undecided about making or building new things (item 15) might reflect a lack of exposure to these kinds of learning activities.

Table 26

Psychomotor Perceptual Preference

Reinforcing Visual and Aural Modes

	UNIVERSITY N=44			COMMUNITY COLLEGE N=38			COLLEGE PREP N=26		
ITEM Number	A	U	D	A	U	D	A	U	D
26	81.82	2.27	15.91	55.26	23.68	28.95	57.69	26.92	15.38
46	68.18	6.82	25.00	53.63	23.68	31.58	69.23	11.54	19.23

Table 26 indicates percentages.

A = AGREE AND STRONGLY AGREE
U = UNDECIDED
D = DISAGREE AND STRONGLY DISAGREE

26. I take lots of notes during lectures.

46. I make lots of notes when I study.

Because items 26 and 46, in Table 26, contain the word "lots", they are open to subjective interpretation, and could, therefore, be criticized for their ambiguity. Perhaps this contributed to the numbers of undecided responses from both the college and upgrading samples. The very small number of undecided responses from the university sample does not, on the other hand, support that criticism. Some of the undecided responses could indicate respondents' unwillingness to admit that they take few notes, an activity they perceive as being favoured by instructors.

Structure Items

Tables 27 - 31 inclusive indicate frequency of responses to structure items for each of the levels of study. The 18 items are examined in clusters that address various components of structure within the learning environment.

Table 27

Structure

Deadlines and Task Completion

	UNIVERSITY N=44			COMMUNITY COLLEGE N=38			COLLEGE PREP N=26		
ITEM Number	A	U	D	A	U	D	A	U	D
5	70.45	2.27	27.27	78.95	5.26	15.95	76.92	15.38	7.69
23	6.82	2.27	90.91	2.63	2.63	94.74	00.00	23.08	76.92
28	11.36	9.09	79.59	15.79	3.85	81.58	15.38	11.54	73.08
39	70.45	9.09	20.45	57.89	15.79	26.32	50.00	23.08	26.92
42	43.18	27.27	29.59	71.05	23.68	5.26	80.77	7.69	11.54
47	86.36	2.27	11.36	92.11	5.26	2.63	84.62	7.69	7.69

Table 27 indicates percentages.

A = AGREE AND STRONGLY AGREE
U = UNDECIDED
D = DISAGREE AND STRONGLY DISAGREE

5. I am always successful in meeting deadlines.

23. I am never successful in meeting deadlines.

28. I often have difficulty completing tasks or projects.

39. I can successfully work on several projects at once.

42. I prefer to have deadlines set by my instructors or supervisors.

47. I am usually successful in meeting deadlines.

In Table 27, responses to items 5, 23, 28 and 47 indicate that all students were, for the most part, able to meet deadlines, and complete projects they undertake. The differences between levels of study, reflected in the overall structure findings, are evident in items 39 and 42. College prep and community college students were less able than their university counterparts to work on several projects at once (item 39). The desire for externally imposed deadlines (item 42) was strongest for the college prep sample, with the community college group following closely.

Table 28

Structure

Materials and Assignments

	UNIVERSITY N=44			COMMUNITY COLLEGE N=38			COLLEGE PREP N=26		
ITEM Number	A	U	D.	A	U	D	A	U	D
9	22.73	15.91	61.36	52.63	15.79	31.58	61.54	19.23	19.23
12	79.55	6.82	13.64	60.53	21.05	18.42	46.15	23.08	30.77
25	50.00	25.00	25.00	18.42	21.05	60.53	30.77	19.23	50.00
33	79.55	13.64	6.82	92.11	7.89	00.00	80.77	11.54	7.69
38	79.55	13.64	6.82	73.68	18.42	7.89	76.92	11.54	11.54
51	88.64	9.09	2.27	97.37	00.00	2.63	96.15	3.85	00.00

Table 28 indicates percentages.

A = AGREE AND STRONGLY AGREE
U = UNDECIDED
D = DISAGREE AND STRONGLY DISAGREE

9. I prefer questions or problems that have only one correct answer.

12. I prefer assignments that let me choose what I want to do.

25. I prefer questions or problems that have several correct answers.

33. I prefer assignments that have all the instructions carefully outlined.

38. I prefer study materials that have lots of practice exercises.

51. I prefer study materials that present a rule or concept followed by several examples.

As shown in Table 28, the university sample was least in favour of questions and problems having only one correct answer (item 9), while the community college sample showed the least preference for questions or problems having several correct answers (item 25). Knox (1977)

discovered that adults learning skills are less tolerant of exploring alternative answers than are those studying issues.

Responses to items 33, 38 and 51 confirmed the accepted idea that adults want to know in very concrete terms exactly what is expected of them. One explanation, offered by Brookfield (1986), is that adults often do not want to spend the time required to reinterpret, and thereby extrapolate from, past experience.

Table 29

Structure

Independent vs Group Work

	UNIVERSITY N=44			COMMUNITY COLLEGE N=38			COLLEGE PREP N=26		
ITEM Number	A	U	D	A	U	D	A	U	D
2	65.91	11.36	22.73	63.16	15.79	21.05	38.46	30.77	30.77
7	00.00	13.64	86.36	10.53	5.26	84.21	3.85	00.00	96.15
22	61.36	15.91	22.73	60.53	26.32	13.16	80.77	11.54	7.69

Table 29 indicates percentages.

A = AGREE AND STRONGLY AGREE
U = UNDECIDED
D = DISAGREE AND STRONGLY DISAGREE

2. I prefer tasks or projects that allow me to work alone.

7. I usually find class discussions a waste of time.

22. I enjoy working in groups.

Hunt (1979) found that children needing much structure wanted to work by themselves at their own desks, while those requiring less structure enjoyed working in groups. response to items 2 and 22, in Table 29, indicate that this might not hold true for adult learners

since both the university and community college samples appeared equally comfortable working either alone or in groups. These responses could reflect the influence of either the adults' broader range of experiences or a greater diversity of tasks or projects within the learning environment. The college prep sample, who generally exhibited the most need for externally imposed structure, least preferred working alone and most enjoyed working in groups. This might result from an overriding desire for peer support and social interaction during the learning process.

The response to item 7 shows overwhelming support for class discussions, supporting Knox's (1986, p.36) claim that adults want to "relate their past experience to current learning" through "sharing with other participants."

Table 30

Structure

Breaks

	UNIVERSITY N=44			COMMUNITY COLLEGE N=38			COLLEGE PREP N=26		
ITEM Number	A	U	D	A	U	D	A	U	D
11	68.18	4.55	27.27	47.37	15.79	34.21	38.46	19.23	42.31
21	13.64	15.91	70.45	28.95	23.68	47.37	46.15	23.08	30.77

Table 30 indicates percentages.

A = AGREE AND STRONGLY AGREE
U = UNDECIDED
D = DISAGREE AND STRONGLY DISAGREE

11. I get more work done when I can take a break whenever I want to.

21. I get more work done when I'm allowed only to take breaks scheduled by the instructor or supervisor.

The university sample's responses to items 11 and 21, in Table 30, confirmed that some adults are most comfortable when allowed sufficient autonomy to schedule their own breaks. A substantial number of community college and college prep respondents were, on the other hand, much less optimistic about their productivity when allowed to schedule their own breaks. The latter groups' responses were, perhaps, prompted by a lack of experience with time management strategies.

Table 31

Structure

Supervision

	UNIVERSITY N=44			COMMUNITY COLLEGE N=38			COLLEGE PREP N=26		
ITEM Number	A	U	D	A	U	D	A	U	D
29	13.64	15.91	70.45	60.53	23.68	15.79	76.92	15.38	7.69
49	45.45	6.82	47.73	31.58	13.16	55.26	15.38	11.54	73.08

Table 31 indicates percentages.

A = AGREE AND STRONGLY AGREE
U = UNDECIDED
D = DISAGREE AND STRONGLY DISAGREE

29. I like to have an instructor or supervisor check my work often.

49. I rarely consult an instructor or supervisor about my work.

In Table 31, the university responses to items 29 and 49 appear somewhat contradictory. One possible explanation for the variation between the percentage of university students (13.64%) who like to have their work checked often and those (47.73%) who disagree that they rarely consult an instructor or supervisor could be that the former activity was perceived as instructor initiated, while the latter occurs

when the the student deems it necessary. There are connotations of autonomy in consulting that are not suggested by having work checked. The community college and college prep students did not, however, appear to make that distinction between the two items.

Impulsivity/Reflectivity Items

Tables 32 - 35 inclusive indicate frequency of responses to impulsivity/reflectivity items for each of the levels of study. The 18 items are examined in clusters that address various components of impulsivity and reflectivity.

Table 32

Impulsivity/Reflectivity

Timed Test Situations

	UNIVERSITY N=44			COMMUNITY COLLEGE N=38			COLLEGE PREP N=26		
ITEM Number	A	U	D	A	U	D	A	U	D
3	29.55	27.27	43.18	28.95	39.47	31.58	30.77	26.92	42.31
13	9.09	15.91	75.00	10.53	7.89	81.58	38.46	11.54	50.00
19	68.18	13.64	18.18	68.42	13.16	18.42	42.31	19.23	38.46
32	75.00	11.36	13.64	52.63	15.79	31.58	80.77	11.54	5.26
40	81.82	6.82	11.36	86.84	5.26	7.89	57.69	19.23	23.08
53	25.00	25.00	50.00	44.74	23.68	31.58	46.15	19.23	34.62

Table 32 indicates percentages.

A = AGREE AND STRONGLY AGREE
U = UNDECIDED
D = DISAGREE AND STRONGLY DISAGREE

3. I am usually one of the first in a group to finish tasks or projects.

13. I rarely ever finish tests or exams when there is a time limit.

19. I always finish tests or exams in the time allowed.

32. I do better on tests and exams when I have as much time as I need.

40. I usually finish tests and exams in the time allowed.

53. I prefer tests and exams that have a specific time limit.

The patterns of responses to items concerning timed tests and exams contained in Table 32 are worth noting. The proportion of the university sample (25%) preferring timed tests and exams (item 53) was substantially smaller than for either of their counterparts (community college 44.74%, college prep 46.15%). They did not, on the other hand,

indicate the least success in completing timed tests and exams. In fact, only 9.09% said they rarely ever finish within the allotted time (item 13).

Community college findings were very similar: an equal proportion (68.18%) said they always finish within the allotted time limit (item 19), while only 10.53% (item 13) rarely finish. They expressed less general discomfort with time limits in that only 53.63% agreed that they do better on tests and exams when they have as much time as they need (item 32). This varied noticeably from the 75% (university) and 80.77% (college prep) of the other two groups.

College prep students appeared to have the most difficulty meeting the demands of timed tests and examinations. Only 57.69% agreed that they usually finish tests and exams when there is a time limit (item 40), and 38.64% agreed that they rarely finish (item 13). This could suggest that adults at lower levels of study are less successful in coping with the anxiety induced by being examined or tested under time constraints.

Table 33

Impulsivity/Reflectivity

Decision Making

	UNIVERSITY N=44			COMMUNITY COLLEGE N=38			COLLEGE PREP N=26		
ITEM Number	A	U	D	A	U	D	A	U	D
18	50.00	4.55	45.45	39.43	15.79	44.74	57.69	19.23	23.08
35	50.00	34.09	15.91	52.63	34.21	13.16	50.00	30.77	19.23
48	77.27	9.09	13.64	42.11	34.21	23.68	73.08	23.08	3.85
52	86.36	13.64	00.00	86.84	7.89	5.26	73.08	15.38	11.54

Table 33 indicates percentages.

A = AGREE AND STRONGLY AGREE
U = UNDECIDED
D = DISAGREE AND STRONGLY DISAGREE

18. I usually make quick decisions about my work.

35. My marks are usually best when I put down the first answer I think of.

48. I spend a long time weighing all the factors before I make a decision.

52. I would rather "guess" an answer than leave a question unanswered.

The contradictory university and college prep responses to items 18 and 48 in Table 33 are puzzling. The contradiction could be due to the fact that the items were interpreted as representing different situations. Making quick decisions about one's work suggests efficiency, a desirable trait. Carefully weighing factors before making a decision suggests thoroughness, also a desirable trait. Another possible consideration, particularly for college prep students, could be that they are frequently reminded to think about all the possibilities before arriving at a conclusion.

Table 34

Impulsivity/Reflectivity

Perseverance

	UNIVERSITY N=44			COMMUNITY COLLEGE N=38			COLLEGE PREP N=26		
ITEM Number	A	U	D	A	U	D	A	U	D
8	20.45	6.82	72.73	42.11	26.32	31.58	84.62	7.69	7.69
24	81.82	4.55	13.64	60.53	7.89	31.58	65.38	7.69	26.92
44	95.44	2.27	2.27	78.95	7.89	13.16	69.23	7.69	23.08

Table 34indicates percentages.

A = AGREE AND STRONGLY AGREE
U = UNDECIDED
D = DISAGREE AND STRONGLY DISAGREE

8. When I find a task or question difficult, I ask for help right away.

24. When I find a task or question difficult, I leave it and go on to the next one.

44. When I find a task or question difficult, I try to figure it out for myself.

In Table 34, the lack of consistency among responses to items 8, 24 and 44, particularly for the community college and college prep samples, could indicate conflict between how students actually are and how they wish to be perceived. Adults would generally rather be seen as being capable of independent problem solving than needing to rely upon others for direction.

Table 35

Impulsivity/Reflectivity

Class Participation

	UNIVERSITY N=44			COMMUNITY COLLEGE N=38			COLLEGE PREP N=26		
ITEM Number	A	U	D	A	U	D	A	U	D
4	50.00	9.09	40.91	50.00	10.53	39.47	50.00	26.92	23.08
14	13.64	9.09	77.27	18.42	7.89	73.68	11.54	19.23	69.23
30	34.09	15.91	50.00	55.26	7.89	36.84	46.15	15.38	38.46
36	54.55	6.82	38.64	50.00	10.53	39.47	50.00	15.38	34.62
45	22.73	4.55	72.73	31.58	7.89	60.53	15.38	15.38	69.23

Table 35 indicates percentages.

A = AGREE AND STRONGLY AGREE
U = UNDECIDED
D = DISAGREE AND STRONGLY DISAGREE

4. I often volunteer answers in class.

14. I never volunteer an answer in class.

30. I volunteer an answer only when I'm sure it is correct.

36. I often express my opinions and ideas during class discussions.

45. I rarely express an opinion or idea in a class discussion.

Items 4, 14 and 30, in Table 35, showed similar responses among all three groups. The community college sample appeared most concerned about answering correctly.

Responses to items 36 and 45 indicate that there was probably some middle ground between "often" and "rarely," both of which were open to the respondents' own interpretations. Responses to item 45, showing that the majority of adults in all three groups engage in class discussions, confirm once again that adults see discussion as a way of

actively seeking meaning by helping "relate past experience to current learning" (Knox, 1986, p.36).

SUMMARY

Chapter 4 contained a brief description of the study's three samples: university, community college, and college prep. The findings concerning preferred perceptual modes according to the respondents' ages and levels of study were reported. The psychomotor mode was the most frequently preferred for all age categories and all levels of study. The only significant difference, at the .05 level of significance, was found for viewing. It occurred between respondents aged 25 - 34 and those over 44, and between the college prep sample and both the university and community college samples. In the former case, the younger students were in favour of learning by viewing films and videos; in the latter, the college prep students were most in favour of learning by films and videos.

Significant differences were found for levels of structure between respondents under 25 and those 45 and over. The older students appeared more able to structure their own learning environments. A significant difference in level of structure also occurred between the university sample and both the community college and college prep samples, with the university students being most able to structure their own learning environments. No significant difference in tendency toward impulsivity or reflectivity was found for either the four age categories or three levels of study.

CHAPTER 5

SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

Chapter 5 begins with a summary of the study. This is followed by a discussion of conclusions, based on the study's findings, implications of the findings and recommendations for both classroom application and further research.

SUMMARY

The study originated from a desire to better understand the concept of learning style as it applies to adult learners of varying ages and levels of study. The value of gaining insights that will enable students to learn more effectively is evident, but classroom conditions and resources do not always facilitate such exploration. The existing array of instruments, born of various individual theories of learning style, provides information that is both interesting and useful. Several, however, are time consuming in that they require the translation of theoretical findings into individual's practical needs and preferences; others have been developed from research based on children. There remains, then, need for more adult oriented learning style instruments suitable for use by classroom instructors.

Purpose

The study was conducted to determine, among adult learners, the existence of similarities in three components of learning style:

preferred perceptual mode, required level of structure and tendency toward reflectivity or impulsivity.

Sub-Problems

The aforementioned areas of learning style among adult learners were explored through the following sub-problems:

1. With what frequency do subjects indicate a preference for each of the following perceptual modes: visual, aural, psychomotor?
2. What are the required levels of structure indicated by subjects?
3. To what degree do subjects indicate tendencies toward impulsivity or reflectivity?
4. Do preferred perceptual mode, required level of structure, and tendency toward impulsivity or reflectivity vary according to age?
5. Do preferred perceptual mode, required level of structure and tendency toward impulsivity or reflectivity vary according to level of study?
6. Will analysis of item responses provide further insights into the learning style of each of the levels of study?

Methodology

A juxtaposition of the adult education and learning style literature resulted in the researcher's devising a 54-item, self-reporting inventory, the purpose of which was to investigate three areas of learning style: (a) preferred perceptual mode, (b) required

amount of structure, and (c) tendency toward reflectivity or impulsivity.

During October, 1988, a total of 108 students completed the inventory. Forty-four were enrolled in classes in the University of Alberta's Faculty of Education, 38 in programmes leading to two-year diplomas at Grant MacEwan Community College, and 26 in college preparatory courses at Alberta Vocational Centre. The total sample was comprised of 45 males and 63 females. The mean ages of the three groups were as follows: university 39.4 years, community college 25.7 years and college preparatory 31.8 years.

Data Analyses

The SPSS-x statistical programs were used to analyze the data. A Lertap item analysis determined Hoyt's Estimate of Reliability for each of the sub-tests: visual preference--reading, visual preference--viewing, aural preference, psychomotor preference, structure, and impulsivity/reflectivity. For each sub-test, descriptive statistics were provided according to age and level of study. A one-way Analysis of Variance, followed by a Scheffé test, compared responses to each sub-test according to age and level of study.

Findings

Findings indicated psychomotor to be the most frequently preferred perceptual mode across the entire sample. The aural mode ranked second for students under 25, but it proved to be least popular for those between the ages of 25 and 44. For the latter age group, viewing was the second most preferred mode for learning and remembering

information. The only significant difference, at the .05 level of significance, for preferred perceptual modes was found for viewing. Respondents between the ages of 25 and 34 were significantly more in favour of learning by viewing films and videos than were those over 44, and the college preparatory group showed a statistically stronger preference for viewing than either the university or community college samples. The university sample indicated reading as their second most preferred mode of acquiring new information , while they least preferred the aural mode.

Significant differences in levels of structure, at the .05 level of significance, occurred between students under 25 and those over 44, and between the university samples and both the community college and college preparatory samples. The older group and those studying at the university level appeared most capable of structuring their own learning environments. The widest range of scores (out of a possible 95) occurred among the university sample, while the community college was most homogenous group in terms of its structure needs.

No statistically significant differences existed in tendency toward impulsivity or reflectivity for either the four age categories or three levels of study. Scores across the entire sample ranged from 26 - 75 out of a possible 90. Higher scores indicate a stronger tendency toward impulsivity, while lower scores indicate a more reflective approach. All respondents beteen the ages of 25 and 34 scored in the 46 - 70 range, while 92.76% of those 45 and over fell in this range. Scores for the 35 - 44 age group ranged from 26 - 75 with the majority, 86.11%, falling between 46 and 70. The scores showed little difference for the three levels of study with 93.18% of the university sample, and

94.74% of the community college sample placing in the 46 - 70 range. Of the college preparatory sample, 96.15% scored between 46 and 70.

DISCUSSION OF CONCLUSIONS

Following is a discussion of the conclusions based on the study's findings.

Learning Style Similarities

Because learning style information provides one of the bases for meeting learners' individual needs, attempts at generalization may be viewed by some as almost heretical. Analysis of the results indicates, however, that, among the adults sampled, some similarities exist in the areas of preferred perceptual modality, required amount of structure and tendency toward impulsivity and reflectivity.

Preferred Perceptual Mode

In this first instance, the respondents generally showed a preference for psychomotor tasks that allow them to be active learners. They like to learn by doing and problem solving and by practicing what they're learning. They confirmed Knowles' (1984, p.59) description of adults as "life-centred (or task-centred or problem-centred) in their orientation to learning."

Structure

The study's most dramatic findings were in the complex area of structure. Statistically significant differences in individuals'

abilities to structure their own learning environments existed between those under 25 and those over 44, as well as between the university sample and both the community college and upgrading samples. In the first instance, the older students and, in the second, the university group were least in need of externally imposed structure. According to Hunt, upon whose work the structure sub-test is based, these students have achieved a higher conceptual level, of which self-responsibility is a component. ("Conceptual level describes students in terms of their requirements for structure in an educational environment" (Hunt,1979, p.29). Hunt views increased conceptual level as a developmental change within children and young adults and he further identifies "the development of a higher conceptual level with its associated adaptive capacity and flexibility" as a major "educational goal" (Hunt, 1971, p.23). Within this theoretical framework, the study's findings were not surprising since the oldest students and those studying at the university level required the least amount of externally imposed structure, while those studying at the college prep level required the most.

Impulsivity/Reflectivity

This study's findings showed no significant differences in impulsivity and reflectivity for either the different age groups or levels of study, nor did they portray adult learners as being unable to act because of the fear of being wrong. The fact that item 52 (I would rather "guess" an answer than leave a question unanswered) received the highest mean score indicates that most students would not be deterred from taking a risk by the possibility of making a mistake.

The general willingness to participate in class discussions suggested that most students do not remain quiet because of fear that they will appear dull or ill-informed. Perhaps adult students take heart in knowing that are part of a growing educational trend, or perhaps their instructors are becoming more skilled at acknowledging the experiences from which adults "derive self-identity" and in realizing that " for many kinds of learning, the richest resources for learning reside in the adult learners themselves " (Knowles, 1984, p.57). The learners most apt to feel alienated in this kind of environment could be the young adults who have not yet accumulated a wealth of experience and who are influenced by peer responses to their behavior. In this study, the community college group, with its mean age of 25.7 years, was least likely to volunteer an answer unless certain it was correct.

The two remaining areas of the impulsivivity/reflectivity sub-test that warrant discussion include responses to items concerning timed tests and perseverance. In the first instance, the college prep sample indicated the greatest difficulty finishing in the allotted time and they were the most convinced that they do better when given unlimited time. The community college sample recorded the least difficulty with time limits. It is tempting to accept Knox's (1977) finding that time induced pressures increase with age. The university sample's response, however, suggested other considerations. Approximately 80% of the university sample said they are able to complete tests and exams within the time allowed, but approximately 80% also indicated they do better when given as much time as they need. Despite their mean age of 39.4 years, they indicated a successfully managed tension between the desire

to perform well and the need to finish on time. The college prep students (mean age 31.8 years) did not seem to have achieved this balance, a possible result of the confidence arising from a long history of learning success. Past learning success might also contribute to perseverance, since those who had achieved the university level of study were most willing to persist in finding their own solutions to difficult problems.

Learning Style Similarities by Age

The findings generally showed that age had little impact on the learning style patterns of the adults surveyed. The two statistically significant differences according to age were for viewing and required amount of structure. In the first instance, respondents between the ages of 25 and 34 were significantly more in favour of learning by viewing than were those over 44. In the case of structure, students over 44 required significantly less externally imposed structure than did those under 25. Two other findings, although not significantly different, are worth noting. The under 25 age group had the highest proportion of preference (24.19%) for aural learning, while those over 44 indicated the highest percentage (21.43%) in favour of learning by reading.

Because of the small differences in learning style according to age and because adults rarely present themselves for instruction in homogenous age groups, there was more practical value in pursuing analysis according to level of study.

Learning Style Similarities by Level of Study

A further examination of the results revealed clusters of common findings within the three levels of study for each of the three areas investigated (preferred perceptual mode, required amount of structure, and tendency toward impulsivity or reflectivity). Any summary of characteristics by level of study should, however, note the distinctly different average ages of each group: university 39.4 years, community college 25.7 years, college prep 31.8 years. Were the average ages of the groups more similar, one could more easily guage whether certain findings are attributable to age or level of study.

College Prep Students' Learning Style Similarities

Slightly less than half of the college prep sample indicated psychomotor as their preferred perceptual mode, while slightly more than one-third said they prefer to learn by viewing films or videos.

Of the three levels of study surveyed, the college prep students indicated the greatest need for externally imposed structure. Like their counterparts, they want all instructions carefully explained and they prefer straightforward materials that present a rule or concept followed by several examples. They can, for the most part, meet deadlines, but they prefer to have those deadlines set by an instructor or supervisor. Most favour questions having a single correct answer and these students were least in favour of choosing their own topics for assignments or project. Most of the college prep sample revealed that they accomplish more when their breaks are scheduled for them and that they like to have an instructor check their work often. Over 80%,

on the other hand, enjoy working in groups, an activity not ususally associated with a highly structured classroom environment.

The college prep responses to impulsivity/reflectivity items showed one major contradiction in that, although 84.62% indicated impulsive behavior in that they ask for help right away when they encounter difficulty, a little over two-thirds said they like to figure out difficult tasks and projects for themselves. These students were largely convinced that that they do better on tests and exams when they have as much time as they need, but they would rather "guess" than leave a question unanswered. Half were prepared to take the risk of volunteering answers and only slightly fewer were afraid of volunteering incorrect answers. Roughly two-thirds of the sample indicated willingness to participate in class discussions.

Community College Students' Learning Style Similarities

Psychomotor was the preferred perceptual mode of roughly 40% of the community college sample, while 20% indicated a preference for learning by viewing films or videos.

The community college respondents indicated a substantial need for externally imposed structure. Although able to meet deadlines, the majority prefer to have those deadlines set by others. Most like having instructors check their work often, and slightly fewer than half indicated that they are more efficient when they schedule their own breaks. Slightly fewer than two-thirds of the sample said they prefer assignments that let them choose what they want to do, but almost all want carefully outlined instructions and study materials that present rules or concepts followed by several examples. Of the three levels

sampled, this one was least in favour of questions having several possible correct answers. These students indicated that they are equally comfortable working either alone or in groups and that they find class discussions beneficial.

The community college patterns of reflectivity and impulsivity differed, in two instances, from those of the other two levels of study. In the first case, most respondents indicated sufficient impulsivity to complete tests and exams within the allotted time, and they were the least convinced that their results are better when they have as much time as they need. In the second instance, the sample indicated differences in class participation behavior. Although about half of the students said they volunteer answers in class, slightly more than half (more than in either of the other two groups) would do so only when certain of being correct. They were also the most cautious about expressing ideas and opinions during class discussions. On the other hand, they, like their counterparts, favoured the impulsive option of guessing rather than leaving a question unanswered. The majority (60%) indicated that they persevere until they succeed in solving a difficult problem by themselves, while only 40% said they ask for help right away.

University Students' Learning Style Similarities

The preferred perceptual mode of slightly more than half of the university sample was psychomotor, while approximately 20% (more than in either of the other two groups) said they prefer to learn by reading.

The university students appeared least in need of externally imposed structure. Most indicated capability of setting their own deadlines and of successfully working on several projects at one time.

They favour questions having more than one correct answer and they like the freedom to choose topics for projects and assignments. Most said they are more efficient when they schedule their own breaks and they do not like to have instructors check their work often. They seem equally at ease working either alone or in groups and most find class discussions beneficial. Like the other two groups, they want carefully outlined instructions and study materials that present a rule or concept followed by several examples.

The majority of the university sample exhibited reflectivity in that they spend a long time weighing all the factors before making a decision and they are inclined to persist until they solve difficult problems. These students were least in favour of timed tests, but over 80% indicated they finish within the allotted time. They showed impulsivity in their willingness to "guess" rather than leave a question unanswered, and to risk volunteering an incorrect answer.

IMPLICATIONS

The study's findings contained implications for both practical application and further research. In the first instance, they were based upon patterns of item responses for each of the levels of study. In the second instance, the implications evolved from the problems inherent in learning style instruments, particularly those that are self-reporting.

Implications for Instruction

The similarities among responses to several inventory items suggested some possible strategies for classroom instruction for each of the three levels of study sampled.

College Prep

Based on responses to psychomotor items 15, 17, 31, 37, 41, and 50 and viewing items 6 and 54, an instructor of this college prep group might consider balancing reading and listening activities with some opportunities for problem solving and learning through viewing. Responses to items 21 and 42 suggested a class routine that includes scheduled deadlines and breaks. The proportion of agreement with items 33, 38 and 51 pointed toward the merit of having assignments and study materials that are presented with absolute clarity, while responses to items 29 and 49 suggested the importance of instructor accessibility to students. The overall results of items 32 and 40, concerning completion of tests, and items 2, 7 and 22, concerning individual and group work, implied that the majority of these students would welcome an unhurried environment that allows opportunity for interaction with classmates both through discussion and group work.

Knox (1986, p.25) reminds us, though, that "in some instances the intent of continuing education is to help adults make transitions to higher levels of personal and cognitive functioning." An instructor might direct these students toward working independently and away from heavy reliance on the peer support usually inherent in group work. Because of responses to items 9 and 25, the college prep students might

also be encouraged through discussion, or other means, to consider problems that have equally acceptable alternative answers.

Community College

The community college sample's responses to psychomotor items 15,17, 31, 37, 41 and 50 and viewing items 6 and 54 suggested that instructors could vary reading and listening activities with opportunities for learning by doing and problem solving, and through viewing films and videos. The proportion of agreement with items 21, 42, 33, 38 and 51 indicated the appropriateness of instructor set deadlines, scheduled breaks, clearly outlined instructions and straightforward materials. According to responses to items 32 and 40, timed tests would not penalize most of these students. Findings generated by items 9 and 25 suggested discomfort with questions having more than one correct answer, while responses to items 30 and 36 suggest that several students would be reluctant to volunteer answers or opinions. After recognizing the class's prevailing preferences, an instructor might decide to encourage class discussions involving issues and problems that have several interpretations or solutions.

University

The university sample's responses to items 15, 17, 31, 37, 41 and 50 suggested the value of instruction that provides the opportunity for activity and problem solving. After considering responses to items 33, 38, 51, 21 and 42, instructors would perhaps be wise to present carefully outlined instructions and clearly organized materials, but they should not need to schedule breaks and deadlines in order to

guarantee efficiency. The high incidence of agreement with items 48, 32 and 29 indicated that these students would be most comfortable when given ample time to solve problems and complete tests without frequent monitoring of their progress. An instructor could consider this particular group of university students best suited to an unhurried, fairly autonomous learning environment.

Implications for Research

A central problem in all learning style research is finding an instrument that will provide the information necessary to facilitate more effective program planning. Each of the major instruments described in Chapter 2 has documented shortcomings. For example, there is little evidence of a positive link between the findings of instruments such as Kolb's Learning-Style Inventory and Gregorc's Style Delineator and students' preferred instructional techniques and achievement (Pigg et al., 1980; Fox, 1984; Lundstrom & Martin, 1986). Hunt's Paragraph Completion Method and the Dunns' Productivity Environmental Preference Survey are based on reasearch limited primarily to children and adolescents (Hunt, 1979; Bonham, 1988a).

Although the "Learning Style Inventory," designed for this particular study, focused on areas of learning style discussed in adult education literature, it, too, had flaws that had an impact on the results. First of all, the findings support some of the general criticisms concerning self-reporting instruments. Responses to individual items were sometimes inconsistent and occasionally contradictory. Students who said they prefer to learn new material by reading also indicated that they prefer to learn it in other ways. Many

students, particularly from the college prep sample, indicated that when confronted with a difficult task or problem, they both immediately seek help, and try to figure it out for themselves. In the former case, one could speculate that students might have been influenced by something as simple as the order in which items occurred, or they might have given so little thought to their own learning that they quickly agreed with what was before them. Perhaps a very recent, but isolated, learning success influenced a particular response. Ideally, students would indicate more than one "preferred" way of learning and remembering because they felt comfortable with aspects of several modes. The latter example might result from participants being caught between the reality of their own learning approaches and the desire to provide a more favourable impression of themselves. Classroom instructors would, therefore, be wise to explore each individual's inventory results through interviews, and observations.

Other problems with the inventory included the imbalance in the numbers of items within the various sub-tests and, what some might deem, the researcher's rather arbitrary selection of items for the sub-tests.

RECOMMENDATIONS

Several recommendations, both for classroom instruction and further research, emerged from the study's findings.

Classroom Instruction

1. Adult educators should be familiar with the concept of learning style as one way of understanding that, that

although groups of students may share some learning characteristics, individuals experience learning differently.

2. Adult educators should vary their methods of presenting information to avoid penalizing students because of their perceptual preferences.
3. Adult educators should devise or adopt some practical means of gaining information about their students' learning styles. This would help avoid incorrect assumptions about their students' desire for autonomy or reluctance to take risks.
4. Whenever possible, follow-up interviews and/or observations should accompany the administration of learning style instruments. This is especially true if learning style information plays a role in any kind of education or career choice, or if a student is experiencing learning difficulties.

Further Research

1. In order to increase their potential for generalization, future studies should include larger samples from a wider range within each of the three levels of study involved. For example, respondents could be drawn from several university faculties, a wider range of community college programs, and college preparatory courses other than reading and writing.
2. A revision of the learning style instrument to address the

imbalance in the number of items within the four perceptual mode sub-tests should result in a more accurate reading of respondents' perceptual preferences.

3. Further exploration of the role played by structure within the learning environment should ultimately enable educators to be more effective in providing optimal learning conditions for their adult students.

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APPENDIX A

Learning Style Inventory

LEARNING STYLE INVENTORY

SEX F___
M___

AGE ___

FACULTY or PROGRAM _____

This inventory contains 54 statements. Each statement is followed by five response choices :

SD = STRONGLY DISAGREE
D = DISAGREE
U = UNDECIDED
A = AGREE
SA = STRONGLY AGREE

Please circle the response that best describes your reaction to the statement. As you make your selections, remember there are no "right" or "wrong" answers. No one response is better than another.

Select only ONE response for each statement.

1.	I prefer to learn new material by reading.	SD	D	U	A	SA
2.	I prefer tasks or projects that allow me to work alone.	SD	D	U	A	SA
3.	I am usually one of the first in a group to finish tasks or projects.	SD	D	U	A	SA
4.	I often volunteer answers in class.	SD	D	U	A	SA
5.	I am always successful in meeting deadlines.	SD	D	U	A	SA
6.	I remember best things I have seen in films or videos.	SD	D	U	A	SA
7.	I usually find class discussions a waste of time.	SD	D	U	A	SA

8.	When I find a task or question difficult, I ask for help right away.	SD D U A SA
9.	I prefer questions or problems that have only one correct answer.	SD D U A SA
10.	I remember best things I have heard.	SD D U A SA
11.	I get more work done when I can take a break whenever I want to.	SD D U A SA
12.	I prefer assignments that let me choose what I want to do.	SD D U A SA
13.	I rarely ever finish tests or exams when there is a time limit.	SD D U A SA
14.	I never volunteer an answer in class.	SD D U A SA
15.	I like building or making new things.	SD D U A SA
16.	I learn better by reading than by listening.	SD D U A SA
17.	I prefer tasks that I must work through carefully one step at a time.	SD D U A SA
18.	I usually make quick decisions about my work.	SD D U A SA
19.	I always finish tests or exams in the time allowed.	SD D U A SA
20.	I prefer to learn new material in a lecture.	SD D U A SA
21.	I get more work done when I'm allowed only to take breaks scheduled by the instructor or supervisor.	SD D U A SA
22.	I enjoy working in groups.	SD D U A SA

23.	I am never successful in meeting deadlines.	SD D U A SA
24.	When I find a task or question difficult, I leave it and go on to the next one.	SD D U A SA
25.	I prefer questions or problems that have several correct answers.	SD D U A SA
26.	I take lots of notes during lectures.	SD D U A SA
27.	I prefer to learn new material by listening to a lecture or tape.	SD D U A SA
28.	I often have difficulty completing tasks or projects.	SD D U A SA
29.	I like to have an instructor or supervisor check my work often.	SD D U A SA
30.	I volunteer an answer only when I'm sure it is correct.	SD D U A SA
31.	I remember what I learn best if I go through each step of the task.	SD D U A SA
32.	I do better on tests and exams when I have as much time as I need.	SD D U A SA
33.	I prefer assignments that have all the instructions carefully outlined.	SD D U A SA
34.	I learn better when I read instructions than when someone tells me what to do.	SD D U A SA
35.	My marks are usually best when I put down the first answer I think of.	SD D U A SA
36.	I often express my opinions and ideas during class discussions.	SD D U A SA

37.	I learn best when I'm actually doing or practicing what I'm learning.	SD D U A SA
38.	I prefer study materials that have lots of practice exercises.	SD D U A SA
39.	I can successfully work on several projects at once.	SD D U A SA
40.	I usually finish tests and exams in the time allowed.	SD D U A SA
41.	I prefer courses that allow me to do experiments.	SD D U A SA
42.	I prefer to have deadlines set by my instructors or supervisors.	SD D U A SA
43.	I remember best things I have read.	SD D U A SA
44.	When I find a task or question difficult, I try to figure it out for myself.	SD D U A SA
45.	I rarely express an opinion or idea in a class discussion.	SD D U A SA
46.	I make lots of notes when I study.	SD D U A SA
47.	I am usually successful in meeting deadlines.	SD D U A SA
48.	I spend a long time weighing all the factors before I make a decision.	SD D U A SA
49.	I rarely consult an instructor or supervisor about my work.	SD D U A SA

50. I remember how to do a task best by actually doing it. SD D U A SA

51. I prefer study materials that present a rule or concept followed by several examples. SD D U A SA

52. I would rather "guess" an answer than leave a question unanswered. SD D U A SA

53. I prefer tests and exams that have a specific time limit. SD D U A SA

54. I prefer to learn new material from films or videos. SD D U A SA