

AN ABSTRACT OF THE THESIS OF

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The American public school system has been delegated the responsibility for providing all children with an equal educational opportunity. For the state of Alaska, this charge is both unique and difficult. The academic performance of Alaskan Native students, the state's largest minority, is a serious concern due to their relatively inferior performance and exceedingly high dropout rate. A literature review revealed few studies dealing with Natives' unique characteristics and none investigating preferred learning style.

The purpose of this study was to determine the learning styles of Native students, compare them with their White classmates, determine whether or not sex differences exist and to ascertain the relationship between learning styles and reading achievement.

The Learning Style Inventory was administered to 141 Native and 478 White urban Anchorage students, grade 4-6. Data analysis included one- and two-way analysis of variance (ethnic group and sex) and

Pearson product-moment correlation coefficients (ethnic group and reading achievement).

Data analysis led to the rejection of all four null hypotheses ( $\alpha = .05$ ). Significant differences between ethnic groups included: Persistence; Authority Figures Present; Requires Intake; Late Morning; and Consistency. Native students were less persistent, preferred the presence of teachers, desired less intake and preferred working in the late morning, while revealing greater inconsistency of preferences. Native females were significantly better motivated than males on both Self Motivation and Teacher Motivation. Two low, but significant, correlations were found between Native preferences (Noise Level and Responsibility) and reading achievement, while eleven were significant for White students.

It was concluded that significant differences do exist between Alaskan Native and White students' learning styles which may have educational implications. The data also suggest that acculturation may modify Natives' preferred learning styles and that the unique northern environment shared by both groups may cause unique physiological responses which make Natives and Whites more common on selected characteristics than either are to the normative group.

Recommendations included replication of the present study with both rural and urban Natives, exploring the impact of acculturation upon learning styles, determining whether or not life in the far North causes physiological responses which result in unique commonalities for its inhabitants and exploration of the construct of sequential-simultaneous information processing ability with Natives.

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LEARNING STYLE PREFERENCE AND READING ACHIEVEMENT  
OF URBAN ALASKAN NATIVE STUDENTS

by

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# LEARNING STYLE PREFERENCE AND READING ACHIEVEMENT OF URBAN ALASKAN NATIVE STUDENTS

## CHAPTER I

### INTRODUCTION

In the United States, the public school system has been delegated the responsibility for providing all children with an equal educational opportunity. For the state of Alaska, with an area of 586,412 square miles (one-fifth the size of the combined 48 contiguous states), a present population of slightly more than 400,000 residents and population density only one-five hundredth of New York's, this charge is both unique and awesome. Since statehood in 1959, remarkable progress has been made in building and staffing schools throughout the state including many in small, rural villages. Unfortunately, for Alaskan Natives, as with other Native Americans and minority groups, educational research dealing with individual differences and diverse needs has not maintained pace with society's ability to build new educational facilities.

Such institutional ignorance has contributed to innumerable problems for America's and particularly Alaska's Native students as revealed by their inferior performance on standardized tests, high dropout rate, withdrawal tendencies and alienation within the public school setting.

The academic performance of Alaskan Native students has become an increasing concern of teachers, curriculum specialists, administra-

tors, parents and Native leaders alike. The seriousness of this situation is illustrated by the meager educational attainment for the adult Native population of which a significant percentage is functionally illiterate. This problem results in part because secondary school educational opportunities have existed in many villages for only the last decade. However, this situation is in marked contrast to the performance level of Native students shortly after entry into the primary grades when test scores suggest generally favorable performance in comparison to the national norm. Soon thereafter, however, a distinct trend is noted in which the gap between Native and White students' performance increases progressively with each succeeding grade.

A closely related problem at the secondary level is a rate of Native student dropouts which far exceeds that of their non-Native peers. This longstanding problem recently led one Native educational leader, Ramona Suetopka-Duerre (1983), to proclaim that "The responsibility is upon the schools to intervene with new approaches to learning and teaching" (p. 31).

Due in part to the passage of the Alaska Native Claims Settlement Act (ANCSA) on December 18, 1971 and the establishment of thirteen Native Regional Corporations under its provisions, the demonstrated need for educated Natives is rapidly and urgently increasing. This need spans the range of blue and white collar professions.

Although Alaskan Natives, particularly the Eskimos, have been extensively studied by anthropologists during the twentieth century, educational research dealing with the unique characteristics of Native

students is scarce. Furthermore, some Natives have been heard to complain about the prior research failing to benefit their people. Repeated computer searches and inquiries to numerous Alaskan educators and researchers, recognized authorities in both Alaska and elsewhere in the United States and Native leaders, have revealed that no research has been conducted to determine the learning style preferences of Alaskan Native children or adults. This need, however, is expressed by individuals across the state as illustrated by the March 25, 1983 correspondence from The Alaska Native Foundation president, Franklin L. Berry (Appendix A).

Teacher awareness of students' preferred learning styles and utilization of appropriate instructional strategies and materials may assure more effective classroom instruction. Culturally different students in general, and Alaskan Native students specifically, demonstrate relatively poorer academic achievement than students from the dominant culture. The failure to identify learning style preferences may be a contributing factor to their inferior academic performance and high dropout rate within the school setting.

The failure to incorporate learning style preference identification and utilize this as a vehicle to promote individualized instruction may contribute to the differences previously noted between Alaskan Native students and their classmates from the dominant culture. Related evidence involving other minority groups such as American Indians, Blacks, and Hispanics has demonstrated different learning styles which have variously been attributed to cultural, environmental, ethnic, maternal and racial factors, and which may

negatively affect academic performance. Other evidence suggests that improved academic performance, from elementary to college level, occurs with utilization of learning styles within the instructional program.

Research during the past two decades utilizing various minority populations reveals different preferred learning styles for many groups, as well as sex differences, although considerable intragroup variability is also observed. Furthermore, the application of this knowledge in the classroom has produced demonstrable benefits, particularly improved academic performance.

Due to the absence of prior research on the proposed topic of preferred learning styles of Alaskan Natives, conducting an exploratory study using variables which have been found to correlate with improved academic achievement in other populations will begin to create a foundation from which to further improve education for Alaska's largest group of minority students. Such endeavors, which are urgently needed and contribute valuable knowledge to the existing body of educational research, are often not possible due to limited financial resources and lack of institutional support.

#### Statement of the Problem

Do Alaskan Native students possess unique learning style preferences which differ from those of their White classmates and do sex differences exist for Native students' preferences? What is the relationship between each group's learning style preferences and reading achievement?

### Purpose of the Study

The primary purposes of this study are to assess the preferred learning styles of Alaskan Native students utilizing the Learning Styles Inventory: An Inventory for the Identification of How Individuals in Grades 3 through 12 Prefer to Learn (LSI) by Dunn, Dunn & Price, 1981, to determine the differences between their preferences and those of their White classmates and to ascertain if sex differences exist for Native preferences. Secondary purposes are to determine the relationship between both groups' preferred learning styles, as measured by the LSI, and reading achievement, as measured by the Iowa Tests of Basic Skills (ITBS).

### Limitations of the Study

Limitations of the study are acknowledged as follows:

1. Subjects will be selected from a heterogeneous population of Native students enrolled in the Anchorage School District. Generalizations of the findings to any particular ethnic subgroup or individuals from villages throughout the state may not be applicable (see Alaskan Native in Definition of Terms).
2. Due to the high concentration of Native students within a relatively well circumscribed area of Anchorage, this study of necessity will only include those students attending schools within this region. A random sampling from the entire school district was deemed to be too disruptive to the educational program since some schools have less than one percent of their enrollment belonging to the target population.

3. Cultural, experimental and socioeconomic factors beyond the control of the design may be present.
4. School district policy requiring complete student anonymity may preclude the utilization of some data for analysis.
5. Since data collection occurred in late April and early May, some Native students, particularly Eskimos, had probably withdrawn from school to return to villages for spring whaling which could have affected the sample composition.

#### Assumptions

The conclusions reached in the study will be based on the following assumptions:

1. The Learning Style Inventory (LSI) is a valid instrument to identify preferred learning styles including Alaskan Native students.
2. The Iowa Tests of Basic Skills (ITBS) are a valid measure for assessing reading achievement including Native students.
3. The Cognitive Abilities Test (CogAT) is a valid measure of verbal, quantitative and nonverbal abilities including Alaskan Native students.
4. Student records maintained by the Anchorage School District and utilized for this research correctly reflect such pertinent student information as birthdate and ethnic/cultural classification.
5. This subject selection process will accurately represent the entire Anchorage Native population.

6. By selecting subjects for both groups from the same schools, the two resulting samples will be comparable.
7. Examiner behavior and rapport will not differ among groups being assessed.
8. Student assessment will be carried out according to generally accepted practices, guidelines established by the publishers of the selected instruments and Anchorage School District policy.
9. The subjects will understand the test administration instructions and respond truthfully to all items.
10. Analysis of Variance (ANOVA) assumes that the distribution of the dependent variable in the population from which the samples are drawn is normal, the variance in the populations from which the samples are drawn is equal, and the effects of various factors on the total variation are additive, as distinct from, say, multiplicative.

#### Definition of Terms

1. Alaskan Native:

A citizen of the United States who is genetically one-fourth or more Alaskan Indian, Eskimo or Aleut, or combination thereof and as further described below:

A. Indians:

The second largest group of Natives traditionally inhabiting Alaska's expansive interior and southeast panhandle and which includes among others, the Athabascan (Athapaskan), Tanana, Tlinkit, Haida and Tsimshian tribes.

B. Eskimos:

The largest Alaskan Native group which historically occupied most of the Alaskan coast south to Prince William Sound. The name originated with Canadian Indians and means "raw meat eaters."

C. Aleuts:

The least populous of the three major Native groups traditionally living on the Alaska Peninsula and speaking a language thought to have been derived about four millenia ago from Eskaleut and which also gave rise to the present day Eskimo languages.

2. Alaska Native Claims Settlement Act (ANCSA):

A Congressional Act passed in 1971 granting 40 million acres and almost a billion dollars to Alaskan Native claimants in return for terminating claims against the U.S. Government.

3. Analysis of Variance (ANOVA):

A method for dividing the variation observed in experimental data into different parts, each part assignable to a known source, cause or factor which is used to test the significance of the differences between the means of a number of different populations.

4. Anglo American:

An English speaking U.S. citizen usually inferred to represent the dominant American culture and referred to as Whites by the Anchorage School District.



5. Cognitive Abilities Test (CogAT):

A standardized group abilities test published by Riverside Publishing Company which assesses verbal, quantitative and non-verbal cognitive ability. This test replaces the Lorge-Thorndike Intelligence Test.

6. Cognitive style:

The habitual manner in which individuals process information which is related to cognitive processes rather than content, described as being bipolar in conception and for the purposes of this study considered as a form of psychological stimuli.

7. Correlation:

A statistical procedure which describes the degree of relation between two variables.

8. Cross-cultural psychology:

The empirical study of members of various cultural groups who have had different experiences which lead to predictable and significant differences in behavior (Brislin, Lonner & Thorndike, p. 5).

9. Dominant culture:

The most influential or major group in American and Alaskan society.

10. Institutional ignorance:

Demonstrated ineffectiveness by public agencies and their representatives in dealing with designated responsibilities due to lack of knowledge, interest, concern, and/or other reasons.

11. Iowa Tests of Basic Skills:

A standardized group achievement test published by Riverside Publishing Co. and widely used in the U.S. to assess academic achievement.

12. Learning Style:

The manner in which a person most successfully absorbs and retains information in response to environmental, emotional, sociological, physical and psychological stimuli.

13. The Learning Style Inventory:

An instrument developed by Dunn, Dunn & Price which was derived from research indicating that different students prefer to learn in different ways and designed for use in individualized instruction. It consists of 104 simple statements requiring dichotomous responses on NCS computer scored answer sheets. The responses are scored on the 23 elements of learning style preference.

14. Reading Achievement:

A subtest score derived from a standardized achievement test indicating reading performance in relation to an established norm.

15. White

The designation utilized by the Anchorage School District to identify students having ethnic origins in Europe (excluding Spain), Russia, North Africa or the Middle East. For the purposes of this study, the term, White, will refer to members of the dominant culture.

## Hypotheses

The following hypotheses are presented in the null form for purposes of statistical analysis:

### Major Hypotheses

1. There is no statistically significant difference between the mean scores of Alaskan Native and White students for the elements of preferred learning style, as measured by the Learning Style Inventory (LSI).
2. There is no statistically significant difference between the mean scores of male and female Alaskan Native students and their preferred learning style, as measured by the LSI.

### Minor Hypotheses

3. There is no statistically significant relationship for Alaskan Native students between preferred learning style and reading achievement, as measured by the Iowa Tests of Basic Skills (ITBS).
4. There is no statistically significant relationship for White students between preferred learning style and reading achievement as measured by the ITBS.

In summary, the present study has been undertaken due to the absence of previous studies utilizing the learning style construct with Alaskan Native students. The demonstrated need for this type of research is further underscored by the relatively poor academic performance and high dropout rate observed with these students as illustrated in the following chapter.

## CHAPTER II

### REVIEW OF THE LITERATURE

This literature review will examine: (1) the development and application of learning style models; (2) sex differences; (3) the relationship between learning style and reading achievement; (4) research related to learning style and Native Americans including Alaskan Natives; and (5) demonstrated need for further research.

Each student brings to the classroom not just a particular set of skills and body of acquired knowledge, but also a unique combination of beliefs, experiences, goals, interests, perceptions, and values. If past performance is an accurate barometer, the schools cannot successfully educate their students if these unique characteristics or individual differences are not considered in development and implementation of instructional programs. To achieve this goal, individualized instruction, with its focus on individual differences, has been attempted during the past two decades. However, the results have led Keefe (1982) to term it a "creed without substance" (p.43) while issuing a stern warning that "Ultimately, education must come to grips with the different learning needs of the individual learner" (p. 43).

Educators are becoming increasingly aware that learning styles may serve as a vehicle to successfully achieve greater individualized instruction. The deceptively simple position assumed by professionals involved with research and application of this approach to individua-

lization is that everyone is different in the preferred ways in which they learn and that furthermore, one way of learning is no better than another -- just different. For instance, Rita Dunn (1982a) states that "no one is affected by all the elements of learning style" (p. 142) and that "most people respond strongly to between 6 and 14," although "a few people are strongly influenced by 18" (p. 142-143). The preferred way of learning for one person is not the preferred mode for another. Torrance (1965), furthermore, has pointed out that:

Alert teachers have always been aware of the fact that when they change their method of teaching, certain children who had appeared to be slow learners or even non-learners become outstanding achievers. (p.253)

Sperry (1972) states that the popularization and application of learning style research and theory is being promoted by at least two professional groups, "those concerned with the disadvantaged and disordered learner" and "those concerned with improving individualized instruction" (p. 97). More recently its importance has been emphasized by Thomson (1982).

We can now say with reasonable assurance that instruction should begin with an analysis of the ways a particular student processes information and then build from that point. This insight provides the practitioner with a more substantive framework for planning than did earlier 'single approach' proposals for teaching all students. A multiple approach to organizing instruction for students becomes, then, the basic rationale for individualizing student learning opportunities. The methodology by which material is presented should depend on the particular way a student processes information. Students with similar learning profiles can be clustered together for instruction. This strategy would replace old concepts of individualization which depended too heavily upon 'independent study', a format that disadvantages some students and advantages other students (p. 218).

#### The Development and Application of Learning Style Models

Authorities disagree as to when learning style elements were first

studied, but Kirby (1979) states that "many sorts of style" have been recorded by the Greeks "as far back as ancient history" (p. 83). Historically, cognitive style has been considered in cognitive and experimental psychology. Psychologists such as Cattell began by measuring individual differences in perceptual characteristics. However, "the findings were plagued with methodological problems and a preoccupation with determining the one perceptual mode that would best improve student learning" (Keefe, 1982, p. 44) which resulted in a diminished interest in the phenomenon.

The term "cognitive style" was reportedly coined by Gordon Allport in 1937 to refer to a quality of living and adaptation influenced by distinctive personality types. More recently, Messick (1976) formulated a widely accepted definition that cognitive styles are information processing habits representing the learners' typical mode of perceiving, thinking, problem solving, and remembering. At that time, Messick reported that more than 20 cognitive style dimensions had been reported in thousands of research articles.

Following World War II, Asch, Witkin and colleagues isolated a perceptual trait, field dependence-independence, which led to the identification of a constellation of interrelated factors which together reflected a person's level of "psychological differentiation", a term which refers to the complexity of a system's structure, with specialization characterizing a more differentiated state (Witkin, Dyk, Faterson, Goodenough & Karp, 1962, p. 9).

Cognitive styles are concerned with the form rather than the content of cognitive activity. They are pervasive, stable dimensions of individual differences in the processes of perception, thinking, problem solving, learning, and so on. They are primarily concerned with how we deal with information

about the world rather than with how much or how well we do. There may be some situations in which a particular style leads to better performance, but other styles are more effective in other situations (Goodenough, 1978, p. 166).

The terms learning style and cognitive style are frequently confused and have often been used synonymously in the professional literature, although authorities such as Keefe and Dunn contend that the two are different. "Learning styles, in fact, is the broader term and includes cognitive along with affective and physiological styles" (Keefe, 1979a, p. 4). Dunn (1981b) elaborates by stating that:

Although the two terms are often interchanged in the literature, they are different but complementary. Learning style is the way in which individuals respond to the environmental, emotional, sociological, and physical stimuli that surround them; whereas cognitive style - whether it refers to field dependence or independence, global or analytical approaches, the 'brain' concept of learning, or specific study skills - describes the ways in which the brain processes information (p. 34).

While more research has been conducted on cognitive styles, and has appeared in the literature first, investigators of learning styles have sought specific strategies to meet the particular needs of individual learners. In this respect, the greatest concern is for practical application (Kirby, 1979). One primary difference between the two styles is the number of elements considered. Cognitive style typically focuses on only a single dimension which is bipolar in nature, while learning style usually includes four or more elements which are not of an "either-or" nature. A person either does or does not prefer a particular learning style element and the absence of one element does not imply the presence of an opposite element as with cognitive style.

A purported difference between learning style and cognitive style

is the relative "value-free" nature of the former (Kirby, 1979; Kogan, 1971; Messick, 1976). The value-laden quality of cognitive style is shared with abilities and easily leads to "better or worse" judgments, although the value or benefit of the dimension of a specific cognitive style varies from one situation to another. The value-free quality of the various combinations of learning styles representing preferred means of acquiring and acting upon information holds particular appeal to educators whose goal is to achieve individualization. An understanding of learning style, which suggests that people's preferences characterize their interactions with their environment, is potentially valuable due to the possibility of predicting future responses (Lidz, 1981, p. 169).

To date, the dispute over nature vs. nurture in the development of learning styles has not been settled, much as has been the case in the related area of ability. Many of the researchers dealing with cognitive styles and cross cultural studies tend to assume a developmental approach and contend that socialization factors have the greatest impact (Goodenough, 1978, Witkin, 1976). Witkin states:

In overview, it seems fair to say from the evidence now on hand that socialization factors are undoubtedly of overwhelming importance in the development of individual differences in field dependence versus field independence. At the same time, it may be that genetic factors are implicated as well, although probably to a much smaller degree. If they are implicated, we should know about the role they play in interaction with social factors (1976, p. 47).

More recently, Gregorc, a researcher in learning styles, while considering their origin concluded that:

From various sources of research, style appears to be both nature/nuture in its roots. Patterns of adapting to environments are apparently available to each of us through our



genetic coding system. These patterns have permitted the survival of our family, nationality, and race (1979, P. 234).

Although uncertainty exists regarding the relative impact of nature and later social experience, it appears that support (e.g. Berry, 1981a) is quite heavily aligned with Gregorc.

Stability of style over time, like the preceding topic, has resulted in contradictory findings and conclusions, in part apparently due to the variety of factors being studied. It is a typical feature of all child developmental theories that adults function more autonomously than children, and such is the reported case with a change from a state of field dependence toward one of field independence during the process of development (Goodenough, 1978; Kogan, 1971; Witkin, Dyk, Fateron, Goodenough & Karp, 1962). With the passage of time, while individuals become more field independent, they also tend to maintain their positions relative to others (Kirby, 1979; Kogan, 1971).

Within the educational setting, Copenhaver's (1979) study indicates that students' learning styles are consistent, regardless of the subject being learned at a given point in time. When studies of a longitudinal nature were conducted, some individual style preference changes were noted (Barbe and Milone, 1981; Carbo, 1982a; Dunn, 1982a; Price, 1982). Carbo tested students in grades two, four, six, and eight using the Reading Style Inventory, which is based upon the Diagnosing Learning Style Model. She found that the youngest group preferred tactual and kinesthetic stimuli and had a greater need of food intake and mobility than the older students being studied (p. 129). Dunn's significant findings revealed that:

The higher the grade level, the less preference was indicated for formal design, structure, and teacher motivation.

Self-motivation decreased during grades 7 and 8, but a gradual increase was evidenced in each of the grades thereafter.

The higher the grade level, generally, the less motivated are students.

The highest need to learn with peers occurs in grades 6 through 8; the lowest need is in grade 12, followed by grade 9. The younger the child, the more tactual and kinesthetic he or she is, followed later by the development of visual strengths, and beginning with grades 5 and 6, the development of auditory strengths (p. 145).

The current state of knowledge is characterized by Price's (1982) statement that:

We do not know ... whether preferences in learning style change primarily because of the changes in the individual, the person's ability to adapt to different types of instruction, or an interaction of the two (p. 117).

The issue of modifiability of selected learning style elements is of considerable potential educational importance, since evidence exists that particular styles might facilitate or impair learning. This might lead to efforts to alter such styles in more adaptive directions (Kogan, 1971). While it appears reasonable to assume that learning styles can be modified, there is little empirical evidence to validate such a position. Reynolds and Torrance (1978), utilizing gifted and talented students in the Georgia Governor's Honors Program, conducted a study in which the experimental group received intensive training in right-hemisphere dominated style of information processing. They concluded that it is possible to change an individual's preferred learning and thinking style over a relatively brief period of time and that it appears that the general direction of the changes can also be controlled. Laosa (1977) supports this position

by asserting that an individual can be trained, with relative ease, to manifest behaviors associated with a cognitive style other than his/her own and that training students and teachers to acquire a variety of 'learning strategies' is within the realm of possibility and probably a worthwhile goal.

Understanding the ways by which students learn (and prefer to learn) is a generally accepted premise in education today and may serve as the means to achieve individualized education and overcome the charge that "Education today is making an insufficient impact on the human potential for learning" (Gregorc, 1982, p. 3).

Learning style research indicates that "we, as human beings, can separate ourselves physically and mentally from our environments" and that "people's styles reveal how they identify, judge, substantiate, confirm, and validate truth (p. 5). To further emphasize the importance of this position, James W. Keefe offers the following statement in the foreward to Student Learning Styles and Brain Behavior:

Knowledge about learning styles and brain behavior is a fundamental new tool at the service of teachers and schools. It is clearly not the latest educational fad. It provides a deeper and more profound view of the learner than previously perceived, and is a part of a basic framework upon which a sounder theory and practice of learning and instruction may be built.

Predictably, different researchers have provided numerous definitions for learning styles. However, distinct commonalities are discernible in virtually all. Keefe (1979a) provides the following definition in Student Learning Styles:

Learning styles are characteristic cognitive, affective, and physiological behaviors that serve as relatively stable indi-

cators of how learners perceive, interact with, and respond to the learning environment (p. 4).

Elsewhere in this publication, David Hunt offers this description:

Learning style ... describes a student in terms of those educational conditions under which he is most likely to learn. Learning style describes how a student learns, not what he has learned. To say that a student differs in learning style means that certain educational approaches are more effective than others for him (p. 27).

Anthony Gregorc (1979) proposes the following phenomenological definition:

Learning style consists of distinctive behaviors which serve as indicators of how a person learns from and adapts to his environment. It also gives clues as to how a person's mind operates (p. 234).

Rita Dunn (1982b) has concluded that everyone, regardless of age, sex, ability level, race, or socioeconomic level, tends to learn through their individual strengths and to avoid their weaknesses. "How we learn - our 'style' - depends on our 1) environment, 2) emotionality, 3) sociological preference, 4) biological traits, and 5) psychological inclinations" (p. 30-31).

The above definitions represent several comprehensive models of learning styles developed to date. Others are more restrictive. For instance, Canfield and Lafferty emphasize conditions, contents, modes, and expectations; Hill emphasizes symbols and cultural influences; Kolb refers to hereditary equipment, past experiences and the environment, while Schmeck compares information processing activities ranging from shallow and repetitive to deep and elaborative (Dunn & De Bello, 1981, p. 372-375).

These models include numerous characteristics, but a close examination reveals a number of commonalities which focus upon the

learner's unique preferences in processing environmental information. This emphasis, individuality, holds the potential to significantly and positively modify the classroom instructional process.

James Keefe's learning style model (1979a), based upon his definition provided earlier, consists of three dimensions: 1) cognitive style (12 elements), 2) affective style (15 elements), and 3) physiological style (5 elements). He reports that cognitive styles are related to, but different from, intellectual abilities because the latter deal with the content of cognition, while the prior illustrate the process. His reception styles deal with the perception and analysis of data, while concept formation and retention styles deal with hypothesis generation, problem solving, and memory processing.

The second dimension, affective styles, incorporates those personality factors which pertain to attention, emotion, and valuing. They are the results of motivational processes which are subject to a wide variety of influences.

Physiological styles are biologically-based modes of response which are related to sex-related differences, personal health, nutrition and each individual's demonstrated reaction to the physical environment (Keefe, 1979a, p. 8-17).

The Dunn and Price Diagnosing Learning Style Model (Dunn, 1982b), serves as the theoretical framework for their Learning Style Inventory. This instrument currently contains 23 elements. The model is based upon research which identified variables that appear to affect the ways in which individuals prefer to learn (p. 30-31 and 80-82).

1. The Environmental Elements of Learning Styles
  - A. Sound
  - B. Light
  - C. Temperature
  - D. Design
2. The Emotional Elements of Learning Styles
  - A. Motivation
  - B. Persistence
  - C. Responsibility
  - D. Structure
3. The Sociological Elements of Learning Styles
  - A. Peers
  - B. Self
  - C. Pair
  - D. Team
  - E. Adult
  - F. Varied
4. The Physical Elements of Learning Styles
  - A. Perceptual
  - B. Intake
  - C. Time
  - D. Mobility
5. Psychological Elements of Learning Styles
  - A. Analytic - global
  - B. Cerebral dominance
  - C. Impulsive - reflective

The current LSI manual (Dunn, Dunn & Price, 1981a) and a number of its authors' recent articles describe the three psychological elements above dealing with brain function, although these elements are not presently assessed by the LSI. Price Systems, the LSI publisher, has recently discontinued efforts at instrumentation of brain function. Dr. Gary Price (Note 1) has concluded that for the present "only individual tests in the area of neuropsychology can really determine the nature of right and left brain functioning."

Based upon this model, the Learning Style Inventory (LSI) with 23 elements and two levels (grades K-2 and 3-12) was developed to yield information concerning the preferred patterns through which learning occurs. It assesses how an individual prefers to learn, not the skills that are used to do so or the content.

Recent research concerned with identifying the relationship between achievement and learning style has provided consistent support for the following: 1) students do learn differently from each other; 2) student performances in different subject areas are related to how individuals do, in fact, learn; 3) when students are taught differently based on the method(s) each prefers, they do learn more efficiently; and 4) systematic ways to identify individual preferences for learning and suggestions for teaching students with varying learning styles...can be developed based on an individual diagnosis (Dunn, Dunn & Price, 1981a, p. 19).

Recent research with the Diagnosing Learning Styles Model has documented that teaching students via their preferred learning styles results in: 1) improved academic performance; 2) improved attitude toward school; and, 3) diminished disciplinary problems (Dunn, 1982a, p. 142). These findings suggest the need for greater awareness on the part of educators so that the knowledge can be translated into educational practice.

The LSI "has proved operationally successful in screening individual students for learning style patterns and profiles and in providing the essential ingredients for diagnostic and prescriptive teaching" (Marcus, 1979, p. 377). His research compared the learning styles of Above-average, Average, and Below-average seventh grade students. The results revealed "numerous differences in the learning styles of the groups tested" (p. 378), but in none of the groups studied could unanimity be found on a single element of learning style.

A word of caution, however, is in order regarding the title "Learning Style Inventory", because not only is the instrument developed by Dunn, Dunn and Price currently being used, but two others possessing the identical title - one by David Kolb and the other by Silver and Hanson - are also in use. To add further confusion, Renzulli and Smith have also developed and marketed the "Learning Styles Inventory".

In summary, learning styles are a recent innovation in education which are receiving increased attention, but unlike the more restrictive construct of cognitive styles from the field of psychology, available learning style research to date is inconclusive and in some cases inadequate. Furthermore, much of the existing research has not yet been replicated. However, the professional literature contains numerous subjective articles in support of the topic. Available evidence indicates that learning styles vary considerably from individual to individual.

Current learning style models tend to focus upon learners' unique



preferences for processing environmental information. The current literature suggests that incorporation of learning styles into the instructional program promotes individualization and results in improved academic performance.

### Sex Differences

The subject of sex differences in learning styles is as confusing as the preceding topics because "a bewildering inconsistency of empirical findings across studies is the rule rather than the exception" (Kogan, 1976, p.102-103). This confusing situation may result from the wide variety of factors which have been assessed and upon which the conclusions are based or the possibility that biology and/or social learning theory interact differently from one situation to another. To illustrate this confusion, numerous sources (Huteau, 1977; Schwen, 1979; Witkin, 1979; Witkin, Goodenough & Karp, 1972) note that differences between the sexes have consistently been found with very few exceptions, although they are often insignificant. On the other hand, Goldstein and Blackman (1978) report a review of a number of studies which reveals that many found no statistically significant differences in field dependence between male and female students through the college level.

The exceptions noted above (Berry, 1966; MacArthur, 1967) were Eskimos where unusual ecological and social factors are present. These researchers reported no significant sex differences for Eskimos on tests of spatial skill and cognitive style. Witkin & Berry (1975) attribute these results to developmental influences due, in part, to societal and environmental factors. Hier (1979) expanded Witkin &

Berry's explanation of the Eskimo subsistence lifestyle as evidence of a high frequency x-linked gene associated with their superior spatial ability, which in turn resulted in the unusual lack of sex difference.

Witkin (1974) raised the possibility that these group differences in cognitive style may be due to genetic differences since "Adaptive selection is particularly apt to play a role in groups that have lived in the same environment over a very long period, and have remained in relative sexual isolation from other groups" (p. 115). This genetic explanation appears plausible since those Eskimos who possessed these characteristics would more likely survive in the hostile Arctic environment to have children, an example of natural selection. These findings led Witkin to conclude that the "marked field-independence of the Eskimo, and their apparently generally high overall level of psychological differentiation, provide further impressive evidence that so-called 'primitive' groups are not uniformly less developed" (p. 116).

The above-reported studies dealt with cognitive styles, particularly of a cross-cultural nature. Recent research dealing with the more global concept of learning styles contains much less data. No clear difference exists between the modality characteristics (Barbe and Milone, 1981; Barbe and Milone, 1982) or styles (Hruska and Grasha, 1982) of boys and girls.

Price, Dunn and Dunn (1977), in the development of the LSI, however, note some significant differences between male and female students although most are inconsistent from grade to grade. Trends are noted for females in grades 3, 4, 6, and 12 who are more "teacher-

motivated", and grades 4, 5, 6, 11, and 12 where they are more "persistent", while males in grades 4, 5, 7, and 10 are more "unmotivated". These researchers, utilizing analysis of variance to compare male and female students in grades 1 - 12, obtained dozens of significant findings ranging from the .05 to .001 level.

#### The Relationship between Learning Style and Reading Achievement

The failure of many students of at least average ability to adequately benefit from their schooling experience has led Gregorc (1982) to claim that education currently has an inadequate impact on the human learning potential. However, recent learning style models have offered encouragement to educators due to their unique and practical qualities. The enthusiasm for their utilization is illustrated in Keefe's (1979b) recent statement:

Learning style is much more than just another innovation. It is a fundamental new tool with which to work. It is a new way of looking at learning and instruction, a deeper and more profound view of the learner than known previously. It is a basic framework upon which a theory and practice of instruction can be built. It makes obsolete any single framework for teaching all students. All recent innovations, whether staff utilization, modular scheduling, independent study or fundamental education must be rethought in the light of learning style. It is nothing less than revolutionary to base instructional planning on an analysis of each student's traits (p. 131).

Carbo (1983a) reports that comparative research dealing with good and poor readers reveals significant differences between the two groups on various elements of learning style, "particularly perception, motivation, persistence, responsibility, structure, design, time of day and hemispheric preference" (p. 490). She further concludes that "not all students will benefit from the step-by-step,

sequential teaching procedures so prevalent in today's reading programs" (p. 491), and that:

Compared to good readers, poor readers tend to have greater need for quiet, intake, mobility, structure, informal design, interaction with peers and teachers, tactile-kinesthetic stimuli, and learning at a time of day other than early morning (p. 491).

Carbo's findings generally lend support to those of Price, Dunn & Sanders (1981), who used the LSI. Their research revealed that the elements assessing persistence, responsibility, ability to function best in the late morning and preference for an informal design best discriminated between third and sixth graders who were identified as having high and low reading achievement. The better readers preferred studying in a dimly lit, formal environment, required mobility, and were self-motivated, persistent and responsible. They did not prefer learning through their tactile and kinesthetic senses, did not function best in the late morning or require food intake.

Conversely, poor readers preferred a brightly lit, informal environment, were adult-motivated, functioned best in the late morning and preferred learning via their tactile and kinesthetic senses. However, they did not prefer mobility.

Persistence and responsibility, ability to function best in the late morning and preference for an informal design best discriminated between those subjects demonstrating high and low reading achievement.

Price, Dunn & Sanders' findings led them to conclude that:

Selected learning style characteristics can be used as predictors to identify early those students who are likely to become good readers, namely, those who are persistent, responsible self-motivated, and who do not prefer to learn tactually or kinesthetically (1981, p. 224).

Students' self-concepts are highly correlated to desirable learning habits (Griggs and Price, 1981) with junior high students possessing positive self-concepts exhibiting more persistence and responsibility than classmates with low self-concepts. Furthermore, those possessing high self-concepts require less mobility and supervision than their classmates. At the elementary level, another study by Dunn, Price, Dunn & Saunders (1979) reveals that youngsters with high self-concepts prefer quiet, are persistent, are adult motivated, like warmer temperature to study and prefer to learn via multiple means. Since positive self-concepts are associated with achievement, the identification of preferred learning style characteristics may positively affect both self-concept and achievement if appropriate individualized intervention strategies are undertaken.

Logic suggests that individuals learn most rapidly and effectively via their preferred learning style, so that identification and utilization of these individual strengths can and should produce improved scholastic performance.

Experimental investigation involving students of all ages and from many groups indicates that they can accurately identify individual preferred modes of learning, that a proper match enhances achievement and diminishes related school problems. Due to the newness of learning style diagnosis, most of the research cited is recent and not intended to imply that underachievement, especially by minority groups, is of recent origin. This is illustrated by the number of articles on this topic which have appeared in the professional literature since the turn of the century.

Students from the primary through college level demonstrate the ability to correctly identify their learning styles (Dunn, 1983a). This is verified by other research which indicates that performance is significantly better when students are taught through their preferred styles. As early as 1971, Farr confirmed that college students could accurately predict the modality in which they could achieve superior performance and that it is beneficial to be tested and to learn through that modality. Furthermore, when testing and learning occurred through non-preferred modalities, the level of performance diminished.

Cafferty (1980), using high school students, required them and their teachers to identify their educational cognitive styles to determine whether or not the "degree of match" affected achievement. The results reveal that the greater the degree of match between teacher's and student's styles, the higher the obtained grade point average and conversely, the greater the degree of mismatch, the lower the obtained grade point average. The ANOVA results were significant at the .01 alpha level and were confirmed by Douglass (1979), using high school biology students. He reported that when those preferring inductive and deductive materials respectively received preferred materials, achievement improved and conversely when preference and materials were mismatched, achievement suffered.

Urbschat (1977) obtained similar results with first graders by demonstrating that even at this age, perceptual strengths could be accurately identified by students and that a match between preference and treatment produced superior results. However, regardless of the

student's identified perceptual strength, a treatment involving a visual approach achieved significance at the .05 level with students possessing auditory, visual and auditory/visual perceptual strengths. Carbo (1980a), using kindergarten students, demonstrated a significant interactive effect between modality preference and word stimulus method with both immediate and delayed recall. Children taught via their strongest perceptual modalities learned more easily and retained more than when taught through their perceptual weaknesses.

Copenhaver (1979), in related research, demonstrated that high school students' learning styles remain consistent regardless of the subject being studied and that significantly more positive attitudes develop when the students' and teachers' styles are similar. In another study involving high school students (Lynch, 1981), learning style and truancy were explored. His results demonstrated that the single greatest influence on the reduction of truancy among chronic truants was the matching of the students' learning style preference with their English course period schedule and that a significant reduction occurred in the mean number of days of truancy when one element (time of English class or teacher assignment) of the truants' educational environment was changed.

Krimsky (1982) and Pizzo (1981) examined learning styles and environmental factors at the elementary level. Pizzo reported that when students were matched with their need for either sound or quiet preferences, significantly higher reading and attitude scores were obtained at the .01 level and that students who were mismatched, attained significantly poorer achievement. Krimsky compared light

preference and reading performance and obtained significant scores at the .001 level when student preference occurred. These studies support Reckinger's contention (1979) that alternative educational environments must be provided to insure success for students possessing different learning styles (p. 255-256).

Summary of the research findings comparing learning styles and reading achievement reveals several consistent patterns. Students can accurately identify their preferred learning styles. When students are taught through preferred styles, academic performance is significantly better and conversely, when a mismatch occurs, achievement is significantly poorer.

Other findings reveal that good and poor readers possess distinct learning styles. Good readers generally demonstrate more persistence, responsibility, self-motivation, a preference for more noise, dim lighting and formal environment and a disinclination to learn via tactile and kinesthetic modalities. Poor readers, especially at the elementary level, typically prefer the opposite. Related studies indicate that students possessing positive self-concepts are more persistent, responsible and generally more mature than classmates with low self-concepts. Considerable faith can be placed in these findings since most have been replicated and confirmed in later research.

#### Research Related to Learning Style and Native Americans Including Alaskan Natives

The educational plight of Native Americans is well documented (Fuchs and Havighurst, 1972; Selakovich, 1978). Although the seriousness of the problem was known by many, the appearance of the Special



Senate Subcommittee report in 1969, Indian Education: A National Tragedy-A National Challenge, commonly known as the Kennedy Report and the NAACP Legal Defense and Education Fund's, An Even Chance in 1971, resulted in an upsurge of interest and concern. While the central purpose of Indian education has remained consistent from the beginning to the present, namely to educate Indians for participation in American life (Thompson, 1964, p. 300), policies implemented have failed miserably to achieve this goal. Many reasons are offered by officials: historical lack of schools; lack of interest in education on the part of some groups; geographical isolation; and cultural differences (Thompson, 1964, P. 275). To this list, others today add biological and ecological factors (Triandis & Berry, 1980) which cross-cultural studies indicate may affect behavior. Szasz (1974), for instance, charges that "Coursework in these schools was usually unrelated to the environment and culture from which the student came" (p.2).

The outcome of this situation has been a well documented dropout rate far greater than the national average (Bryde, 1970; Chiago, 1981; Ogbu, 1978; Selakovich, 1978) and low academic achievement level (Bryde, 1970; Burgess, 1978; Edington, 1969). The dropout rate for Indian students has consistently been found to be at least double the national average. A number of studies indicate that Indian children enter school at a readiness level comparable to other students, but within several years the "cross-over phenomenon" (Bryde, 1970) is observed, a relative and progressive decline in academic performance with the passage of time when compared to national norms. The consequences of this "institutional ignorance" is an internalized negative

self-image and poor ego-identity (Wilson, 1978), withdrawal, depression and alienation (Bryde, 1970).

Learning theorists claim that students usually learn more, both quantitatively and qualitatively, when the curriculum and instructional strategies are matched to the students' learning styles and developmental levels (Gay, 1978). If this approach were implemented, the current dropout rate might be significantly improved. Twenty five percent of all students nationwide fail to complete graduation requirements, 31 percent of this group being members of racial minorities (Beck and Muia, 1981). Within the American Indian population, the dropout rate is reported to be twice the national average (Chiago, 1981; Selakovich, 1978), which is associated with relatively poor academic achievement. This condition led Chiago (1981, p. 23) to express concern that the outcome has been actual "cultural genocide" in some cases.

Dropout studies of Alaskan Aleut, Eskimo and Indian students are not as numerous as those of other populations, including American Indians. This situation is attributed to a variety of factors unique to Alaska and other arctic regions (Ousterhout, 1979). In re-interpreting earlier research, she concluded that while the Alaskan White population was completing 12 years of education, non-Whites were completing only 8 years (p. 9). In two more recent studies, the Alaska State Board of Education (Polley, Suetopka-Duerre, Ray & Elliott, 1981) found that while Alaskan Native students composed only 7.5 percent of the public school enrollment, they accounted for 22 percent of the dropouts, while the Anchorage School District

(Standardized Test Report: spring, 1982) reported that Native students comprised 4 percent of the population, but 23 percent of the dropouts. Since recent research suggests that children from various cultural-linguistic groups differ in regard to characteristics which have direct relevance for differential selection of instructional designs (Laosa, 1977), it is possible that utilization of the Diagnosing Learning Styles Model could improve achievement and result in decreased dropout rates for Native students.

The urgency to resolve these problems is magnified by the knowledge that between 1960 and 1980, the Indian population increased from 552,000 to well over one million due to a birthrate more than twice the national average (Havighurst, 1981, p. 330).

The situation reported for American Indian students is not unique to this population. Such diverse minority students as Blacks, Hispanics, and Puerto Ricans suffer similar experiences of poor academic performance, early school leaving, negative psychological impact and future unemployment. This had led some investigators to conclude that group differences in learning and cognitive style result from different socialization practices (Berry, 1966; Cohen, 1969) and environmental factors (Berry 1971a; Dawson, 1967). Considerable agreement exists between educators and social scientists that Native children possess superior visual discrimination and visual motor skills (Bland, 1975; Cattey, 1980; Garber, 1968; Gardner, 1980; John, 1972; Kleinfeld, 1971), although it is doubtful that this knowledge has been utilized to assist Native students by modifying existing educational programs. The extent of their visual perception and recall superior-

ity is demonstrated by Bland's (p. 91) findings which were statistically significant at the .0005 level and led him to state that much of the problem occurs due to curriculum demands presented through learning styles which are incompatible with the students' cognitive patterns (p. 87).

Should adequate educational strategies in keeping with Indian children's cognitive strengths and learning style be developed and applied within context of a culturally relevant curriculum, it is reasonable to expect substantial increase in Indian children's achievement levels (p. 89).

Brown (1978) and Gardner (1980) emphasize the importance of identifying and stressing Native students' unique learning styles. Gardner offers the following recommendation:

Recognize that culture-specific learning styles may vary among subgroups and among individuals within a culture. The amount of acculturation or assimilation to the American culture may also cause variations among students from differing ethnic groups. For successful teaching and learning, however, teachers need to be aware of possible strengths and preferences which may be present. All children deserve the opportunity to learn in the manner which they prefer (p. 9).

Common theory regarding the relationship between American Indians and Eskimos suggests that they are distantly related, although of common Mongoloid lineage, with the Eskimos following other groups into the Americas. However, Szathmary & Ossenberg (1978), in a recent study, found no statistical validity to the claim that Eskimos are more closely related to Mongoloids than American Indians. Furthermore, some Eskimos were found to be more closely related to nearby Indian tribes than more easterly Eskimos. These Indians were, in turn, more closely related to Eskimos than other Indians.

According to the 1980 census figures, the 64,000 Alaskan Natives constitute 16 percent of the state's population, while the 8,900 in

Anchorage constitute 5 percent of the largest city's population. Estimating the correct Alaskan Native population of Anchorage, however, is difficult (Ender, 1980) since unofficial estimates (Preview of Alaskan Native News, 1982) range up to 14,000. Such remarkable discrepancies may be explained in part by the concept of "circular migration" (Feldman, 1983), the seasonal migration between Anchorage and rural villages for subsistence activities. In either case the Alaskan Native population in Anchorage entitles it to be known as the largest Native village in Alaska. Ender's study reveals that the urban Native population consists of 15.5 percent Aleuts, 47.5 percent Eskimos and 37 percent Indians (p. 4) and that while the Native population in the state increased by 41 percent during the 1970's, in Anchorage it was 107 percent (p. 10).

Many of the problems experienced by American Indians and other minority groups also affect Alaska Natives, only the environment is different. Within the school setting, these are primarily manifested by poor academic achievement, especially after the primary grades, and a high dropout rate. From grade to grade, Native students' academic performance is inferior to non-Natives, with the gap increasing progressively through the grades (Robert R. Nathan & Associates, 1976, p. 2). The crossover phenomenon (Bryde, 1970) is also evident in Alaska. In many rural districts, the event often occurs before the intermediate grades. Within the Anchorage School District, recent test results indicate that the phenomenon is observed later than in other studies and that Native achievement is relatively high.

The 1982 average scores of Native students were high in the primary years as compared to the National norming group average, essentially equal to the National norm group average

in grades three through eight, and then tailing off through high school (Anchorage School District Standardized Test Report: spring, 1982, p. 39).

The unusually high Native achievement scores in Anchorage may be related to the urban stimulation described in Suess' (1981) study on the influence of acculturation on Eskimo students.

The dropout rate in Anchorage is reported by Ender (1980) to be 40.4 percent in the twelfth grade (p. 35), but it is still much below that of many smaller districts in the state. This problem is serious enough that the Alaska Native Education Association addresses it in their statement of purpose by declaring that:

We, as educators, know that the dropout rate for Natives is generally higher, the achievement lower, and the social dissonance greater for Native students than for non-Native students ... we feel that the educational processes need change.

This concern has been addressed more recently by Dr. Ramona Suetopka-Duerre (1983), an Alaskan Native educator who declared that "Students, parents, Native educators and the community uniformly agree that effective ways of dealing with culturally diverse students should be developed" and that "The responsibility is upon the schools to intervene with new approaches to learning and teaching" (p. 31).

A contradictory position has been taken by Finley (1983), a "White" school principal in the North Slope Inupiat (Eskimo) village of Wainwright, who reports that ninety-two percent of all his students, grades 1-12, performed below the 50th percentile on a widely used, nationally standardized achievement test. Fully one third of the 135 students performed at or below the 10th percentile (p. 580). He reported that the students "are not goal oriented" and that "an incentive to study hard and to excel is simply lacking." Simply put,

"education is, quite obviously, not relevant to them." He concludes that "the Inupiat are the only ones who can solve the problem of low academic achievement in Wainwright" (p. 581).

While the need to address the Native students' achievement level and dropout rate is generally agreed upon by everyone concerned, little has been done to date to answer the basic question of "Why?" For example, the Northwest Regional Educational Laboratory completed the Topic Summary Report: Native American Education (1981), and determined that the literature contained only 37 items "likely to offer useful findings about the response of Native American student populations to various educational practices" and of this number only 26 were "judged to be both relevant and sufficiently well-designed to yield believable and meaningful results" (p. 4). Within this meager research base is included Alaskan Native studies. The dearth of research dealing with this population is reinforced by Mell's (1982) study which reported that "Both a computer and a manual search of the literature produced only four studies that were in any way related to Alaska Native ability patterns" (p. 24), but that several studies involving Canadian Eskimos and Indians had been conducted.

Berry (1966) found significant differences in the cognitive styles of the Eskimos of Baffin Island and the Temne of Sierra Leone, Africa whose socialization practices differed with respect to socialization, ecological and cultural forces which tend to form distinctive patterns of perceptual style. This enhanced visual perceptual ability known as "field independence" was attributed to the Eskimos' endless white environment which places a premium upon investment in the articulation of space. Berry suggested that the complex geometric-spatial

terms of the Eskimo language served to help Eskimo children achieve an articulated concept of space. He discovered that not only did the Eskimos surpass the Temne, but that they were not significantly different from the Scots, who served as a western comparison group, in level of field independence.

Dawson (1977a) explored the theory of field independence-dependence with the Eskimos by comparing cognitive styles with auditory, eye, and hand dominance. His data supported his hypotheses that fixed right dominant Eskimos would be more field-independent and that fixed left dominant subjects would be more field-dependent and possess lower spatial skills. His data confirmed the "predicted relationships between ecology, adaptive socialization and handedness, with the expected higher incidence of left-handers found among the hunters..." (p. 134), thereby supporting the earlier findings of Berry and Witkin.

Weitz (1971), in a study of Canadian Algonkian and Athapaskan (Athabaskan) Indians' cognitive styles, examined the impact of acculturation on this construct. Significant differences were found between the traditional and urban group utilizing the Embedded Figures Test, thereby implicating the effect of acculturation. Sex differences, unlike results obtained by Berry (1966) and MacArthur (1967), were found and attributed to the effect of conflict between "traditional Indian patterns" and "the social and economic demands of Western society" (p. 128) and the different manners by which the sexes dealt with them. The Rod and Frame Test revealed increased field-independence with age.



Her recommendations echo John's (1972) and Kleinfeld's (1974):

Flexible time and spatial structures should allow the child to concentrate without interruption on tasks which interest and challenge him. In the area of teacher-child relationships, effort could be directed to creating a climate of acceptance, patience and non-aggression, of interaction between child and teacher (p. 138).

Kleinfeld (1971) provided further evidence of the Eskimos' unique traits. She determined that on a test of visual memory, "Village Eskimo students scored significantly higher than urban Caucasian students" (p. 134) and that the visual memory scores increased significantly with age. This unusual perceptual skill was attributed to the Eskimos' unique ecology, socialization practices, genetic factors and language(s). This study is of particular interest because the researcher stressed that their superior skills "may have significant educational implications" and the desirability of exploring occupations "where such perceptual skills might enable Eskimos to excel" (p. 137).

Kleinfeld's later research (1973a) dealt with the Eskimo and other Mongolian groups who demonstrated "high figural abilities." She indicated that "different cultures may foster different types of intelligence, that is, particular abilities which are adaptive in coping with the demands of a particular environment" (p. 342), thereby concurring with Berry's earlier conclusions.

In another study the same year Kleinfeld (1973b), while describing the characteristics of Native students, cautioned against overgeneralization and stereotyping. Academic failure is not due to lack of necessary cognitive or academic abilities. Rather, it is due to the lack of a sense of direction and purpose. This conclusion is

supported by Yates' (1982) investigation of Eskimo students which demonstrated "a persistent and significant relationship between self-concept and academic achievement" (p. 59). This researcher further bluntly concluded that "Alaskan Eskimos have been among the worst victims of an elitist approach to education" (p. 62).

The well-developed spatial skills of the Inuit were noted in Taylor and Skanes' (1976a) study. Of particular interest was the finding that "there are no significant differences on tests of verbal-educational ability or inductive reasoning" (p. 4) at the first grade level and as has been witnessed repeatedly with other Eskimos, the "Inuit children are forced to conform to an artificially induced system alien to their culture." Consequently, "they typically are not successful in the school and fall farther behind their white counterparts in the V:ed (verbal educational factor) sphere the longer they remain in school" (p. 6).

Overall, the important finding of this study is that Inuit and white children, when matched for grade placement and environmental circumstances, and after only one year of school show no differences in verbal-educational or inductive reasoning abilities. At this level the Inuit children have developed skills similar to white children in similar circumstances. This fact emphasizes the importance of the environment on the development of abilities. It also points out that at this level Inuit children are equipped as well as a comparable group of white children to be successful in school. It is up to the school system, in consultation with native groups, to adopt materials and methodology, the subject and media of instruction ... that results in an increase in V:ed and inductive reasoning abilities in Inuit children and avoid the conflicts that presently exist (p. 7).

The cognitive styles of Inuit, Indian, Metis and non-Native adolescents and adults were investigated by Koenig (1981). Through content analysis of their tape-recorded responses, it was found that

cultural background was the most significant discriminator. The Inuits, along with the other Native groups tended to think in "relational styles." However, when the three Native groups were combined, they identified with the moral-relational cognitive style (people-oriented, subjective, holistic, concerned with morals and ethics). The Inuits, however, along with the Indians were discovered to be more analytical (objective, linear, field-independent) than the Metis, but less than the non-Natives.

In this study, significant differences were noted in the cognitive styles preferred by respondents of the different cultural, age, educational, language, and sex groups. The best discriminator in relation to cognitive style differences was found to be cultural background. As with the previous study, this researcher suggested that a closer match between Native student learning styles and instructor teaching techniques be achieved.

The emotional or affective learning style element of Eskimo students was examined by Kleinfeld (1974) who compared the impact of nonverbally warm versus a nonverbally neutral impersonal teaching style. The findings suggest that "instructors who behave in a nonverbally warm style may increase the learning and verbalness of both the Eskimo and White students" (p. 3).

Two similar studies, Barnett's (1973) in Canada and Hikel's (1977) in Alaska, reveal the institutional ignorance which prevails in the education of Eskimos. In Cambridge Bay, Barnett noted that "with the exception of the school, the majority of children responded favorably to the major institutions in the village" (p. 53). Hikel,

in a similar vein in assessing the benefits to the Natives of the educational system observed that "Institutional behavior is an acquired habit that has little significance for these people" (p. 403) and that "Present policy makers seem to desire a carbon copy of the standard white middle-class curriculum, rather than taking into account Native heritage and culture" (p. 404). He critically concluded that "the Eskimos should be saved from their saviors" (p. 404).

A unique study (Collier, 1979) used motion pictures to assess interactions, specifically the patterns of pace and flow, between Eskimo children and both Native and non-Native teachers. Analysis of the films revealed that the pace of Native children and adults was slow, relative to the Anglos, and characterized by "soft and rounded" movements (P. 42). Along with more variability, the Anglo teachers' pace "was fast to moderate and movements were linear and often abrupt" (p. 42). While Anglos were observed to speed their pace in stressful situations, Eskimos were observed to slow down. Eskimo teachers also tended to utilize more time for activities and have more gradual transition between them. These differences result in impaired interactions between the Anglo teachers and Native students.

Differences in pace and low levels of flow result in isolation of individuals, while shared pace and high levels of flow create "unity" of the group (p. 45).

In general, the Native pattern was one of slowly paced activities and movements, carried on with a great deal of interpersonal awareness and adjustments. This interplay of movements created a sensation of unity of people and purpose, a current moving slowly but steadily toward some distant destination. Most of the Anglo teachers, with their quick pace and abrupt, impersonal style, cut across this current and left the students stranded in the classrooms like so many

pieces of driftwood on the shore waiting for different waves and tides to take each person away (p. 47).

This empirical analysis reveals the importance of non-verbal communication with Natives and "suggests that the discrepancy between Anglo teachers and Native children in pace and movement styles, with concurrent absences of flow, served to destroy the communication processes in the classrooms" (p. 49). The resultant conflict of styles may have a profound, negative impact on the learning process.

In a related investigation (Harrison, 1982) in the same region of western Alaska, an ethnographic approach was utilized to determine how Eskimo children learned outside the school setting. The results revealed a single preferred sequence of processes by the Native learners.

The preferred Yup'ik sequences was a complex of components beginning with the attention of the learner, the learner's observation of a model in an emotionally supportive context, the learner's attempt at the task, verbal instruction from an adult, and emotional reinforcement either in the form of a pleased response from an adult or in the form of personal satisfaction for the learner and, often, in both forms. Deliberate verbal instruction was important in transmitting certain kinds of information, and language was an important component in the whole (p. 167).

In a study designed to determine whether cultural differences reported on convergent tasks existed on divergent tasks related to verbal, spatial and numerical skills, Mell (1982) studied a group of Anchorage, Alaska Native, Black and White seventh grade students. While significant ethnic differences at the .001 level were found on the convergent measures, the Cognitive Abilities Test and the Iowa Test of Basic Skills, no significant difference in performance of Alaskan Native and White students on divergent measures was found.

Furthermore, the variance in performance within each group by both gender and ethnicity was as great as between them, which is contrary to the earlier findings of Berry (1966) and MacArthur (1967).

In summary, the educational plight of American Natives is well documented in the literature (Bryde, 1970; Chiago, 1981; Fuchs and Havighurst, 1972; Selakovich, 1978) and typified by poor academic performance and exceedingly high dropout rates. Numerous reasons have been offered in explanation of this outcome such as cultural differences, disinterest, geographic isolation and historic lack of schools (Thompson, 1964). However, virtually no examples are reported where the identified institutional ignorance has been addressed within the educational setting, e.g. curricular design recognizing Natives' cultural differences, heritage, and demonstrated visual modality strengths. Although the literature (Barnett, 1973; Bland, 1975; Collier, 1979; Gardner, 1981; Gay, 1978; Hikel, 1977; Kleinfeld, 1971 and 1973b; Taylor and Skanes, 1976a; Weitz, 1971; and Yates, 1982) contains numerous recommendations for rectifying this widely recognized problem, a total absence of articles reporting on the outcomes of such change is noted.

Most of the related research reported in the literature is from the field of cross-cultural psychology where Canadian and Alaskan Natives' cognitive styles and visual function were assessed. Related research consistently reports that the crossover phenomenon (Bryde, 1970) occurs for most Native subjects by the intermediate grades. However, this situation is delayed until high school within the Anchorage School District, a possible consequence of acculturation.

### Demonstrated Need for Further Research

The urgent need for additional research on the general topic of learning styles and their relationship to American Natives, particularly Alaskan Natives, is illustrated by the following recommendations and quotations. Hopefully, research in the near future will address these questions and provide new insights to better identify their individual differences and preferred learning styles and thereby enhance their academic performance and self-concept, while decreasing their unnecessarily high dropout rate.

Lidz (1981) mentions that "Much research is required to determine the critical response tendencies for specified situations, to discern their origin, and to devise methods to modify inadequate response tendencies" (p. 169). Kirby (1979), meanwhile, maintains that "Another important need...is research on the kinds of training that are more successful with the various cognitive and learning styles" (p. 43) and more specifically that "More cross-cultural research is needed in regard to cognitive style" (p. 42). Schmeck (1982) insists that:

We need more research that would provide an opportunity to observe interactions between instructional treatments and learning styles. We need to determine which instructional treatments counteract the negative influences of certain styles and take advantage of the strengths of other styles (p. 79).

When the focus is directed toward American Natives, Thompson, in 1964, declares that "There is a tremendous lack of working data about almost every Indian tribe today and there is a tremendous need for research about Indians" (p. 82). To cope with the dropout problem, she asks "What might be undertaken, both immediate and long-range,

toward improvement in attracting out-of-school Indian youths to attend school?" (p. 86) More specifically, Bland (1975) stipulates that:

Research is needed to define and describe effective and affective instructional strategies and learning experiences for Indian children in response to any reasonably strong results of research indicating their cognitive strengths are not being utilized in the schools (p. 93).

Noley (1981), in declaring that a new research approach is needed, states that:

This demand includes the need to develop a better cultural understanding by all teachers and more appropriate material for the use of all pupils in the day-to-day work of school ... research also should help us avoid the replication of unsuccessful educational programs and suggest approaches which could lead not only to 'innovations' but to genuine success (p. 14).

The Northwest Regional Educational Laboratory (1981) in a recent study on Native American education stipulated that "Additional research should be conducted on effective teaching and learning methods for Native Americans" (p. 12) and that:

Since these findings, conclusions, and recommendations are based on relatively small numbers of studies, it is recommended that additional, carefully designed and sharply focused studies be undertaken (p. 12).

In focusing on the problems confronted by Alaskan Natives, a study at the time of statehood (Ray, 1959) concluded that "Future research studies are badly needed in the field of Native education" (p. 261-262) and that "More detailed research relating to curriculum objectives, instructional methods, and material suitable for Native schools must be conducted" (p. 262). Due to the Native dropout problems, follow-up studies were recommended because "no curriculum can be considered satisfactory until the effect it has had upon the pupils for whom it was designed is determined" (p. 263). Barnett (1973), in



a similar vein after teaching Canadian Eskimo children, indicated that "There is a need for all teachers to conduct action/classroom research to increase understanding of their students" which "becomes particularly important when working with children whose cultural values and beliefs may differ from those of the teacher" (p. 57).

In a study dealing with Alaskan Natives and higher education, Jacquot (1974) concluded that "A host of studies are needed in all areas that touch on education on Alaska Natives" and that "In each case...the investigator must conduct wholly new, empirically-based studies" because "like others, Natives change over time" (p. 203-204).

Clyne & Clyne (1982), in an article written at the request of the Alaska Department of Education, noted that "Alaska Native students may indeed process information differently than Caucasian students" and that "Substantial data is needed for development of instructional strategies, materials and processes which are conducive to maximizing the learning potential of Alaska Native students" (p. 23).

Yates (1982), in research examining the relationship between academic enrichment programs and self-concept of Alaskan Eskimo students, concluded that:

The relationship evidence shows a persistent and significant relationship between self-concept and academic performance. If we accept this research it seems clear that if the goal of academic achievement is to be met, the self-concept must be improved (p. 59).

Within the Anchorage School District, the long-standing concern regarding the Native students' high dropout rate was directed to the Anchorage School District superintendent on June 20, 1980 by The Anchorage Native Caucus and The Native Education Coalition in the form

of a position paper entitled Native Educational Concerns. The groups specified that:

We want the Anchorage School District to conduct a survey over at least two years to ascertain why sixty-six percent of Alaska Natives in Anchorage schools do not graduate. In addition, we want the District to identify the factors which contribute to the successful graduation of other Native students.

Several months later, on October 22, 1980, the same two organizations addressed correspondence to the superintendent stating that "We also request that the Anchorage School District (ASD) develop research data on the dropout problem..." and stipulated the manner in which it should be done. In response, the District conducted the requested research and on March 8, 1982 issued the report, Alaskan Native Early School Leavers: A Study With Recommendations. Included within the ten possible areas targeted for further research were the following:

- #6. Learning styles of culturally different youth, and
- #2. Characteristics of potential dropouts.

It is apparent from the most recent Group Test Report: Spring 1983 that significant improvement has been made by the Anchorage School District in meeting not only the needs of its Native students, but those of other minorities as well. However, as the letter (Appendix A) dated March 25, 1983 over the signature of Mr. Franklin L. Berry, President of the Alaska Native Foundation indicates, more must be done to improve the quality of instruction for Alaskan Native students.

Based upon this well documented and long-standing need to better understand and serve Alaskan Native students, the present study has been approved and conducted.

### CHAPTER III

#### METHODOLOGY OF THE STUDY

The primary goal of this study is the identification of intermediate grade Alaskan Native students' learning style preferences, the statistical comparison of their preferences with their classmates from the dominant culture, and determination if the Native subjects demonstrate sex differences on this construct. Furthermore, the relationship between both ethnic groups' preferred learning style and reading achievement is explored.

This chapter deals with four topics related to the design of the investigation: (1) Subjects; (2) Design; (3) Materials; and (4) Procedures.

#### Subjects

The accessible population for this study consisted of the fourth, fifth and sixth grade Alaskan Native and White (Anglo) students enrolled in the Anchorage School District during the 1982-83 school year. The official 1980 U.S. census figure for the Municipality of Anchorage was 174,431, but as of July 1, 1981 the Department of Labor counted 180,740 residents (the Alaska Almanac, 1982, P. 137), with this figure increasing even more dramatically since then to 230,000 ("Population of Anchorage," 1983). The current Anchorage school enrollment, K-12, exceeds 38,000 students of whom more than 21,000

attend elementary school. Of this population, 79.5% are White, while 6.2% (more than 1300 students) are identified as Alaskan Natives.

The Alaskan Natives are actually a diverse population consisting of three ethnic and linguistic stocks - Indians, Aleuts and Eskimos (Ray, 1979) the prior composed of numerous tribes traditionally inhabiting portions of the interior and panhandle of Alaska. The Aleuts have historically inhabited the string of Aleutian Islands extending from the Alaska Peninsula, while Eskimos have primarily occupied the low-lying and coastal regions of western and northern Alaska. Alaskan Natives, similar to many minority groups throughout the nation, constitute a disproportionate percentage of the economically disadvantaged. "This group makes up approximately 17 percent of the population but represents 33 percent of the economically disadvantaged" (Alaska Department of Labor, 1981, p. 50).

Within the Anchorage school system, Alaskan Natives constitute the second largest minority being slightly outnumbered by a fraction of one percent by Blacks (Anchorage School District, 1982, p. 38-39). Furthermore, they are highly disproportionately represented in fewer than a dozen elementary schools which are generally clustered in the older neighborhoods of the city. For the purposes of the study, Alaskan Natives will meet the criteria delineated under Definitions.

The sampled schools located in some of the older sections of the community included Denali, Fairview, Government Hill, Mountain View, North Star, Williwaw and Wonder Park and involved all students present, except those enrolled in self-contained special education classrooms. Table 1 further describes these schools and their Alaskan

Native students who represent 32% of the district's Native population in grades 4-6.

Table 1.

Accessible Schools and Their  
Alaskan Native Representation

School	Total Membership		Alaskan Native (Percentage)	Native Population	
	K-6	4-6		K-6	4-6
Denali	230	87	34.2	79	33
Fairview	362	136	15.0	54	23
Government Hill	311	118	16.2	50	21
Mountain View	630	233	19.9	125	54
North Star	396	150	11.5	46	20
Williwaw	329	141	12.6	41	18
Wonder Park	304	115	10.0	30	13
Totals	2562	980	16.6	425	182

Table 2 indicates the Alaskan Native and White membership in the seven participating schools at the time of the study and the number and percentage of each group who were included in the study.

Table 2.

## Student Composition of the Study

Group	<u>Grade 4-6 Sample School Enrollment</u>	<u>No. Participating in Study</u>	<u>Percent- age</u>
Ak Native	182	141	77.5
White	506	478	94.5
Total	688	619	90.0

Four of the seven sampled schools (Denali, Fairview, Government Hill and Mountain View) receive Chapter I (formerly Title I) funds. Within these four elementary schools 83, 62, 60 and 44 percent of the students, respectively, receive free or reduced lunches. All seven schools receive Indian Education funds. Denali, Fairview and Mountain View have been assigned full-time Indian Education tutors and half-time counselors, while North Star and Wonder Park have a full-time tutor. Government Hill and Williwaw have a .6 FTE resource teacher. In addition, all the sampled schools, except Government Hill, benefit from the Anchorage School District's Multicultural Education Support Program and four (Fairview, Government Hill, Mountain View and North Star) possess a Multicultural Education tutor.

### Design

Due to the absence of previous, related research on Alaskan Native students, the study using a between-subjects design is exploratory in nature and contains descriptive, correlational and cross-cultural research elements. It focuses upon the Alaskan Native students' preferred learning styles, compares them with their White classmates and reveals the relationship between both groups' preferences and reading achievement.

<u>Independent Variables</u>	<u>Dependent Variables</u>
Group (Native and White)	LSI element scores
Sex (male and female)	ITBS reading score

Selected programs from the Statistical Package for the Social Sciences (SPSS) were utilized for data analysis. For purposes of statistical analysis, the variables were treated as interval data (Kerlinger, 1973, pp. 440-441). The data were analyzed by analysis of variance (ANOVA) and product-moment correlations using the .05 alpha level to determine statistical significance for the groups being compared.

As with many studies in the educational setting, random selection of subjects could not be done due to the potential disruption to the instructional program. Instead, all subjects were selected from seven elementary schools containing a high percentage of minorities that comprise approximately 11% of the Anchorage School District's enrollment in grades 4-6. In excess of 30% of the district's Alaskan Native and 7% of the White students are enrolled in these schools.

The study sample included 141 Alaskan Native and 478 White subjects which consisted of all those students in grades 4-6 who were in attendance from the general program on the day that assessment occurred.

Since random sampling procedures could not be used, the study incorporated a practice recommended by Ferguson (1981), the investigation of selected sample characteristics such as age, sex and IQ to demonstrate that the sample does not differ appreciably in these characteristics from the total population (p. 145). Data available to the researcher for this purpose included sex, attendance records, absenteeism rates, Cognitive Abilities Test (CogAT) scores, Iowa Tests of Basic Skills (ITBS) scores and data from the Alaska Statewide Achievement Test. These data reveal the comparability to the accessible and target populations on these factors and determine the generalizability of the findings to these populations.

Table 3 provides a breakdown of the 1982-83 sex ratios for students attending the sample schools, other elementary schools and the entire district.

Table 3.  
Sex Ratios for Anchorage Elementary Students

Schools	Alaskan Natives		Whites		Alaskan Natives		Whites	
	Male	Female	Male	Female	Male	Female	Male	Female
	N	%	N	%	N	%	N	%
Sample	90	53.3	79	46.7	259	51.2	247	48.8
Others	189	49.1	196	50.9	3465	51.6	3245	48.4
Total	279	50.4	275	49.6	3724	51.6	3492	48.4



The official end of school year attendance summary reveals that, at the elementary level, district-wide attendance was 94.6%, while the sample schools recorded 93.4%.

During the spring of 1983, fifteen elementary schools were selected as a representative sample of the district and included in an unpublished study of the distribution of absences. Four of the fifteen schools (Denali, Fairview, Mountain View and Wonder Park) were included in this study.

The mean number of days absent for these four schools was 12.8 and 10.4 for the other eleven schools. The derived standard deviation for the entire sample was 9.8. While existing data from the study is incomplete, a comparison of the four sample schools had fewer students with zero to 19 absences than did the 11 other schools. Conversely, the percentages are higher for the sample schools in the three columns depicting 20 or more absences. The percentages of students from the four schools are double those for the study totals in the two columns depicting 30-39 and 40+ absences.

Each spring, the Anchorage School District administers the Cognitive Abilities Test (CogAT) to all third and sixth grades. Table 4 compares the three scores (verbal, quantitative and nonverbal) for Native and White students attending the sixth grade from both the sample schools and the entire district. While all scores are within the average range (stanine 5 & 6), several trends are suggested. White students in both categories obtained slightly higher scores than did their Native classmates and scores for both groups were slightly lower from the seven sample schools than the district at large. Also,

Native students performed relatively better in nonverbal reasoning ability and poorest in verbal ability.

The CogAT profile for the sample Native students is similar to, but higher than for many Natives in rural Alaska. For example, two years earlier sixth grade Eskimo students in one rural district performed relatively poorer on the verbal subtest when administered the CogAT. Their mean verbal standard score was 85 (17% and stanine 3), mean quantitative score of 89 (25% and stanine 4) and nonverbal score of 96 (40% and stanine 5) utilizing national norms.

Table 4.

Grade 6 Cognitive Abilities Test Performance,  
Spring, 1983

Group	N	Verbal		Qualitative		Nonverbal	
		Std.	Sc. PR	Std.	Sc. PR	Std.	Sc. PR
Native Sample	41	97	43%	102	55%	103	57%
Native District	191	101	52%	103	57%	104	60%
White Sample	158	107	67%	108	69%	109	71%
White District	2600	110	73%	110	73%	110	73%

Table 5 provides a similar comparison of the spring, 1983 Iowa Tests of Basic Skills (ITBS) reading composite score. In comparing the Native and White students from both the sample schools and the school district, about one year's discrepancy is noted with White students demonstrating superior achievement. Comparison of reading

performance for both Native and White students from the sample schools with the entire district reveals almost identical achievement levels. This conclusion is based upon the fact that a similar number (198, 203, and 217) of students were enrolled in grades 4, 5 and 6 from the seven sample schools but whose scores were not broken down by grade level.

The district data in Table 5 tend to support the crossover phenomenon described by Bryde (1970) in Chapter II with the achievement lag by Natives increasing from 8 months in grade four to 9 in the fifth and 10 in the sixth.

Table 5.

Comparison of Native and White  
Reading Achievement

Group	<u>Grade Equivalent</u>		<u>Discrepancy (Mo's)</u>
	Native	White	
Sample (Gr. 4, 5, 6)	5-6	6-5	9
District			
Gr. 4	4-8	5-6	8
5	5-7	6-6	9
6	6-7	7-7	10

In March, 1983, the Alaska Department of Education conducted its biennial assessment of all fourth and eighth grade students. The 306 fourth graders from the seven sample schools obtained a Total Math

score of 68% and Total Reading score of 63% compared with districtwide performance of 75 and 70%, respectively. Although this testing program currently lacks defined expectations or standards, the sample students' math performance more closely paralleled that of students from rural or small districts who scored at the 65th and 70th percentiles, respectively. In reading, the sample students' performance most closely approximated students from small districts (enrollment below 1,200) whose score was 64%.

The aforementioned data reveal various commonalities between the sampled students of both Native and White ethnic backgrounds and similar students from throughout the Anchorage School District. Only the results of the absenteeism study and the Alaska Statewide Achievement Test indicate differences between the sample students and others from throughout the district. These data suggest greater commonality with village Native students.

### Materials

The Learning Style Inventory (Dunn, Dunn & Price, 1981a) was selected for the study and administered in a classroom setting utilizing the oral format (Dunn, Dunn & Price, 1981, p. 3) to insure completion within a single class period as specified by the Anchorage School District to insure minimal classroom disruption. Administration was conducted by the regular classroom teachers, after orientation by the researcher, with him present for consultation and following existing school district policy regarding student testing and research projects. Directions, dissemination of materials and

administration required approximately 40-50 minutes for each of the forty-three classes.

Name of Instrument:

Learning Style Inventory (LSI)

Authors:

Rita Dunn, Kenneth Dunn and Gary Price

Purpose of the Instrument:

The LSI was designed for use in individualized instruction by identifying the environmental, emotional, sociological and physical preferences a student has for learning. It assesses process, not cognitive content.

Subscales:

Scores are presently provided for the 23 following subscales.

<u>Subscale</u>	<u>LSI Area</u>
1.	Noise level
2.	Light
3.	Temperature
4.	Design
5.	Motivated
6.	Persistent
7.	Responsible
8.	Structure
9.	Learning Alone
10.	Peer Oriented
11.	Authority Figures Present
12.	Learn in Several Ways
13.	Auditory
14.	Visual
15.	Tactile
16.	Kinesthetic
17.	Requires Intake
18.	Evening-Morning
19.	Late Morning
20.	Afternoon
21.	Needs Mobility
22.	Adult Motivated
23.	Teacher Motivated

Response Form:

"Yes" or "No" on NCS Trans-Optic computer answer sheets.

Scoring:

Machine, by Price Systems, Inc.

Reliability:

Dunn, Dunn & Price (1981a) in the LSI Manual, report that fifty-six percent of the reliabilities on 4669 students in grades 3-12 equalled or exceeded .60. The areas with the highest reliabilities were reported to be: sound, light, temperature, responsible, structure, prefers learning alone, peer oriented learner, prefers learning with adults, tactile preferences, requires intake, prefers learning in morning and afternoon and needs mobility. Areas with reliability coefficients below .60 included: design, motivated/unmotivated, adult motivated, teacher motivated, persistent, learning in several ways, auditory preferences, visual preferences, kinesthetic preferences, late morning and evening (p. 15-16).

In an earlier study (Price, Dunn & Dunn, 1976, 1977) point-biserial correlations were computed on 1836 students in grades 1 through 12. Of the 48 computed reliability analyses, 33% exceeded .70, 25% were between .50 and .69, 23% were between .30 and .49, and 19% were less than .29. Each sub-scale contained seven or fewer items.

Dunn, Dunn & Price (1981a) report findings from 207 subjects who were assessed and re-assessed 8 months later. Eighty percent of the variables were significant at the .05 level or better with a total of 56 percent significant at the .01 level on test-retest reliability (p. 16).

### Validity:

The LSI was developed subsequent to factor analysis of individual learning styles. The original factor analysis (Price, Dunn & Dunn, 1976, 1977) was conducted upon 1000 students in grades 1 through 12 and was based upon their responses to 100 LSI items. It was determined that 32 factors had eigen-values greater than 1.00 and accounted for .615 of the total variance. Factor 1, encompassing 25 items and explaining .06 of the total variance, was identified as a basic structure related to distractors. Factor 2, containing 19 items, accounted for .05 of the variance and described 'ideal' youngsters. Factor 3, which included 16 items, accounted for .04 of the variance and identified how students achieve in the educational environment.

This research resulted in revision of the LSI including the combination of some sub-scales and deletion of some factors.

At the same time, these researchers also conducted a one-way analysis of variance (ANOVA) for male and female students to determine if there was a significance difference among grades 1 to 12 (p. 12-15 & 29).

For the 48 one-way analyses calculated, 60% (29) were significant at the .01 alpha level and 40% (19) at the .0001 level. The analyses indicate that learning style preference varies across grades for both males and females. Twenty of the 24 analyses were significant for females (.05 alpha level), while 15 of the 24 analyses for males were significant.

When significant results were obtained, the scores were converted to a standard score scale (mean of 50 and standard deviation of 10)

and the Scheffe post hoc procedures were used to determine between which grades the significances occurred.

In general for males, the lower the grade the greater was the preference to learn in a quieter environment and the more they were teacher-motivated. Lower grade males preferred learning with adults significantly more than males in higher grades and the lower the grade, the more they expressed a preference to learn in the late morning. In general, the higher the grade the less males preferred learning via tactile and kinesthetic modalities.

Female students were significantly less persistent in grade 1 than those in grades 2 through 12 and preferred learning with adults less and less as they progressed from grade 1 through 12. Those at the high school level (grades 9-12) expressed a greater preference to learn through the auditory modality than younger females and conversely, the higher the grade the less they preferred learning through their tactile and kinesthetic senses. Girls at the primary level preferred to study in the late morning, but change as they move through the higher grades.

This research concluded that "the most important implication is that individuals are different from each other and instruction should be designed to meet the individual's learning preferences" (p. 15).

Price, Dunn & Dunn (1976, 1977), utilizing discriminate analysis, determined that eleven LSI variables significantly discriminated between subjects who were identified as high and low reading achievers. Students with high reading achievement preferred low light, formal design, were self-motivated, not adult-motivated, persistent, respon-



sible, did not prefer to use tactile and kinesthetic modalities, did not prefer food intake, did not function best in the late morning, and needed mobility. Those with low reading achievement expressed the exact opposite preferences.

Overall, they noted that various student preferences relate to reading achievement.

Individuals achieving in reading were generally persistent, responsible, self-motivated, desired a formal design and did not like bright light; whereas low achievers in reading were not self-motivated, but were adult-motivated, wished to learn using tactile and kinesthetic senses, wanted food present while studying, liked an informal design and bright lights (p. 19).

Similar relationships were found between learning style preference and math achievement. Good predictive validity for learning styles is indicated by their concluding statement:

The research on this sample predicts that by knowing how a person prefers to learn in certain areas, one could predict correctly eight out of ten students who would do well in reading and math and seven out of ten students who would have difficulty with math and reading (p. 20).

Further research has demonstrated that (1) students can identify their own learning styles, (2) when exposed to a teaching style consonant with the ways they believe they learn, students score higher on tests and factual knowledge, have better attitudes, and are more efficient than those taught in a manner that is dissonant with their learning style, and (3) it is advantageous to teach and test students in their preferred modalities (Dunn, Dunn & Price, 1981a & b).

More recently, Kirby (1979), has stated that "Price, Dunn & Dunn... have established impressive reliability and face and construct validity" (p. 72).

This team of researchers takes the approach of informing students as well as instructors of the range of learning differences so they can take advantage of options in individualized instruction. It is a very complete 'school of learning style' in its concern for building up a body of research primarily on younger learners (up to grade 12 reading and interest level)....(Kirby, 1979, p. 72).

The Iowa Tests of Basic Skills (ITBS) is a reliable and well validated group-administered academic achievement test for elementary and junior high students which have been adopted and used by the Anchorage School District for a number of years. It provides multiple scores in the subject areas of vocabulary, reading and language arts skills, study methods and mathematics.

The ITBS Manual for School Administrators (1982) reports that the ITBS was most recently standardized in 1977 using three random stratifying variables: district enrollment, geographic region, and community socio-economic status. More than 43,000 students per grade at the intermediate level were included in the stratified, random standardization samples. Racial-ethnic representation of the standardization samples closely approximated the national racial-ethnic composition. Substantial relationships between basic skills performance and latter measures of academic success have been reported. Predictive validity, with correlation coefficients exceeding .80 between 6th and 12th grade achievement and between 6th grade achievement and American College Test composite scores is adequate.

The ITBS demonstrates good reliability. The K-R 20 and split halves (odd-even) reliability coefficients for the standardization samples were .912 and .917, respectively, for readings.

The Cognitive Abilities Test (CogAT), published by Riverside Pub-

lishing Company, which also publishes the ITBS, is a group-administered measure of cognitive ability possessing three subtests - verbal, quantitative and nonverbal. The battery is a revision and expansion of the earlier and highly successful Lorge-Thorndike Intelligence Test.

Since the ITBS and CogAT were standardized on the identical samples, the standardization data for the CogAT are identical to those reported for the ITBS.

The Cognitive Abilities Test Technical Manual (1982) reports the following K-R 20 reliability estimates for grades 4, 5 and 6:

<u>Grade</u>	<u>CogAT Subtests</u>		
	<u>Verbal</u>	<u>Quantitative</u>	<u>NonVerbal</u>
4	.954	.928	.938
5	.946	.918	.934
6	.945	.915	.930

Criterion-related validity for the CogAT at the intermediate level is demonstrated by the following correlations between the CogAT and reading performance as measured by the ITBS:

<u>Grade</u>	<u>CogAT Subtests</u>		
	<u>Verbal</u>	<u>Quantitative</u>	<u>Nonverbal</u>
4	.77	.67	.63
5	.81	.69	.65
6	.83	.70	.65

The following correlations demonstrate the relationship between IQ scores from the Stanford-Binet Intelligence Test and the CogAT for 197 students between the ages of 9 and 11:

	<u>CogAT Subtests</u>		
	<u>Verbal</u>	<u>Quantitative</u>	<u>Nonverbal</u>
Stanford Binet	.72	.65	.60

### Procedures

Approval to conduct this research was secured in writing from the Anchorage School District on April 14, 1983 (Appendix B) after complying with the requirements set forth in the Outline of Procedures to Conduct Research Studies in the Anchorage School District and meeting individually with each of the principals from the sample schools. Provisions for administration of the LSI were coordinated through the offices of Mr. Bob Christal, Director of Elementary Education, Dr. Linda Black, Director of Educational Support Programs, and Dr. Fred Stofflet, Director of Assessment and Evaluation with the Anchorage School District.

Administration of the LSI occurred in 43 of 44 classrooms of fourth, fifth and sixth graders in the seven sample schools between May 3 and 13, 1983. Administration was conducted by the classroom teacher during a 50 minute instructional period after orientation to the study and instrument by the researcher. Prior to administration, all participating students had the research project briefly described

and were informed that their results would be available to them during the 1983-84 school year.

In early June, the LSI answer sheets were forwarded to Price Systems, Inc. for computer scoring and recording on a magnetic computer tape. In the meantime, Drs. Fred Stofflet and Ray Fenton from the district's Assessment and Evaluation Department began providing school and classroom printouts of the sample schools for the April, 1983 administration of the Iowa Tests of Basic Skills (ITBS) for grades 4, 5 and 6 and the Cognitive Abilities Test (CogAT) for grade 6.

Through the use of each student's seven digit identification number, the data received from Price Systems and the Anchorage School District were then merged onto a magnetic tape preparatory to analysis.

Data analysis was done via the Control Data Corporation CYBER 170/720 computer located on the Oregon State University campus and utilizing the Statistical Package for the Social Sciences (SPSS).  $H_1$  and  $H_2$  were tested through the use of analysis of variance (ANOVA) and  $H_3$  and  $H_4$  through the use of Pearson product-moment correlation coefficients.

## CHAPTER IV

### PRESENTATION AND ANALYSIS OF THE DATA

This study was undertaken to determine the learning style preferences of Alaskan Native students, to compare them with White classmates and to ascertain whether or not sex differences exist for Native students. In addition, the relationship between each racial-ethnic group's learning style preferences and reading achievement was examined.

The following organization will be used in this chapter to present the research findings: (1) descriptive analysis of the subjects; (2) discussion of the major hypotheses; and (3) discussion of the minor hypotheses.

#### Descriptive Analysis of the Subjects

Contingency table (crosstabulation) analyses utilizing SPSS procedures were computed to describe the 619 subjects on the variables of ethnic group, sex, grade placement and age. None of the results attained the .05 level of significance, indicating statistical independence.

Table 6 describes the 141 Alaskan Native subjects of whom 74 were male and 67 female. The 478 White subjects included 238 males and 240 females.

Table 6.

## Crosstabulation of Ethnic Group by Sex

ETHNIC GROUP	COUNT Row Pct Col Pct Tot Pct	SEX		ROW TOTAL
		Male	Female	
Alaskan Native	74.0	67.0	141.0	
	52.5	47.5	22.8	
	23.7	21.8		
	12.0	10.8		
White	238.0	240.0	478.0	
	49.8	50.2	77.2	
	76.3	78.2		
	38.4	38.8		
Column Total	312.0	307.0	619.0	
	50.4	49.6	100.0	

Table 7 exhibits grade placement similarities for the Alaskan Native and White students in grades 4, 5, and 6. The Native students consisted of 43 fourth graders (30.5%), 52 fifth graders (36.9%), 45 sixth graders (31.9%) and 1 whose grade was unknown (0.7%). The White sample was composed of 155 fourth graders (32.4%), 151 fifth graders (31.6%) and 172 sixth graders (36.0%).

The mean ages were ten years nine and one half months for the 141 Native students and ten years eight months for the 477 White students. Table 8 provides an age breakdown by ethnic group. Nine year old Natives are slightly underrepresented, but analysis indicates comparability on this variable. These data suggest that the retention

rates and ages at which Native students enter school in this district are similar to their White classmates.

Table 7.

## Crosstabulation of Ethnic Group by Grade

ETHNIC GROUP	COUNT	GRADE			ROW TOTAL
	Row PCT Col PCT	4	5	6	Unknown
Alaskan Native	43.0	52.0	45.0	1.0	141.0
	30.5	36.9	31.9	.7	22.8
	21.7	25.6	20.7	100.0	
White	155.0	151.0	172.0	0	478.0
	32.4	31.6	36.0	0	77.2
	78.3	74.4	79.3	0	
Column Total	198.0	203.0	217.0	1	619.0
	32.0	32.8	35.1	.2	100.0

School district records and queries directed to the Indian Education tutors allowed 21 of the Native students to be identified as Aleut, 63 as Eskimo and 38 as Indian. Additionally, 4 were identified as a combination due to intermarriage, e.g. Eskimo and Indian, while the remaining 15 could not be definitively classified. Table 9 presents the numerical and percentage breakdown for the Native subgroups.

Results of the Spring, 1983 administration of the Cognitive Abilities Test to all sixth graders were utilized to demonstrate that



the abilities of both Alaskan Native and White samples were average. Table 10 presents the means, standard deviations, range of scores and percentile ranks based upon national norms.

Table 8.

## Crosstabulation of Ethnic Group by Age

	COUNT		Ethnic Group		RAW TOTAL	
	Row PCT	Col PCT	Alaskan Native	White		
<u>AGE</u>	9.		7.0	52.0	59.0	
				11.9	88.1	9.5
				5.0	10.9	
				1.1	8.4	
10.			43.0	141.0	184.0	
				23.4	76.6	29.8
				30.5	29.6	
				7.0	22.8	
11.			48.0	143.0	191.0	
				25.1	74.9	30.9
				34.0	30.0	
				7.8	23.1	
12.			36.0	125.0	161.0	
				22.5	76.6	26.1
				25.5	26.2	
				5.8	20.2	
13.			7.0	16.0	23.0	
				30.4	69.6	3.7
				5.0	3.4	
				1.1	2.6	
	COLUMN TOTAL		141.0 22.8	477.0 77.2	618.0 100.0	

Table 9

## Alaskan Native Subgroups

	<u>ALEUT</u>	<u>ESKIMO</u>	<u>INDIAN</u>	<u>COMBINATION</u>	<u>UNKNOWN</u>	<u>TOTAL</u>
Number	21	63	38	4	15	141
Pct.	14.9	44.7	27.0	2.8	10.6	100

Table 10.

Cognitive Abilities Test Scores for  
Alaskan Native and White Subjects

<u>SUBTEST</u>	<u>NATIVE</u>	<u>WHITE</u>
<u>Verbal</u>	(n = 41)	(n = 155)
Mean	97	107
St. Dev.	11.977	12.588
Range	77-123	77-139
Pct. Rank	44	63
<u>Quantitative</u>	(n = 38)	(n = 158)
Mean	102	108
St. Dev.	15.166	16.209
Range	78-138	67-160
Pct. Rank	53	63
<u>Nonverbal</u>	(n = 39)	(n = 158)
Mean	103	109
Std. Dev.	12.879	15.277
Range	78-127	51-143
Pct. Rank	56	66

## Major Hypotheses (H<sub>1</sub> and H<sub>2</sub>)

The two major hypotheses were examined utilizing the SPSS one- and two-way analysis of variance procedures. Both hypotheses were tested at the 0.05 alpha level. The two groups' scores on each of the 23 Learning Style Inventory elements and the consistency measure were examined.

Upon completion of the above analyses, an estimate of the strength of association was obtained through the use of the correlation ratio,  $\eta^2$ , to determine the proportion of the total variance accounted for by systematic variation. The computational formula for  $\eta^2$  is as follows:

$$\frac{\text{sum of squares between groups}}{\text{sum of squares total}}$$

### Hypothesis I

There is no statistically significant difference between the mean scores of Alaskan Native and White students for the elements of preferred learning style, as measured by the Learning Style Inventory (LSI).

The null hypothesis stating that there were no significant differences between Native and White students' mean scores on the LSI elements was rejected. Analysis of variance performed on these data reveal that, while there are no significant differences on nineteen of the elements, four others and the consistency score were significantly different at the .05 alpha level. These four elements were: #6 - Persistent, #11 - Authority Figures Present, #17 - Requires Intake and #19 - Late Morning.

On Element #6 - Persistent, the White students' mean score of 2.958 significantly exceeded the mean of 2.702 for Alaskan Natives,  $F(1,617) = 5.811$ ,  $p < .05$ . The Native mean of 1.099 for element #11 - Authority Figures Present, was significantly greater than the .816 of White students,  $F(1,617) = 8.781$ ,  $p < .05$ . Element #17 - Requires Intake, resulted in White students scoring significantly higher (2.998) than their Native classmates (2.645),  $F(1,617) = 3.996$ ,  $p < .05$ . Native students expressed a significantly greater preference to work in the late morning on Element #19 - Late Morning, with a mean of 1.057 versus .812 for their White peers,  $F(1,617) = 6.738$ ,  $p < .05$ . The White subjects' mean consistency score of 86.151 was also significantly greater than the Natives' score of 83.475 indicating that the Natives' preferences were more variable,  $F(1,617) = 4.216$ ,  $p < .05$ .

Calculation of the strength of association estimate,  $\eta^2$ , on the above data reveals that a very small proportion of the total variance could be accounted for by the systematic variation. Only two elements, #11 - Authority Figures Present (1.4%) and #19 - Late Morning (1.1%), accounted for more than 1% of the total variance.

The derived data for Hypothesis 1 are presented in Table 11.

Table 11.

## Hypothesis I Analysis of Variance Decision Table

<u>LSI Element</u>	<u>p Value (0.05)</u>
1. Noise Level	.289 (NS)
2. Light	.380 (NS)
3. Temperature	.074 (NS)
4. Design	.083 (NS)
5. Motivation	.764 (NS)
6. Persistent	.016 (S)
7. Responsible	.782 (NS)
8. Structure	.324 (NS)
9. Learning Alone	.590 (NS)
10. Peer Oriented	.878 (NS)
11. Authority Figures Present	.003 (S)
12. Learn in Several Ways	.128 (NS)
13. Auditory	.994 (NS)
14. Visual	.783 (NS)
15. Tactile	.934 (NS)
16. Kinesthetic	.775 (NS)
17. Requires Intake	.046 (S)
18. Evening-Morning	.802 (NS)
19. Late Morning	.010 (S)
20. Afternoon	.492 (NS)
21. Needs Mobility	.778 (NS)
22. Adult Motivated	.210 (NS)
23. Teacher Motivated	.550 (NS)
Consistency	.041 (S)

n = 619

### Hypothesis II

There is no statistically significant difference between the mean scores of male and female Alaskan Native students and their preferred learning style, as measured by the LSI.

The null hypothesis stipulating that no significant differences exist between the preferred learning styles of male and female Alaskan Native students was rejected. Computation of analysis of variance on these data reveal that their scores on two of the LSI elements were

significantly different at the .05 alpha level. These two elements were #5 - Motivation, and #23 - Teacher Motivated. A third, #6 - Persistent, approached significance.

The mean for female Native students (4.642) was significantly greater than their male classmates (4.365) on Element #5 - Motivation,  $F(1,139) = 5.992$ ,  $P < .05$ . On element #23 - Teacher Motivated, the female mean score of 3.866 was also significantly greater than the male mean of 3.365,  $F(1,139) = 13.783$ ,  $p < .05$ . Element #6 - Persistent, which approached statistical significance, resulted in a mean score of 2.878 for males and 2.508 for females. No other elements approached the established level of significance.

Computation of  $\eta^2$  for  $H_2$  reveals that more than 4% of the total variance was accounted for by the systematic variance on two LSI elements, #23 - Teacher Motivated (9.0%) and #5 - Motivation (4.1%). Three more exceeded 1%: #6 - Persistent (2.5%); #8 - Structure (1.7%); and #17 - Requires Intake (1.3).

The results of the analysis of variance for Hypothesis II are presented in Table 12.

Table 12.

## Hypothesis II Analysis of Variance Decision Table

<u>LSI Element</u>	<u>p Value (0.05)</u>
1. Noise Level	.497 (NS)
2. Light	.505 (NS)
3. Temperature	.839 (NS)
4. Design	.769 (NS)
5. Motivation	.016 (S)
6. Persistent	.061 (NS)
7. Responsible	.844 (NS)
8. Structure	.106 (NS)
9. Learning Alone	.316 (NS)
10. Peer Oriented	.560 (NS)
11. Authority Figures Present	.375 (NS)
12. Learn in Several Ways	.690 (NS)
13. Auditory	.937 (NS)
14. Visual	.958 (NS)
15. Tactile	.850 (NS)
16. Kinesthetic	.411 (NS)
17. Requires Intake	.172 (NS)
18. Evening-Morning	.590 (NS)
19. Late Morning	.654 (NS)
20. Afternoon	.245 (NS)
21. Needs Mobility	.556 (NS)
22. Adult Motivated	.991 (NS)
23. Teacher Motivated Consistency	.001 (S)
Consistency	.747 (NS)

n = 141

A two-way analysis of variance was calculated to test the significance of differences on the 23 LSI element scores by ethnic group and also by sex. No interaction between ethnic group and age was found on 22 elements. A significant interactive effect  $F(2,618) = 5.478$ ,  $p < .05$ , however, was obtained between ethnic group and sex on element #6, Persistent.

### Minor Hypotheses (H<sub>3</sub> and H<sub>4</sub>)

The two minor hypotheses were examined utilizing the SPSS Pearson product-moment correlation procedure to determine the strength of relationship between the selected variables. The 0.05 alpha level was selected to test the significance of the correlations. The coefficient of determination ( $r^2$ ) was then computed to reveal the strength of association between the derived scores.

### Hypothesis III

There is no statistically significant relationship for Alaskan Native students between preferred learning style and reading achievement as measured by the Iowa Tests of Basic Skills (ITBS).

The null hypothesis stating that there is no significant relationship between Native students' preferred learning style and reading achievement was rejected. Computation of Pearson product-moment correlation coefficients reveals that a significantly strong relationship exists between two of the Native students' LSI element scores (#1 - Noise Level and #7 - Responsible) and their reading achievement, while twenty-one failed to attain the designated significance level. A third, #8 - Structure, approached the .05 significance level.

The results of the Pearson product-moment computations are presented in Table 13. A significant, positive relationship was found between Native students' LSI Responsibility and Sound scores and reading achievement. Students who are more responsible and who prefer higher sound levels tend to possess slightly higher reading scores,



whereas their classmates who are less responsible and prefer lower noise levels tend to have lower reading achievement scores.

Although statistically significant, the correlations of .26 between Natives' responsibility level and reading performance and .16 between their preferred noise level and reading achievement are low, reflecting only a slight relationship between the identified variables. These findings are illustrated by the computation of the coefficient of determination ( $r^2$ ) to obtain a strength of association measure for the two significant correlations. Less than 7% of the variance in the reading achievement score can be attributed to the learning style variable, responsibility, with the remaining 93% being attributable to other factors. Only 2-1/2% of the achievement variance is attributed to their noise level preference leaving an even higher percentage that is attributed to other factors.

Table 13.

Correlations and Coefficients of Determination  
between Native Students' LSI Scores and  
Reading Achievement

<u>LSI Element</u>	<u>Correlation Coefficient</u> (r)	<u>p Value</u> (0.05)	<u>Coefficient of Determination</u> (r <sup>2</sup> )
1. Noise Level	.1578	.043	.025
2. Light	.0736	.212	.005
3. Temperature	.0683	.229	.005
4. Design	-.0392	.335	.002
5. Motivation	.0413	.327	.002
6. Persistent	.0993	.140	.010
7. Responsible	.2631	.002	.069
8. Structure	-.1495	.052	.022
9. Learning Alone	.0558	.272	.003
10. Peer Oriented	-.1042	.129	.011
11. Authority Figures Present	-.1377	.067	.019
12. Learn in Several Ways	-.1326	.074	.018
13. Auditory	.1382	.066	.019
14. Visual	-.0787	.197	.006
15. Tactile	.0039	.483	.000
16. Kinesthetic	.0374	.343	.001
17. Requires Intake	.0627	.248	.004
18. Evening-Morning	-.0079	.466	.000
19. Late Morning	-.1064	.124	.011
20. Afternoon	-.0352	.351	.001
21. Needs Mobility	.1172	.101	.014
22. Adult Motivated	-.0823	.186	.007
23. Teacher Motivated Consistency	.0366 .1029	.346 .132	.001 .011

n = 120

#### Hypothesis IV

There is no statistically significant relationship for White students between preferred learning style and reading achievement as measured by the ITBS.

The null hypothesis stating that no significant relationship exists between White students' learning style preferences and reading achievement was rejected. Ten of the 23 correlation coefficients exceeded the designated significance level. These included: #1 - Noise Level; #5 - Motivation; #6 - Persistent; #7 - Responsible; #11 - Authority Figures Present; #12 - Learn in Several Ways; #17 - Requires Intake; #19 - Late Morning; #21 - Needs Mobility; and #22 - Adult Motivated.

The derived Pearson correlation coefficients reveal that the strongest relationship with reading achievement for White students was with LSI Element #11 - Authority Figures Present ( $r = -.277$ ), #12 - Learn in Several Ways ( $r = -.200$ ) and #1 - Noise Level ( $r = .171$ ). These data indicate that a slight, negative relationship exists between the White students' desire to have an authority figure present while studying and reading achievement. A slightly weaker, negative relationship was found between reading performance and the students' preference to learn in a variety of ways. A weaker, positive relationship was found between the preference for studying in an environment with a higher noise level and reading achievement. Table 14 contains the results of the obtained Pearson product-moment correlation coefficients describing the relationship between the elements of learning style preferences and reading achievement for White students.

Table 14.

Correlations and Coefficients of Determination between  
White Students' LSI Scores and Reading Achievement

<u>LSI Element</u>	<u>Correlation Coefficient</u> (r)	<u>p Value</u> (0.05)	<u>Coefficient of Determination</u> (r <sup>2</sup> )
1. Noise Level	.1711	.001	.029
2. Light	-.0204	.336	.000
3. Temperature	.0452	.174	.002
4. Design	.0174	.359	.000
5. Motivation	.1020	.017	.010
6. Persistent	.0895	.031	.008
7. Responsible	.1381	.002	.019
8. Structure	-.0133	.391	.000
9. Learning Alone	.0456	.172	.002
10. Peer Oriented	-.0547	.128	.003
11. Authority Figures Present	-.2769	.001	.007
12. Learn in Several Ways	-.1999	.001	.040
13. Auditory	-.0342	.239	.001
14. Visual	.0241	.308	.001
15. Tactile	-.0556	.124	.003
16. Kinesthetic	-.0456	.172	.002
17. Requires Intake	.1466	.001	.021
18. Evening-Morning	-.0686	.077	.005
19. Late Morning	-.0869	.035	.008
20. Afternoon	.0116	.405	.000
21. Needs Mobility	-.1385	.002	.019
22. Adult Motivated	.1385	.002	.019
23. Teacher Motivated Consistency	.0410 .2311	.197 .001	.002 .053

n = 433

Computation of the coefficient of determination ( $r^2$ ) to establish the strength of association between the three learning style elements with the highest correlation and reading achievement reveals that little common variance exists. The highest correlation of .277 on Element #11 - Authority Figures Present, indicates that less than 8% of the variance is common while more than 92% is attributable to other factors. Element #12 - Learn in Several Ways predicts less than 4% of the variance in reading achievement, while the third highest correlation, .171 on Element #1 - Noise Level, predicts slightly less than 3% of reading achievement variance.

In addition to the relatively small number of significant findings obtained (20 of 96 tests of significance) and the small amount of shared variance found, it is important to remember that as the number of significance tests increases, so does the probability of obtaining a statistically significant result even though the null hypotheses may, in fact, be true (Good, 1984, p. 105). Based upon his calculations, there is a likelihood of a Type I error and that at least one of the obtained significant results was due to the number of significance tests computed (p. 106).

## CHAPTER V

## SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

This chapter presents a summary of the major findings, conclusions of the study and a discussion of the theoretical and practical implications. Recommendations are offered for further research and alternative instructional strategies to meet the unique needs of Alaska's Native students. Due to the exploratory nature of this study, the unknown genetic composition and acculturation level of the Native subjects and use of an instrument not previously used with Alaskan Native students, the conclusions presented are viewed as tentative.

Summary

The Anchorage School District, due to interest in its minority students, provided the researcher with the opportunity to conduct this original research in the spring of 1983. Four broad questions provided direction for the researcher in the form of two major and two minor hypotheses. The major purposes of this study were to determine whether urban Anchorage Alaskan Native and White intermediate grade (4-6) students possess significantly different learning style preferences ( $H_1$ ) and whether significant differences exist between the preferred learning styles of male and female Alaskan Native students

at this same grade level ( $H_2$ ). Minor purposes were to determine the relationship between both groups' preferred learning styles and reading achievement ( $H_3$  and  $H_4$ ).

The sample for the study consisted of 141 Native (74 male and 67 female) and 478 White (238 male and 240 female) subjects enrolled in the Anchorage School District in April and May, 1983. They included all students of these two racial-ethnic groups comprising 43 of 44 classrooms from seven selected elementary schools who were present on the day of testing.

Preferred learning style was assessed with the Learning Style Inventory (LSI) by Dunn, Dunn, and Price, while reading achievement was determined by the reading comprehension subtest of the Iowa Tests of Basic Skills. The LSI provides scores on 23 elements categorized as environmental, emotional, sociological and physical stimuli, plus a Consistency score, an indicator of students' consistency of expressed preferences. Additional data gathered included: 1) ethnic classification; 2) sex; 3) grade placement; 4) age; 5) attendance records; 6) absenteeism rates; 7) Cognitive Abilities Test scores (verbal, quantitative and non-verbal); and 8) Alaska Statewide Achievement Test reading and math scores.

The statistical treatment consisted of the one-way analysis of variance (ANOVA) to determine whether the between-groups' variance was significantly greater than the within-groups' variance ( $H_1$  and  $H_2$ ), two-way ANOVA, and the Pearson product-moment correlation to determine the strength of relationship between selected variables ( $H_3$  and  $H_4$ ). Analysis was conducted utilizing SPSS procedures.

Statistical analyses led to the rejection of both major and minor hypotheses as illustrated in Tables 11, 12, 13 and 14. For the four hypotheses, 96 tests of significance were calculated, 92 for learning style elements and 4 for consistency scores. Of these, 76 were retained, indicating that no significant difference or relationship exists between the groups; twenty were rejected ( $p = .05$ ), 7 of which indicate significant differences between the selected groups ( $H_1$  and  $H_2$ ) and 13 of which indicate that significant relationships exist between the two groups, learning styles and reading scores ( $H_3$  and  $H_4$ ). The derived data from the LSI on  $H_1$  and  $H_2$  indicate that urban Alaskan Native and White students' learning style scores are similar on most elements and that very few differences exist between male and female Native learning style scores. Furthermore, the data from  $H_3$  and  $H_4$  reveal only a slight, though significant, relationship between learning style and reading achievement for both Native and White students, with no correlation coefficient greater than .28.

Following is a summary of the significant findings:

1.  $H_1$  was rejected at the .001 level for Element #19-Late Morning, the time of day during which Native students expressed a significantly greater desire to work and study than did their White classmates; Element #11-Authority Figures Present was significant at the .003 level with Natives preferring much more teacher contact and feedback than did their peers from the dominant culture; Element #6 - Persistent, was significant at



the .016 level with White individuals expressing greater persistence than Native students; Whites' preference for greater food and liquid consumption was significantly greater at the .046 level than for their peers of Alaskan Native heritage; and members of the dominant culture exhibited greater consistency in their preferences at the .040 level on the Consistency score than did members of the minority group.

2. The null hypothesis was rejected on only two of the LSI elements in comparing male and female Native students ( $H_2$ ), while on a third, #6 - Persistent, the males' higher score approached significance (.061). Female Native students demonstrated significantly greater response to teacher attention and reinforcement (.001) on Element #23 - Teacher Motivated than did Native males. Females also demonstrated significantly greater eagerness to learn on Element #5 - Motivation, at the .016 level, than did their male peers.
3. For Native students, only two correlation coefficients exceeded the .05 significance level when examining the relationship between learning style preference and reading achievement. The strongest relationship of .263 was found between Element #7 - Responsible and reading performance. The other was Element #1 -

Noise Level (.158), while #8 - Structure, approached significance (-.150).

4. In comparing White students' preferred learning styles and reading achievement, ten correlation coefficients exceeded the established significance level, but all were low. These findings include the following in descending order of value: Authority Figures Present (-.277); Learn in Several Ways (-.200); Noise Level (.171); Requires Intake (.147); Adult Motivated (.139); Needs Mobility (-.139); Responsible (.138); Motivation (.102); Persistent (.090); and Late Morning (-.087). The correlation of .231 between the Consistency score and reading achievement was also significant.

Calculation of the strength of association estimate,  $\eta^2$ , on  $H_1$  and  $H_2$  reveals that a very small proportion of the total variance can be accounted for by the systematic variance. In only one case did it account for more than 5% ( $H_2$ , #9 - Teacher Motivated = 9%).

For  $H_3$  and  $H_4$ , the weak relationship found between the two racial-ethnic groups' preferred learning styles and reading performance is illustrated by the computation of coefficients of determination ( $r^2$ ), a measure of strength of relationship. For the highest correlation obtained, -.277 on Authority Figures Present ( $H_4$ ), the variance of learning style only predicts 7.7% of the reading performance variance, while the remaining 92.3% is attributed to other factors.

The results obtained from  $H_1$  and  $H_2$  in this study differ from the normative data reported in the LSI Manual (Dunn, Dunn & Price, 1981) on numerous elements, although none are more than one standard deviation from the mean. One unusual trend noted is that the scores of both Native and White students from Anchorage differ from the norm on several elements that are of a physiological nature (Keefe, 1979, p. 15) and which in turn may implicate the effect of the northerly environment upon all these students. For instance, both groups expressed preference for more light, warmth, nutritional intake and greater mobility than did the more southerly normative group. Furthermore, both groups expressed a lesser desire for kinesthetic learning experiences than the normative sample. One interesting difference found between the Anchorage students from this study when compared to the normative group was on Element #11 - Authority Figures Present. Natives prefer more contact with the teacher than the norm, while White subjects desire less.

When comparing Native students with the normative group, it is noted that the Native students are less persistent and express a stronger preference for studying in the late morning and afternoon.

In examining the data for Natives by sex, it was determined that Native males are generally less self-motivated and teacher-motivated than both their female Native peers and the male normative sample. They also demonstrate less desire for visual, tactile and kinesthetic instruction than do those in the normative group, but they are virtually identical in this regard to their female Native and White classmates. Female Natives are less persistent than either their male

counterparts or the females from the normative sample. In addition, they are less responsible than females from the normative group.

The present study reveals an identical score (1.9) for Natives and Whites on the element denoting visual perceptual preference for learning activities. This finding is inconsistent with the existing body of literature (Berry, 1966; Kleinfeld, 1971 and 1973a; Taylor and Skanes, 1976a; Trotter, 1976; and Witkin, 1974) which consistently reports superior visual perceptual, spatial and memory skills for Native subjects. This has been repeatedly verified by the majority of educators working with them according to research (Kleinfeld, 1971) and the investigator's personal observations.

### Conclusions

Based upon the results of this research, the following conclusions were drawn:

1. Significant differences do exist between the preferred learning styles of urban Alaskan Native and White students.
2. The obtained results, however, differ from the existing body of literature previously reported in both magnitude and content. The following possibilities are offered in explanation for the study's failure to obtain additional significant findings:
  - A. The Learning Style Inventory (Dunn, Dunn & Price, 1981) possesses limited ability to discriminate between

the preferred learning styles of urban Anchorage Alaskan Native and White students.

B. Inability to control extraneous variables such as the Natives' actual genetic composition may have introduced additional, unwanted variability into the experiment.

C. It is possible that few differences actually exist between urban Alaskan Native and White students' preferred learning styles, contrary to the consensus of educators who have worked with them.

D. The possibility exists that the learning style construct differs so greatly from cognitive style and visual perceptual ability that comparison with this earlier literature is unwarranted.

E. The process of acculturation on the Alaskan Natives may be responsible for the limited number of differences found in this study, thereby supporting the positions of Dawson (1977a), Suess (1981), and Weitz (1971), who noted that acculturation diminished many of the unique traits of Natives.

F. Common physiological responses to environmental conditions at the northerly latitude where these subjects reside may account for the shared desire for greater light and warmth, increased demand for solid

and liquid intake and need for greater mobility while studying than expressed by the normative group.

3. Based upon derived data, it is concluded that unlike the dominant culture, few sex differences currently exist between urban male and female Alaskan Native learning style preferences. These findings are consistent with earlier cross-cultural findings (Berry, 1966; Berry & Witkin, 1975; and MacArthur, 1976).
4. The highest obtained correlation coefficient comparing learning style preference and reading achievement was less than .28 which reveals only a slight relationship between these two factors. Statistical significance was not attained due to the strength of the relationship, but rather, due to the sample size (power). Unlike the Price, Dunn and Sanders' study (1981), these derived correlations are so low as to have little if any importance, much less predictive value (Linton & Gallo, 1975) since the learning style variance predicts only 7.7% of the reading achievement variance.

### Implications

The present research which identified differences between Native and White students for environmental, emotional and physical forms of stimuli may provide a basis for modifying the existing instructional strategies to more effectively meet the educational needs of Native

students. Awareness of the potential impact of acculturation upon all Natives and the effects of climate and environment upon all Alaskans indicates the need for Alaskan educators to look beyond the classroom for answers to many of the perplexing problems confronting them today.

Based upon the results of this research, the following theoretical and practical implications are suggested:

1. Examination of these findings reveal that fewer differences exist between the Native and White subjects than previously reported in the literature (Berry, 1966; Collier, 1977; Harrison, 1982; Taylor and Skanes, 1976a; and Trotter, 1976). Alaskan Natives continue to experience the effect of acculturation by moving from villages to urban centers, increased exposure to satellite television and intrusion by the dominant culture (Dawson, 1977a, Suess, 1981; and Weitz, 1971). Teachers may observe fewer of the striking characteristics previously observed with Native students which may consequently lead to similar techniques and strategies being equally effective when used with both groups. Recognition of change secondary to acculturation, as that noted by Price (1982) due to maturation, should alert educators to the apparently dynamic nature of learning styles.
2. Due to the limited validity studies reported on the LSI and the weak strength-of-association results obtained

in this study, it is suggested that for the immediate future this instrument be used with caution, especially with minority subjects. Learning style research is in its infancy, "an immature area of research", and is currently utilizing "first generation instruments" (Note 2) according to Dr. Anthony Gregorc. With continued research, improved instrumentation and development of teaching strategies, the validity and value of models and identification procedures can be enhanced, thereby increasing the value for students and teachers alike.

3. In view of the Natives' preference for learning in the late morning, reading instruction should be more successful if scheduled no earlier than late morning, thereby accommodating their expressed preference when energy levels are the highest and maximal mental and physical productivity might be expected.
4. Since Native students prefer the presence of an authority figure and demonstrate impersistence, they may benefit from a teacher who insures his/her accessibility, uses direct teaching with close monitoring and corrective feedback and by providing reinforcement for on-task behavior.
5. Since male Natives often do not desire to achieve academically or respond as readily to teacher praise as



their female counterparts, instruction should include options based upon individual interests, opportunity for the student to study by himself or with peers, use of extrinsic motivation and frequent reinforcement.

#### Recommendations for Further Research

The following suggestions are offered as an outgrowth of this study:

1. Since previous studies have not appeared in the literature dealing with the preferred learning styles of Alaskan Natives, it is strongly recommended that additional research be conducted to confirm and expand these findings. These studies should include diverse Native subjects from both village and urban areas.
2. Based upon the limited, positive findings of this study, it is recommended that the LSI be further refined and validated and that additional data be gathered on minority groups.
3. Developmental research suggests that learning styles may change with maturation (Price, 1982), while the present study suggests that acculturation may produce a similar outcome. Further research is indicated to determine if, indeed, Alaskan Natives' learning styles are altered as a result of acculturation.

4. In light of this study's failure to support earlier research which reported superior visual perceptual ability, it is recommended that future research identify and compare rural and urban Native students' perceptual strengths and weaknesses.
5. Upon consideration of the outcome of the present study utilizing a learning style model, future research with Natives might be fruitful exploring the related concept of information processing. Two viable models which should be considered are Luria's simultaneous and sequential information processing model (Das, Kirby and Jarman, 1979; and Kaufman and Kaufman, 1983) and Jung's theory of personality type containing four behavioral functions - sensing, intuition, thinking and feeling (Silver and Hanson, 1980).

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APPENDICES

## APPENDIX A



## THE ALASKA NATIVE FOUNDATION

411 WEST 4th AVENUE, SUITE 314 • ANCHORAGE, ALASKA 99501 • PHONE (907) 274-2541

March 25, 1983

83-133

Mr. Roger Clyne  
635 N.W. 5th, Apt. 9  
Corvallis, Oregon 97330

Dear Roger,

I encourage you in the strongest way to pursue your dissertation relating to the identification of unique learning styles of Alaska Native students.

For years people have either assumed that there aren't any or else it has not been important enough to deal with. At any rate, I do not know of any research addressing the topic.

I can see a great importance and usefulness in having information which might improve the educational processes and methods utilized in the classroom. Any study which will help to improve the quality of instruction for Alaska Native students should rightly be supported by everyone.

I wish you the best of luck.

Sincerely,

— Franklin L. Berry  
President

cc: Dr. Gene Davis

## APPENDIX B



ANCHORAGE  
SCHOOL DISTRICT

4600 DeBarr Avenue  
Pouch 6-614  
Anchorage, Alaska 99502  
[907] 333-9561

PRESIDENT  
Lee Gorsuch

VICE-PRESIDENT  
Jean Buchanan

CLERK  
Alyce Hanley

CLERK PRO TEM  
Brent Wadsworth

TREASURER  
Vi Schelenberg

ASST. TREASURER  
& PAST PRESIDENT  
Jim Robinson

PARLIAMENTARIAN  
Bettye Davis

April 14, 1983

Mr. Roger Clyne  
3011 Lexington Circle  
Anchorage, AK

Dear Mr. Clyne:

Your proposal to conduct a study of learning styles of various groups of students through the administration of the Learning Style Inventory (LSI) is approved with some conditions with which you will have to comply.

1. The administration of the LSI is to be limited to students in fourth, fifth, and sixth grade in not more than seven schools including the three schools designated as multicultural pilot schools for 1983-84.
2. It must be made clear to teachers and principals that their participation is voluntary. While participation is encouraged because of the value of your potential findings to the District, participation is not required.
3. A summary of your findings be provided to each participating teacher and principal.
4. Your complete report which must include an analysis of the performance of students by grade by ethnic group (black, white, hispanic, and Alaska Native) be provided to the Assessment and Evaluation Office of the Anchorage School District.

E.E. (Gene) Davis, Ed. D.

Roger Clyne  
April 14, 1983

page 2

The Assessment and Evaluation Office will provide access to the spring, 1983, Iowa Tests of Basic Skills results for participating students in grades 4, 5, and 6 and Cognitive Abilities Test scores for students enrolled in grade 6. The test scores should be available by May 31, 1983.

Please feel free to contact the Assessment and Evaluation Office if we may be of further assistance. There is a good deal of enthusiasm for your project among the District staff. We will be pleased to do whatever we can to facilitate your study.

Sincerely,

Ray Fenton, Ph.D.  
Research Associate  
Assessment and Evaluation

jw

cc Linda Black  
Thelma Boyd  
Bob Christal  
Steve Daeschner  
Edna Lamabull  
Frederick Stofflet

## APPENDIX C

## LEARNING STYLE INVENTORY

by  
Rita Dunn, Ed. D.  
Kenneth Dunn, Ed. D.  
Gary E. Price, Ph. D.

## Directions:

This inventory has several statements about how people like to learn. Answer each question based on how you would like to study or concentrate, if you had something new or difficult to learn.

If your answer sheet has T and F on it answer T if the statement is usually True for you and F if the statement is usually False for you. If your answer sheet has SD, D, U, A, and SA on it, answer SD if you Strongly Disagree, D if you Disagree, U if you really do not know if the statement is true for you (Undecided), A if you Agree, and SA if you Strongly Agree with the statement.

You should give your immediate or first reaction to each question. Please answer each question on the separate answer sheet. Do not write on this booklet.

Before you begin to answer the questions, blacken the circle for your name, sex, grade and any other information called for in the space provided on the answer sheet with a no. 2 pencil.

Remember, try to answer each question.

Now open the booklet and start with question 1.

Copyright 1975, 1978

P.O. Box 3067, Lawrence, Kansas 66044



1. I study best when it is quiet.
2. My parents want me to get good grades.
3. I like studying with lots of light.
4. I like to be told exactly what to do.
5. I concentrate best when I feel warm.
6. I study best at a table or desk.
7. When I study I like to sit on a soft chair or couch.
8. I like to study with one or two friends.
9. I like to do well in school.
10. I usually feel more comfortable in warm weather than I do in cool weather.
11. Things outside of school are more important to me than my school work.
12. I am able to study best in the morning.
13. I often have trouble finishing everything I ought to do.
14. I have to be reminded often to do something!
15. I like making my teacher proud of me.
16. I study best when the lights are dim.
17. When I really have a lot of studying to do I like to work alone.
18. I do not eat or drink, or chew while I study.
19. I like to sit on a hard chair when I study.
20. Sometimes I like to study alone and sometimes with friends.
21. The things I remember best are the things I read.
22. I think better when I eat while I study.
23. I like others to outline how I should do my school work.
24. I often nibble something as I study.
25. It's hard for me to sit in one place for a long time.
26. I remember things best when I study them early in the morning.
27. I really like people to talk to me.
28. I hardly ever finish all my work.
29. I usually start my homework in the afternoon.
30. There are many things I like doing better than going to school.
31. I like to feel inside what I learn.
32. Sound usually keeps me from concentrating.
33. If I have to learn something new, I like to learn about it by having it told to me.
34. At home I usually study under a shaded lamp while the rest of the room is dim.
35. I really like to do experiments.
36. I usually feel more comfortable in cool weather than I do in warm weather.
37. When I do well in school, grown-ups in my family are proud of me.
38. It is hard for me to do my school work.
39. I concentrate best when I feel cool.
40. I like to sit on carpeting or rugs when I study.
41. I think my teacher feels good when I do well in school.
42. I remember to do what I am told.
43. I really like to watch television.
44. I can block out sound when I work.
45. I am happy when I get good grades.
46. I like to learn most by building, baking or doing things.
47. I usually finish my homework.

GO ON TO NEXT PAGE

48. If I could go to school anytime during the day, I would choose to go in the early morning.
49. I have to be reminded often to do something.
50. It is hard for me to get things done just before lunch.
51. It is easy for me to remember what I learn when I feel it inside of me.
52. I like to be told exactly what to do.
53. My parents are interested in how I do in school.
54. I like my teacher to check my school work.
55. I enjoy learning by going places.
56. When I really have a lot of studying to do I like to work alone.
57. I like adults nearby when I work alone or with a friend.
58. I can sit in one place for a long time.
59. I cannot get interested in my school work.
60. I really like to draw, color, or trace things.
61. The things I remember best are the things I hear.
62. I remember things best when I study them in the afternoon.
63. No one really cares if I do well in school.
64. I really like to shape things with my hands.
65. When I study I put on many lights.
66. I like to eat or drink, or chew while I study.
67. When I really have a lot of studying to do I like to work with a group of friends.
68. When it's warm outside I like to go out.
69. I remember things best when I study them early in the morning.
70. I can sit in one place for a long time.
71. I often forget to do or finish my homework.
72. I like to make things as I learn.
73. I can think best in the evening.
74. I like exact directions before I begin a task.
75. I think best just before lunch.
76. The things I like doing best in school I do with friends.
77. I like adults nearby when I study.
78. My family wants me to get good grades.
79. Late morning is the best time for me to study.
80. I like to learn most by building, baking or doing things.
81. I often get tired of doing things and want to start something new.
82. I keep forgetting to do the things I've been told to do.
83. I like to be able to move and experience the motion and the feel of what I study.
84. When I really have a lot of studying to do I like to work with two friends.
85. I like to learn through real experiences.
86. If I could go to school anytime during the day, I would choose to go in the early morning.
87. The thing I like doing best in school, I do with a grown-up.
88. I can ignore most sound when I study.
89. If I have to learn something new, I like to learn about it by seeing a filmstrip or film.
90. I study best near lunchtime.
91. I like school most of the time.

GO ON TO NEXT PAGE

92. I really like to listen to people talk.
93. I often eat something while I study.
94. I enjoy being with friends when I study.
95. It's hard for me to sit in one place for a long time.
96. I remember things best when I study them before evening.
97. I think my teacher wants me to get good grades.
98. The thing I like doing best in school I do with grown-ups.
99. I really like to build things.
100. I can study best in the afternoon.
101. Sound bothers me when I am studying.
102. When I really have a lot of studying to do I like to work with two friends.
103. When I can, I do my homework in the afternoon.
104. I love to learn new things.

STOP

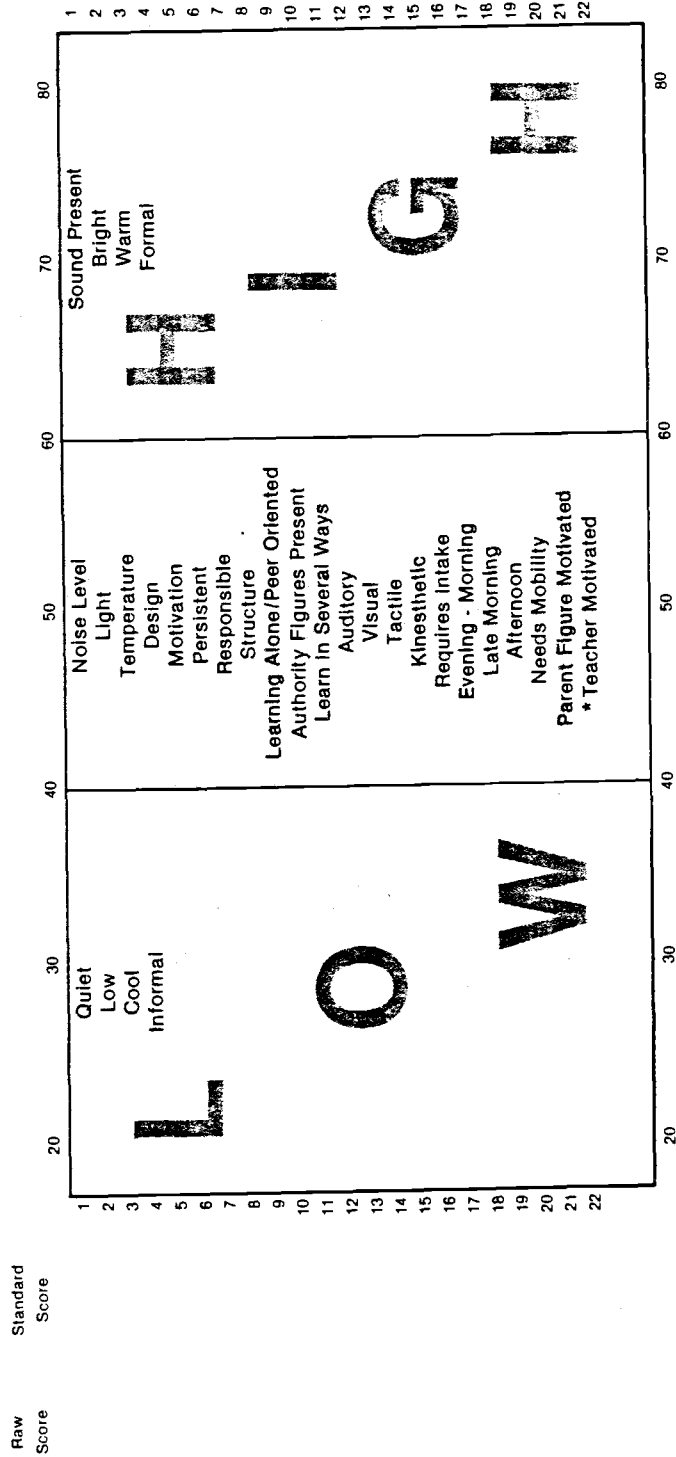
APPENDIX D

INDIVIDUAL PROFILE

Name: \_\_\_\_\_ Sex: \_\_\_\_\_ Year in School: \_\_\_\_\_ Date of Birth: \_\_\_\_\_ I.D. No.: \_\_\_\_\_  
 Yr./Mo. \_\_\_\_\_

Group Identification: \_\_\_\_\_ Special Code: \_\_\_\_\_ Date: \_\_\_\_\_ Group No.: \_\_\_\_\_

PREFERENCE SUMMARY



## APPENDIX E

## Learning Style, Brain Function and Native Americans

Due to the investigator's doctoral training in neuropsychology and assumption that the LSI would be capable of assessing selected aspects of brain function by the time data collection required its use, the following topical literature review was completed. As noted earlier, however, instrumentation proved to be impossible so the following section was transferred to the appendices.

Conjecture and research regarding the relationship between aspects of learning style, such as field dependence-independence, and brain function, especially hemispheric specialization, have existed since Witkin and his associates introduced the field dependence concept in 1954 (Garrack, 1978). After reviewing a number of selected studies, Garrick stated that "a neurophysiological basis for field dependence...can be postulated" (p. 635). He concluded that:

In considering the characteristics of the field-independent individual identified in many subjects, it is readily apparent that there are many similarities between these characteristics and the characteristic mode of functioning of the right hemisphere, and between field-dependent characteristics and the left hemisphere mode of functioning (p. 635).

Furthermore, characteristics in which field-independent subjects excel are predominantly associated with right hemispheric function (p. 636). Research by Bloom-Feshbach (1980) corroborated these findings,

while Berlin and Languis (1981) confirmed earlier research, which in addition to supporting the association of right hemispheric activation with field independence, also demonstrated the validity of the Rod-and-Frame Test for assessment of field independence using a nonverbal administration.

In an investigation exploring the concept of hemisphericity among children and relating lateralization of function to the reflection-impulsivity dimension of cognitive style, Lewis (1977) demonstrated that children show a greater proficiency in one mode of thought than the other at the .05 level of significance. However, no relationship was found between hemisphericity and the dimensions assessed, but the relationship between ethnicity and hemispheric preference was significant beyond the .05 confidence level, with Hispanics demonstrating greater right hemispheric preference and Anglos greater left hemispheric preference.

Zenhausern, Dunn, Cavanaugh & Eberle (1981), utilizing the Differential Hemispheric Activation, determined that the seven Learning Style Inventory scores which differentiated Rights and Lefts were the same that Dunn and Dunn (1978) found differentiated good and poor readers and that hemispheric preference could be considered another element of learning style.

Consequently, hemispheric preference was accepted as a "new element of learning style" (Dunn, Price, Bacilious & Zenhausern, 1982, P. 47), and, along with analytic-global and impulsive-reflective dimensions, considered for addition to the LSI. In regard to the charge that schools tend to be 'left brained', these writers commented:

Although hemispheric preference is just beginning to shed additional light on the learning process, in all fairness to the many kinds of youngsters that we are pledged to serve, the least that should be done at this time is to establish alternative school environments that can be responsive to different students, their inherited brain preferences and their physiological makeup (p. 47).

In a more recent study (Dunn, Cavanaugh, Eberle & Zenhausern, 1982) involving the LSI and the Differential Hemispheric Activation test, high school biology students were assessed. The results revealed that students who: (1) are not bothered by sound, (2) prefer dim illumination, (3) require an informal design, (4) are unmotivated, (5) are not persistent, (6) prefer learning with peers, and (7) prefer tactile stimulation, scored significantly more right preferences than those whose learning styles differed. Furthermore, persistent students scored more left preferred than their classmates whose preferred styles failed to include that element. Thus, left- (e.g. verbal and inductive reasoning) and right- (e.g. spatial and deductive reasoning) preferred students possess different environmental and organizational needs in the classroom in addition to different personality and motivational characteristics (p. 293).

Related research (Reedy, 1981) examined the relationship between brain dominance and the effect of a "whole brain" writing curriculum on tenth grade students. She concluded that there was a significant treatment effect upon the members of the treatment group, and that a curriculum designed to promote left-, right-, and whole-brain processes does significantly affect performance.

In an investigation based upon studies which have demonstrated that cultural and social positions are correlated with lateralized

cognitive functions, Clemens (1981) found that Blacks were more appositional (right hemispheric dominant) than Whites and that those from lower SES levels were more appositional than middle SES members.

A limited body of research (Hynd, Teeter & Stewart, 1980; Hynd & Scott, 1980; Rogers, Ten Houten, Kaplan & Gardiner, 1977; and Scott, Hynd, Hunt & Weed, 1979) involving Hopi and Navajo subjects suggests that as children their native language is more appositional, favoring the left side of space and consequently the right cerebral hemisphere during perceptual tasks including language reception. However, with increasing age and acculturation, Native American language lateralization more closely resembles the dominant culture. Ross (1982) flatly states that "It has been determined that traditional Native Americans are more dominant in right hemisphere thinking," and that "educators today are becoming increasingly concerned with the importance of the functions of the right hemisphere" (p. 5).

While research focusing on the relationship of brain function and Alaskan Natives is scarce if not non-existent, the following citations lend credence to the argument that biological and/or environmental factors may underlie Native students' failure to respond to the same instructional materials and strategies which prove successful with the dominant culture.

Trotter (1976) reported the results of anthropological studies which investigated the cerebral asymmetry of the Inuits of Frobisher Bay and Lake Harbor to determine if right hemispheric functions were "more highly developed in Eskimos than in modern urban populations" (p. 220).



They are known for their unusual gestalt (integrated) abilities, such as drawing accurate maps of their territories. They seem to have a sort of symbiotic feeling of oneness with their environment and have traditionally depended on their well-documented ability to find their way out of the most incredible circumstances. Such abilities would probably be highly adaptive in an environment like the Arctic, which demands a high degree of visuospatial ability for survival ... The Eskimo language also reflects a high degree of spatial, right hemispheric orientation. Linguistic studies rate it as being the most synthetic of languages. American English is at the other end of the same scale and is rated as the most analytic (left hemisphere) (p. 220).

He concluded that the findings were suggestive of hemispheric symmetry or at least a high degree of cooperation between the hemispheres and that they are "highly suggestive of a specific role for the right hemisphere" (p. 220). Furthermore, it was conjectured that different cultures might actually "channel" their members into a "greater or lesser reliance on one or the other hemisphere" (p. 223).

McLuhan (1978), in reviewing Trotter's and Luria's research, stated that "societies that have not developed the use of the phonetic alphabet tend to exhibit the same right-hemispheric orientation," because "non-literate cultures are mainly oral/aural, even when they cultivate some non-phonetic form of writing such as Sanskrit" (p. 55). He then surmised that hemispheric dominance was "largely dependent upon environmental factors" (p. 55), a position similar to Kleinfeld's (1971).

Some well meaning educators have erred in their interpretation of brain research. Jerre Levy (1983), a neuroscientist and longtime critic of improper neuroscience research interpretation and application, offers educators a stern warning when she states that "the

research is not yet available to demonstrate conclusively what all this means for educational practice" (p. 71).

The evidence strongly disputes the idea that students learn with only one side of the brain, but we do have evidence that there are individual differences among people to the extent that one hemisphere is more differentially aroused than the other (p. 70).

This concern is echoed by Hardyck & Haapanen (1979) who offer the following caution for educators:

Before reorganizing the curriculum, buying new right and left brain tests, or learning to think in 'right brain' or 'left brain' terminology, we should ask for more evidence that these differences really exist outside a narrow experimental context unrepresentative of either the educational process or the course of daily life (p. 229).

In summary, evidence does exist which suggests that young American Indians, at least, utilize greater right hemispheric arousal for language reception than do Caucasians. However, due to crude assessment techniques previously used and the limited research completed on this topic to date, extreme caution is urged for educators intent upon developing and implementing a right- and left- brain curriculum.

## REFERENCE NOTES

1. Price, G. E. Personal communication, July 6, 1983.
2. Gregorc, A. F. Personal communication, October 18, 1983.

