AN ASSESSMENT OF CONGRUENCE BETWEEN LEARNING STYLES OF CREE, DENE, METIS AND NON-NATIVE STUDENTS AND INSTRUCTIONAL STYLES OF NATIVE AND NON-NATIVE TEACHERS IN SELECTED NORTHERN SASKATCHEWAN SCHOOLS

A Thesis

Submitted to the College of Graduate Studies and Research in

Partial Fulfillment of the Requirements

for the Degree of Master of Education

BY KATSUO TAMAOKA

INDIAN AND NORTHERN EDUCATION PROGRAM

COLLEGE OF GRADUATE STUDIES AND RESEARCH

UNIVERSITY OF SASKATCHEWAN

August, 1986

ABSTRACT

The purpose of this study was to assess the congruence between the learning styles of Division III Cree, Dene, Metis and non-Native students, and the instructional styles of Native and non-Native teachers in Nothern Saskatchewan schools.

The data for this study were collected by administering Canfield's Learning Styles Inventory and Canfield's Instructional Styles Inventory in six Northern Saskatchewan schools. The total sample of 464 consisted of 385 students and 79 teachers; the student sample was comprised of 81 Cree, 65 Dene, 134 Metis and 105 non-Native students, while the teacher sample consisted of 15 Native teachers and 64 non-Native teachers. The independent variables in this study were culture, sex and age; and the dependent variables were the 16 learning/instructional style scales, predicted levels of student academic performance and perceived responsibility of teachers for the students' learning process.

The nine hypotheses posed in the study were tested by an examination of mean scores on 16 inventory scales; and by using one-way ANOVA with accompanying Newman-Keuls comparisons between ordered means. Overall differences in the sample of students and teachers classified by culture, sex and age were assessed by discriminant analysis.

The findings of this study must be considered in relation to the following limitations: the size and nature of the sample, the difficulty of assessing learning/instructional style, and the existence of cultural bias.

The major question of the study asked whether preferred instructional styles of Native and non-Native teachers were congruent or

incongruent with the preferred learning styles of Cree, Dene, Metis and non-Native students. It was found that neither group of teachers was congruent with all components of learning style preferences in any student group, but both Native and non-Native teachers were congruent on more than 50 percent of all components. There was strong evidence in the study however that Native teachers were congruent with all student groups on a greater number of components than was true for non-Native teachers. Native teachers were congruent with all student groups in 54 (84.4%) out of 64 possible learning/instructional style components. The congruency rate for non-Native teachers was 40 out of 64 instances, or 62.5%.

Certain components of learning style differed among students of Cree, Dene, Metis and non-Native backgrounds, with the Dene most different from the non-Native group. The Cree and the Metis were similar to each other, and fell midway between the Dene and the non-Native students. In sum, differences were found among the groups of Native students (Cree, Dene and Metis), as well as between the Native and the non-Native students. Although culture was found to relate to learning style, sex appeared to be an even stronger variable influencing student learning style preferences. Age was found to relate to the learning styles of the Dene and non-Native students but not of their Cree and Metis counterparts. The Cree and Metis students held the lowest expectations for their academic performance. The Dene students exceeded the Cree and Metis groups.

The points of difference in instructional style indicated that non-Native teachers preferred to teach from logically and clearly organized materials, whereas Native teachers were more likely to

encourage students to work independently. No other differences were found between cultural groups. Male and female teachers were found to prefer, to a modest degree, different approaches to teaching at only certain age levels. Female teachers at all age levels reacted more negatively to teaching about inanimate objects than did males. Younger female teachers preferred teaching by having students read written material and by teaching students about working with people, while males of the same age were more interested in teaching by the experiential approach. In scores on teacher responsibility for the students' learning process, no differences were found among teachers classified by culture, sex and age. The teacher group as a whole appeared to share similar perceptions about their responsibility for student learning.

This study showed that culture, sex and age related to differences in instructional style of teachers in patterns similar to the ways in which the variables influenced learning style among students. Among students, sex influenced student preferred learning style to a greater degree than did cultural background by itself. Age was of second importance. Among teachers, sex was found to be the most important variable followed by culture and age, both of which were of similar degree of importance. Cultural background as an isolated variable was relatively unimportant in relation to either learning or instructional style.

ACKNOWLEDGEMENTS

The author wishes to express sincere gratitude to Dr. Del Koenig, for her excellent advice and encouragement during the writing of this thesis. Special gratitude is also expressed to Dr. Murray Scharf for his advice and assistance in the statistical analysis of the data. Sincere appreciation is extended to Dr. Aldrich Dyer for his invaluable encouragement and support to the author. Appreciation is also expressed to Prof. Sonia Cipywnyk, as an external examinor, for her scholarly concern and advice regarding future research.

Appreciation is extended to the Director of Education in Northern Lights School Board No. 113, Mr. Elie C. Fleury, and to the Acting Superintendent in the Board of Education of the Ile-a-la-Crosse School Division, Mr. David Thomson, who permitted this research to be conducted. Special thanks is expressed to the principals, teachers and students for their cooperation and willingness to participate in this study.

The author is also grateful to Dr. Cecil King, Dr. Cathy Littlejohn, the graduate students, and the secretary in the Indian and Northern Education Program, and the Associate Dean of the College of Education, Dr. Earle Newton, for their encouragement and advice to the author.

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CHAPTER 1

1. INTRODUCTION

Unlike the detailed attention given to Native teacher education and Native curriculum development in Saskatchewan since 1973, improvements in teaching methods for Native students have been given only minor consideration by governments and Native organizations. Therefore, beyond the concerns about 'who is teaching' and 'what is being taught', the question remains: how is teaching to be done in order to maximize learning?

Efforts to improve education for Native peoples in Saskatchewan have been undertaken since 1973 in the area of Native teacher education programs. In 1973, the Indian Teacher Education Program (ITEP) was implemented jointly by the Saskatchewan Indian Cultural College and the University of Saskatchewan. This was the first teacher education program in Saskatchewan to "provide Native people with the opportunity to become proficient teachers" (Indian Teacher Education Program, 1985, p.1). According to the record of ITEP graduates, compiled in November, 1985 by the ITEP office, 90 of 132 graduates, or 68.2 percent, were listed as having been hired as teachers. In addition, among ITEP graduates, there were three principals, one vice-principal and nine educational co-ordinators and counsellors.

In 1976, the Northern Teacher Education Program (NORTEP) was established in Lac La Ronge, Saskatchewan, as a teacher education program for Native students. An agreement between the Northern Lights

School Division #113 (NLSD) and the province of Saskatchewan provided for delivery of NORTEP in conjunction with the University of Saskatchewan and the University of Regina. Prior to the beginning of NORTEP in 1976, 98 percent of teachers in Northern Saskatchewan schools were English-speaking Canadians from other areas (Cook & More 1979). As of September 10, 1985, 36 Native teachers were employed by NLSD, or 14.06 percent of the total of 256 teachers. Among the 36 Native teachers working for NLSD, 78 percent were NORTEP graduates as reported by the Director of NORTEP (Cook, April 13, 1986).

The Saskatchewan Urban Native Teacher Education Program (SUNTEP) was established in 1980 to provide training for urban Native students. Programs were set up in Regina, Saskatoon and Prince Albert under the direction of the Gabriel Dumont Institute of Native Studies and Applied Research, in co-operation with the University of Regina and the University of Saskatchewan (Birnie & Ryan 1983, Bouvier 1984). By 1985, SUNTEP had produced 20 graduates with Bachelor of Education degrees or Standard "A" teaching certificates. Nineteen of those were employed in educational institutions with one-half of them teaching in the provincial school system (Saskatchewan Human Rights Commission, 1985).

In part, these programs have been premised on the reasoning that it is Native peoples who have the most intimate understanding of Native traditions, customs and languages. As such, it is they who will be "best able to create the learning environment suited to the habits and interests of the Indian child" (National Indian Brotherhood, 1972, p.18). Furthermore, the Saskatchewan Human Rights Commission in the report entitled Education Equity (September, 1985), concluded that

"persons of Indian ancestry are not receiving equal benefits from the education system of Saskatchewan" (p.79). The report recommended filling teaching positions with qualified teachers of Indian ancestry in numbers equal to the proportion of students of Indian ancestry enrolled in schools of Saskatchewan.

Since 1982, Native curriculum development in Saskatchewan has also received considerable attention. It has been said by members of the Native community and other critics of the education system, that through school curricula, Native peoples are "often cast in an unfavorable light" (National Indian Brotherhood, 1972, p.9). If sensitized to Native perspectives, school curricula should include positive, accurate and up-to-date programs for both Native and non-Native students.

On September 27, 1982, the Native Curriculum Review Committee was established in Saskatchewan "to recommend to the Department of Education principles for curriculum development as they apply to Native students" (Minister's Advisory Committee on Native Curriculum Review, 1984, p.49). In March 1984, this Committee released a report titled A Five Year Action Plan for Native Curriculum Development. In this report, twelve recommendations were made regarding the development of Native curricula. After the recommendations were accepted by the Minister, a new committee called the Indian and Metis Curriculum Advisory Committee was formed to incorporate Indian and Metis content into the provincial core curriculum which was being designed in the 1980s.

Among initiatives taken to improve Native curricula, teaching and learning materials have been designed for the Grade VIII Social Studies program, entitled Apihtowkosan: the Story of the Metis Nation in Western

Canada (Dorion & Dorion, 1982). These materials include both a student activity book and a teacher's guide and resource book. A similar package of teaching and learning materials is the textbook titled The Riel Rebellion: Biographical Approach (Hou & Hou, 1984). These teaching and learning materials have been designed to be used as a part of "locally determined courses" of the Middle Level (grades six to nine) which was proposed by the Core Curriculum Advisory Committee in the report, Program Policy Proposals released in January, 1986.

Although teacher training and curriculum innovations have been undertaken in an effort to improve Native education, few developments have been initiated in the area of improving teaching methods. Research has indicated that Native children process information in a manner different from that of non-Native children (e.g., Goodenough, 1926; Telford, 1932; Berry 1966 & 1971; Steward, 1971; Bland, 1975; Koenig, 1981; Kaulback, 1984). In addition, the Native Curriculum Review Committee also stated as one of the principles and guidelines for Native curriculum development:

> There shall be a recognition that children exhibit different learning styles but that these learning styles cut across cultural and socio-economic groups (Minister's Advisory Committee on Native Curriculum Review, 1984, p.3).

The present study was conducted to provide information concerning possible differences and similarities in learning styles of Cree, Dene, Metis and non-Native students, and the instructional styles of Native and non-Native teachers in Northern Saskatchewan.

1.1 Statement of the Problem

By utilizing Canfield's Learning Styles Inventory: Form E (CLS-Form E) and Canfield's Instructional Styles Inventory (CIS), the main purpose of this study was to assess the congruence or incongruence between learning styles of Cree, Dene, Metis, non-Native students and instructional styles of Native and non-Native teachers in Northern Saskatchewan schools.

To explore both learning and instructional styles as they related to unique cultural backgrounds, the study investigated the following specific questions:

1. Do preferred learning styles differ among Cree, Dene, Metis and non-Native students?

2. Do preferred learning styles of students differ on the basis of sex?

3. Do preferred learning styles of students differ on the basis of age?

4. Do predicted levels of academic performance of students differ on the basis of culture, sex and age?

5. Do preferred instructional styles differ between Native and non-Native teachers?

6. Do preferred instructional styles of teachers differ on the basis of sex?

7. Do preferred instructional styles of teachers differ on the basis of age?

8. Does perceived responsibility of teachers for the students' learning process differ on the basis of culture, sex and age?

9. Is congruence more likely to be found between learning styles of Cree, Dene, Metis and non-Native students and instructional style of Native teachers, than it is between learning styles of Cree, Dene, Metis and non-Native students and instructional style of non-Native teachers?

1.2 Delimitations of the Study

1. The study was limited to a total sample of 464 respondents, consisting of 385 students and 79 teachers selected from four different cultural groups in Northern Saskatchewan.

2. The sample of students was selected from grades seven to nine (Division III), and was composed of 81 Cree, 65 Dene, 132 Metis and 105 non-Native students. This sample limited findings to the learning styles of Division III students only.

3. The study focused on the existence of congruence or incongruence between learning styles of Cree, Dene, Metis and non-Native students and instructional styles of their teachers. Other aspects of learning and instructional interaction were not considered.

4. The conclusions concerning congruence between learning styles of students and instructional styles of teachers was limited to findings as measured by CLS-Form E and CIS.

1.3 Limitations of the Study

1. SAMPLING PROCEDURES: The sample of 385 students of four cultural groups from six schools in Northern Saskatchewan was selected from students at the grade seven to nine level (Division III). The sample of 79 teachers was selected from the same six schools. Since a random sampling technique was not used, the characteristics of subjects and the sample size limited the explanatory potential of findings and conclusions.

2. DATA SOURCE: Data in this study were collected by the use of CLS-Form E and CIS of the Canfield inventories. These inventories have been widely used with students and teachers in the United States and with some other cultures, but no studies could be found where the inventories had been used with Native students and teachers; therefore, questions in the inventories may have contained cultural biases. Norms for Native students and teachers have not been established, so it is not possible to compare the groups in this study to the published norms.

3. DATA COLLECTION: To assess the learning styles of students, the researcher visited six schools in Northern Saskatchewan. During class time, CLS-Form E was administered to the students as a group. Problems could have arisen if the inventory was perceived as a test in which there were right and wrong answers. Hence, misunderstandings about the nature of the assessment could create anxiety in the students. At the same schools, the assessment of instructional styles by the use of CIS was administered to teachers either individually or in small groups. The researcher assumed that most teachers would not have difficulties

completing CIS on a self-administered basis. However, dissatisfaction with CIS itself could occur during the assessment. The results of the assessment, therefore, might be affected by negative reactions to the instrument.

4. ANALYTICAL PROCEDURES: This study used 16 variables to assess and analyze the learning styles of students and instructional styles of teachers on the basis of three independent variables: cultural backgrounds, sex, and age. The sample of students and teachers were not matched on these independent variables. In the student sample, both age and culture together were considered in the process of analyses; in the teacher sample, both age and sex were considered. Because of the requirements of the detailed analyses, the sample classified simultaneously by two independent variables may have affected the findings. In addition, the inventory for learning style required subjects to rank four options in order of preferences in 24 questions. Since four choices were given in each question, a strong preference for one statement would have influenced the level of preference for the other statements.

5. LANGUAGE: The language used for the study was English, which is a second language for the researcher and for some of the respondents. This may have created miscommunication during data collection. In addition, subjects whose first language was not English may have experienced difficulties in understanding the questions.

1.4 Assumptions of the Study

To develop the rationale, design and procedure of the study, it was assumed that:

1. It was possible to identify and describe some of the major aspects of learning styles of students, and the instructional styles of teachers, using CLS-Form E and CIS of the Canfield inventory.

2. The sample used in this study was deemed to be large enough to draw tentative conclusions concerning learning styles, instructional styles and the possibility of congruence between learning styles of students and instructional styles of teachers in Northern Saskatchewan schools.

3. The Cree, Dene, Metis and non-Native students and Native and non-Native teachers chosen for this study were typical of their cultural groups in their way of learning and teaching.

4. The statistical technique chosen was appropriate to analyze the data in this study.

5. The subjects understood the questions clearly enough to respond.

6. The subjects responded honestly to the questions.

7. The researcher was able to be "value-fair" in conducting the research and interpreting the results.

1.5 Hypotheses of the Study

This study tested the following research hypotheses:

Hypothesis 1. Differences would be found in the preferred learning styles of students of Cree, Dene, Metis and non-Native backgrounds.

Hypothesis 2. Differences would be found in the preferred learning styles of male and female students.

Hypothesis 3. Differences would be found in the preferred learning styles of students of different ages.

Hypothesis 4. Differences would be found in predicted levels of academic performance of students on the bases of culture, sex and age.

Hypothesis 5. Differences would be found in the preferred instructional styles of Native and non-Native teachers.

Hypothesis 6. Differences would be found in the preferred instructional styles of male and female teachers.

Hypothesis 7. Differences would be found in the preferred instructional styles of teachers of different age groups.

Hypothesis 8. Differences would be found in the perceived levels of responsibility of teachers for the students' learning process on the bases of culture, sex and age of teachers.

Hypothesis 9. Congruence would be more likely to be found between learning styles of Cree, Dene, Metis and non-Native students and instructional style of Native teachers, than it would be between learning styles of Cree, Dene, Metis and non-Native students and instructional style of non-Native teachers.

1.6 Definition of Terms

For the purpose of the present study, the following terms are defined:

Cultural group refers to subjects who identify themselves as being either Cree, Dene, Metis or non-Native people.

Native peoples is used inter-changeably with aboriginal peoples that, as stated in Section 35 (2) of the Constitution Act, 1982, refers to the Indian, Inuit and Metis peoples of Canada. Since this study focused on the psychological assessment of learning and instructional styles, the legal definition of 'Indian' under Section 2 of the Indian Act is not used. When referring to Indian people, Cree and Dene is used.

Cree is defined as those Indian people who identify themselves as Cree.

Dene is defined as those Indian people who identify themselves as Dene. Often these Indian people living in Northern Saskatchewan are referred to by their tribal name of Chipewyan.

Metis is defined as those people who identify themselves as Metis and who are generally understood to be descendents of Indians and non-Indians.

Non-Native cultural group refers to the group of Canadians of non-aboriginal backgrounds.

Cognitive style is defined as "one's preferred way of receiving information or of gaining meaning from one's environment" (Cranstone & McCort, 1985, p.136).

Learning style is used to describe "the manner in which an individual perceives and processes information in the learning situation" (Rezler and Rezmovic, 1981, p.28). The concept of learning style has a similar meaning to that of cognitive style, except that learning style focuses on an individual's attitudes towards learning situations, materials, teachers and group activities.

Learning preference is often used inter-changeably with learning style but in this study refers to "the choice an individual makes for one learning situation or condition over another" (Rezler and Rezmovic, 1981, p.28).

Canfield's Learning Styles Inventory: Form E (CLS:Form E) is an instrument "devised to measure some of those affective variables that seem to effect learning" (Canfield, 1980, p.1). It was administered in this study to students who were at the fifth grade reading level or above.

Instructional style describes the approach by which an individual provides and presents information in the teaching process.

Instructional preference is often used inter-changeably with instructional style but in this study refers to the choice an individual makes for one teaching approach or condition over another.

Canfield's Instructional Styles Inventory (CIS) is an instrument designed to measure some of those affective variables that seem to influence teaching (Canfield, 1976). It was administered in this study to teachers of Native and non-Native backgrounds.

Learning and Instructional Conditions refers to the inventory category of learning and instructional styles which measures student preferences for conditions of learning and teacher preferences for conditions of instruction.

Learning and Instructional Content refers to the inventory category of learning and instructional styles which measures the comparative interest of students and teachers in the materials being learned and taught.

Learning and Instructional Mode refers to the inventory category of learning and instructional styles which measures the comparative preference for the different modes of learning and teaching.

Expectation refers to students' predicted levels of academic performance.

Responsibility refers to the amount of responsibility a teacher feels towards the students' learning process.

1.7 Significance of the Study

Using CLS-Form E and CIS, the study sought to identify differences and similarities in learning and instructional styles in Northern Saskatchewan schools. The inventories for learning and instructional styles designed by Canfield have not been used with Native students and teachers. Hence, this study was significant in that it provided some information concerning the usefulness of the Canfield inventories for assessing learning and instructional styles of Native and non-Native learners and teachers.

Specially, the study yielded data of interest to three groups of educators:

1. Consultants responsible for inservice programs in Northern Saskatchewan schools. This study showed how instructional styles of Native and non-Native teachers related to learning styles of Cree, Dene, Metis and non-Native students. Based on findings concerning the levels of congruence between learning and instructional styles, some suggestions were made for adjusting teaching methods to match more

closely the learning styles of Cree, Dene, Metis and non-Native students in Northern Saskatchewan schools.

2. Instructors in Native teacher education programs. This study investigated how Cree, Dene, Metis and non-Native students in Northern Saskatchewan learn. Information about preferred learning styles generally shared by Cree, Dene, Metis and non-Native students is available in this study to teacher trainees who start teacher internship in Native schools.

3. Curriculum designers responsible for teaching materials for Native students. As a basis for designing and organizing teaching materials for Native students, this study offers information concerning the preferred learning styles of Cree, Dene, Metis and non-Native students. This knowledge may enable curriculum designers to produce teaching materials more suitable for Native students.

CHAPTER 2

2. BACKGROUND OF THE STUDY

Studies of learning style originated as studies of cognitive style. In an early stage, Witkin (1948a, 1948b, 1948c, 1949, 1950a, 1952) conducted a series of experiments on vertical perception which led him to form the concepts of field-dependent and field-independent cognitive styles. Kolb (1971, 1974) devised an inventory containing four categories of learning styles. This inventory successfully assessed a group of students' overall learning preferences based on the students' subject majors. In the late 1970s, Canfield (1976, 1980) designed multi-dimensional instruments which can be utilized to provide more detailed information on learning and instructional styles.

The following sections review and assess the work of Witkin, Kolb and Canfield. Their contributions to our understanding of learning and instructional styles are discussed. A rationale is presented for the use of the Canfield inventory in this study.

2.1 Witkin's Experiments on Vertical Perception

Researching cognitive styles, Witkin began with a series of rigid experiments which were concerned with how people locate the upright in space. From 1948 to 1952, he developed three kinds of orientation tests, namely the body-adjustment test, the rod-and-frame test and the rotating-room test. The initial concepts of field-dependent and field-independent cognitive styles were derived from these experiments.

2.1.1 The Body-Adjustment Test

The aim of the body-adjustment test was to determine how the upright was established in the absence of a surrounding visual field. To eliminate the visual field, the subject was located in a completely darkened room. The visual datum was a luminous rod. The subject had to adjust the rod to the true vertical and horizontal. The positions of the subject's head and body were varied systematically to compare the accuracy of judgement in each position (Witkin, 1948a, 1948b, 1948c, 1949).

From the third experiment of this test, it was found that the "errors vary in magnitude with the amount of body tilt, the largest error occurring when the body is in a horizontal position" (Witkin, 1948c, p.610). It was clear that when the body was upright, postural factors were adequate for judging the vertical and horizontal, but when the body was tilted, postural factors provided a less effective basis for judgement. In addition, some subjects seemingly did much more poorly than others (Witkin, 1948c). This result indicated that individual factors affected the magnitude of errors.

Witkin considered intellectual factors not to be an issue. As a college population was used for subjects, they had considerably more intellectual capacity than was required for the tasks in the experiment (Witkin, 1949). Thus, the possibility of another factor remained in this study. Under six different conditions, 45 subjects out of 274 became ill, so that some errors may have been caused by "the suppression

of certain experiences under conditions of sensory conflict" (Witkin, 1949, p.45).

2.1.2 The Rod-And-Frame Test

Following the body-adjustment test, Witkin devised the more detailed test called the rod-and-frame test. The aim of experiments with the rod-frame test was to examine how visual frameworks of different tilts and different body positions affected perception of the upright. In this test, the visual field consisted of a simple luminous frame which was contained in a completely darkened room. A luminous rod was located within the frame. The subject had to set the rod to the vertical and horizontal. The frame was tilted 28 degrees right, 28 degrees left, or erect. At the same time, the body was also erect or tilted 28 degrees left. In this experiment, 53 adults were used as subjects (Witkin, 1948d).

When the body was tilted 28 degrees left and the frame was tilted 28 degrees right, the figure of distributions clearly showed individual differences in perceiving the upright (Witkin, 1948d). In his discussion of findings of thses studies, Witkin made the following important observation:

> There were subjects who, despite the tilt of the frame, brought the rod close to the true vertical and horizontal: at the other extreme subjects perceived the tilted frame as upright, and aligned the rod with it (Witkin, 1948d, p.781).

To generalize this result, some people were strongly affected by the surrounding field while others were able to escape this influence and

locate the upright independently. However, the distributions of scores in this experiment did not reveal two distinguishably different groups. What was found was a variety of individual responses rather than two distinct ways of perceiving the upright.

2.1.3 The Rotating-Room Test

The aim of the rotating-room test was to determine how a basic change in postural factors affects perception of the upright. To accomplish such a change in postural factors, the subject was seated in a completely enclosed room, and rotated about a circular path. Under this condition, the force acting upon the subject's body was changed from the true upright. The task of the subject was to adjust a rod on the front wall of the room to the true vertical and horizontal during rotation conducted at two speeds. A total of 258 subjects participated in the various experiments (Witkin, 1950a).

The results of the experiments were reported according to the presence or absence of an upright visual field at a lower or higher speed. In the presence of the upright visual field at the lower speed, (the force on the body shifted by 20.5 degrees), the mean error in adjusting the rod to the vertical and horizontal was 3.1 degrees. At the higher speed (the force on the body shifted by 33.4 degrees) the mean error was 6.3 degrees. In the absence of the upright visual field, the mean error rose to 10.7 degrees at the lower speed and 24.7 degrees at the higher speed. In this set of studies, Witkin found marked individual differences of perception in establishing the upright during rotation (Witkin, 1950a).

Furthermore, Witkin indicated two distinguishable groups. Subjects who tilted their bodies far toward the tilted room in the body-adjustment test were also likely to tilt the rod far toward the tilted frame in the rod-and-frame test and to align their bodies with the upright room in the rotating-room test. In contrast, the subjects in the other group brought their bodies close to the true upright in the body adjustment test, regardless of room position. They were also likely to separate the rod from the frame in the rod-and-frame test and adjust the rod close to the upright. In addition, they were also likely to tilt their bodies toward alignment despite the centrifugal force acting upon them (Witkin & Goodenough, 1981).

2.1.4 Summary

From reviewing the three kinds of orientation tests used by Witkin, it is possible to summarize the results of the experiments into four points:

(1) There were individual differences among subjects. Throughout three kinds of orientation tests, Witkin found that subjects were markedly different from one another in their performance. This may indicate that each individual has his own preferred way of integrating information for locating the upright.

(2) There were self-consistencies among subjects. The results of Witkin's three orientation tests indicated that each individual tended to use the same way of integrating information for locating the upright under various conditions.

(3) There seemed to be two distinguishable groups among subjects. Although it was not clearly shown in the two extreme distributions of scores in Witkin's three orientation tests, subjects could be separated into two different groups.

(4) The results of the experiments might not be related to the intelligence of the subjects. Adults who were considered to be able to manipulate tasks were used as subjects in Witkin's three orientation tests. Because of the very simple tasks executed in the experiments, errors made by subjects would not be caused by their lack of intelligence. This indicated that the way of integrating information for locating the upright had no relation to intelligence.

2.2 Witkin's Dichotomous Concepts of Cognitive Styles

Generalizations from the experimental results of the three orientation tests were limited to the perception of the upright. To continue his experiments, Witkin carried out a new kind of test called the embedded figures test. Based on the results of this test, he mapped out definitions of two tendencies: field dependence and field independence. Later on, these definitions were developed into the general concepts of field-dependent and field-independent cognitive styles. Retracing these steps will clarify the explicit definitions of field dependence and field independence as one aspect of human cognitive styles.

2.2.1 The Embedded Figures Test

The purpose of the embedded figures test was to demonstrate how contextual factors affect perception. The test used by Witkin was originally devised by Gottschaldt (1920). Subjects in this test were required to find simple figures within complex ones. Witkin chose eight of Gottschaldt's original simple figures and 24 complex figures. To develop an additional means of obscuring the simple figures, Witkin colored the complex figure so as to reinforce a given pattern and its subpatterns. Test data treated both the distributions of time scores for men and women and the solution time for individual complex figures (Witkin, 1950b).

In the test, the average performance of women was significantly poorer than that of men. There were 88 instances of failure for women, compared with 35 for men in the entire series. Witkin considered that women possess "stronger adherence to the structure of the presented field" (1950b, p.13). Along with this, Witkin also found remarkable individual differences. Furthermore, Witkin reported that the subjects tended to be self-consistent in performance (1950b). This observation may suggest that individual differences are caused by personal factors in each subject.

As with the results of the three orientation tests, the embedded figures test showed subjects who did well and subjects who did poorly (Witkin, 1950b). Witkin offered the same explanation as used for the previous tests; subjects who performed poorly had a tendency to adhere

to the pattern of the complex figure while subjects who performed comparatively well escaped this influence.

Witkin's results for the embedded figures test were similar to those of the three orientation tests; remarkable individual differences, self-consistencies and two distinguishable groups among subjects. However, the relatively high correlation between the embedded figures test and the intelligence test (Witkin, 1950b) showed that the intellectual capacity of the subject might influence the results of the embedded figures test.

2.2.2 Definition of the Dichotomous Concepts

From the findings of the body-adjustment test, the rod-and-frame test, the rotating-room test and the embedded figures test, it may be concluded that each individual had his own preferred way of integrating information. Added to this, individuals tended to be self-consistent in performance. Hence, each individual appeared to retain a preferred way of integrating information over time.

On the other hand, individuals could be separated into two groups based on their performances in the tests. There were poorly-performing individuals who had a tendency to see the field as a single unit. Witkin named this tendency 'field dependence'. On the other hand, individuals who performed well had a tendency to see the objects in their field of vision as separate units. He named this tendency 'field independence'. Witkin asserted that as the individual tends to be self-consistent in performance, field dependence and field independence

among individuals will stay constant over time and may appear under various conditions.

The experiments concerned with field dependence and field independence have been replicated by many researchers using different approaches. Based on a review of studies, Witkin indicated certain social characteristics of field-dependent and field-independent persons.

> Field-dependent persons showed a significant increase in a cluster of nonverbal behaviors, such as the palms-up gesture, mouth touching, forward leaning (Witkin, Moore, Goodenough & Cox, 1977, p.12).

These behaviors were interpreted as an "expressive of need for closeness to others" (Witkin, Moore, Goodenough & Cox, 1977, p.12). In contrast, field-independent persons "showed significantly more nonverbal behaviors, such as arm crossing, leg crossing, absence of forward leaning" (Witkin, Moore, Goodenough & Cox, 1977, p.12). Witkin stated that differences concerning social distance preference exhibited "the boundaries between self and the world outside, particularly other people" (Witkin, Moore, Goodenough & Cox, 1977, p.3). In other words, field-dependent people are more likely to rely primarily on external references. Field-independent people, by contrast, are likely to rely on internal references. Thus, it appears from the research that there are two extreme tendencies in the processing of information.

If the term 'cognitive style' can define "how individuals conceptally organize the environment" (Goldstein & Blackman, 1977, p.462), field dependence and field independence possibly represent one facet of cognitive style. Thus, field-dependent and field-independent

cognitive styles may be conceptually more universal than the original definition.

2.2.3 Ambiguous Points of Field-Dependent and Field-Independent Cognitive Styles

An examination of the dichotomous concepts of field-dependent and field-independent cognitive styles requires a consideration of human developmental factors and social factors.

Developmental psychologists such as Jean Piaget claimed that there was a universal sequence in human development. Piaget postulated four stages of human intellectual development identified through his experiments. At the fourth stage, 'formal operations', the person becomes capable of thinking abstractly beyond immediate sensory experience (Swenson, 1980, p.462). The definition of this period is, more or less, similar to the concept of field-independent cognitive style. Therefore, field-dependent cognitive style may be associated with an earlier stage of development and ascend toward field-independent cognitive style.

Concerning this matter, Witkin organized an experiment to examine the stability of cognitive style using two groups: one group from 8 to 13 years old and another group from 10 to 24 years old. Up to age 17, he found a great increase in the extent of field independence, with no further change from 17 to 24 years old. Within this general tendency, subjects showed relative stability in the extent of field dependence (Witkin, Goodenough & Karp, 1967).

It is held generally that every society teaches behaviors, attitudes and values that are understood and acceptable in that society. These messages are conveyed through child rearing, education, role learning and rites of passage (Plog & Bates, 1980). Within multicultural societies, factors of socialization vary greatly and human cognition is formed in more complicated ways than those of mono-cultural societies. Furthermore, members of every society classify their positions in society according to age, sex, family background, wealth, occupation, educational background and so on. Because of the great variety of social factors that influence personality formation, it is not easy to identify factors which affect field-dependent and field-independent cognitive styles.

2.2.4 Summary

After discussing the research concerning feld-dependent and field-independent cognitive styles, it is possible to generalize knowledge about these concepts into three points.

(1) Field-dependent and field-independent cognitive styles may be general concepts that can apply to various conditions. A field-dependent cognitive style refers to a way of organizing and processing information in which the field is seen as a single unit. This definition includes a tendency to rely mainly upon external references. Field-independent cognitive style refers to a way of organizing and processing information in which the objects in one's field of vision are seen as separate units. This definition includes a tendency to rely upon internal references.

(2) The relationship between the intelligence of subjects and their cognitive styles cannot be clearly indicated on the basis of the four tests. In contrast to the results of the three orientation tests which indicated no relation between the results of the tests and intelligence, a relatively high correlation was found between the embedded figures test and the intelligence test. Hence, the intellectual capacity of subjects might influence results of the embedded figures test.
(3) The concepts of field-dependent and field-independent cognitive styles is only one way of conceptualizing human cognition. Since many factors are involved in the formation of cognitive styles, it is difficult to identify cognitive style by using only one set of dichotomous concepts, field dependence and field independence. Therefore, it may be necessary to consider other aspects of cognitive styles in order to illustrate a total image of human cognition.

2.3 Kolb's Learning Styles Inventory

The dichotomous concepts of field-dependent and field-independent cognitive styles as identified by Witkin classified human cognition into two categories. Hence, an increase in the number of research dimensions regarding human cognition may be required in order to improve an assessment of cognitive styles. One researcher who added to the growing body of information regarding cognitive styles was Kolb.

2.3.1 Experimental Learning Model

The concept of learning style differs slightly from that of cognitive style, which may be defined as "one's preferred way of

receiving information or of gaining meaning from one's environment" (Cranstone & McCort, 1985, p.136). Although the concept of learning style has a similar meaning to that of cognitve style, learning style focuses on an individual's attitudes towards learning situations, materials, teachers and group activities. Because learning style describes actual learning situations, the measurement criteria more clearly specify conditions of learning than do those of cognitive style.

According to Kolb (1971, 1974), learning theoretically is undertaken on the basis of a four-stage cycle, the so-called experimental learning model. At first, a learner will openly and fully experience a new situation without bias (i.e., Concrete Experience). Successively, he will be able to reflect upon and observe his experiences from various perspectives (i.e., Reflective Observation). Furthermore, he will create abstract concepts that may explain and generalize what he has observed (i.e., Abstract Conceptualization). Finally, the learner will use these abstract concepts and generalizations to make decisions and to solve problems (i.e., Active Experimentation). This process repeats by returning to the first stage. Kolb, consequently, assumed that the learner needs four different abilities corresponding to each stage of the experimental learning model.

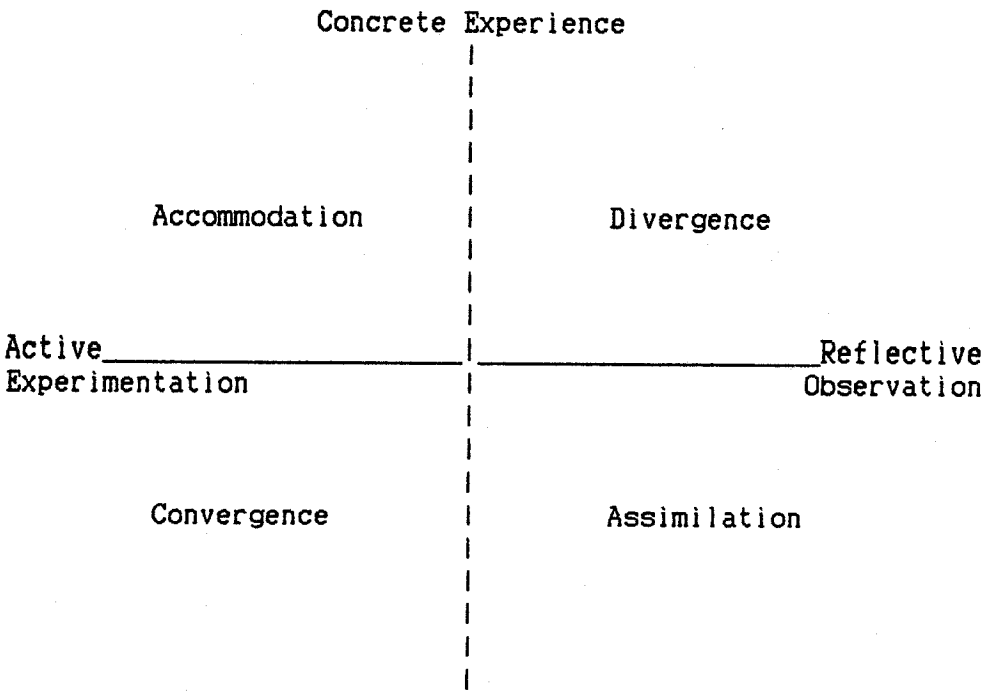
2.3.2 Development of Learning Styles Categorization

In Kolb's experimental learning model, there are four stages which require four different abilities. Kolb questioned whether the learner developed all of these abilities, and acted as the model describes. In

most cases, the learners continually chose a set of learning abilities which were used in specific learning situations (Kolb, 1974, p.28). Hence, Kolb considered that an individual may develop his own preferred learning style rather than developing all-round abilities required to circulate the learning process. To describe learning styles of individuals, Kolb (1971, 1974) set up two primary dimensions of the learning process based on the experimental learning model shown in Figure 1. The first dimension is drawn from Concrete Experience at one end of the axis and Abstract Conceptualization at the other end. This dimension describes two opposite types of learning processes; concreteness, which implies learning by immediate experience, and

Figure 1

Learning Styles and the Learning Process



(Kolb, 1974, p.35)

abstraction which implies learning by the formation of concepts. The second dimension is drawn from Active Experimentation at one end of the axis and Reflective Observation at the other end. Active Experimentation in the learning process refers to testing the implications of hypotheses, while Reflective Observation refers to the interpretation of experiences.

By crossing the two dimensional axes, four categories are formed. These categories of learning style are named Convergence, Divergence, Assimilation and Accommodation. Each learning style has two dominant learning abilities: Abstract Conceptualization and Active Experimentation for Convergence; Concrete Experience and Reflective Observation for Divergence; Abstract Conceptualization and Reflective Observation for Assimilation; and Concrete Experience and Active Experimentation for Accomodation. Using these four categories, Kolb developed the Learning Styles Inventory which contained nine items, each consisting of four words. The subject was required to rank the words in order to characterize his learning style (Kolb, 1974). As such, Kolb's Learning Styles Inventory was devised theoretically according to the experimental learning model.

2.3.3 The Use of Kolb's Learning Styles Inventory in Research

Kolb's Learning Styles Inventory has been used by various researchers. Research findings are generally reported in terms of overall assessment of learning style, change of learning style,

relationships between learning style and career choices, and relationship between learning style and personality factors. Applicability of the assessment to actual classroom learning will be examined through these research findings.

Assessing learning style, Hudson, in Kolb(1971), analyzed the data of his study on the basis of the students' subject majors. Students majoring in the social sciences such as education/liberal arts, history and philosophy, were located in the category of Divergence while those in sciences such as engineering and physics were located in the category of Convergence. In addition, another study (Carrier, Newell & Lange, 1982) indicated that most dental hygiene students were located in the categories of Accommodation and Divergence. Laschinger and Boss (1984) also conducted studies using incoming nursing students and more advanced nursing students. The results showed that a majority of students were located in the category of Accommodation or Divergence.

Concerning changes in learning style, Cahill and Madigan (1984) conducted research using students in an occupational therapy class. During the first week of classes, a pretest was administered. A posttest was administered at the end of four quarters of academic course work. The study found no significant difference between the pretest and the posttest scores on Kolb's Learning Styles Inventory and the Rezler-French Learning Preference Inventory (a type of assessment similar to Kolb's inventory). Between the pretest and the posttest, students devoted their time in the following ways: 10 percent followed the traditional lecture format; 20 percent used small group, laboratory and tutorial format; and 70 percent used a guided independent study

format. According to this study, Cahill and Madigan concluded that "students who were involved in different modes of learning over a one-year time period exhibited no significant change" (p. 686).

Wunderlich and Gjerde (1978) reported that there was no association between learning style assessed by Kolb' Learning Style Inventory, and career choices in the field of medicine. In addition, using the same instrument, Laschinger and Boss (1984) conducted a study on the learning style of nursing students and their career choices. In their study, no relationship was found between learning style and preferred nursing specialty.

Furthermore, another study examined the relationship between learning styles described by Kolb and seven personality factors (West, 1982). The result indicated that students in the category of the Convergence learning style had significantly higher scores on the personality factor of the social acceptability dimension while no other significant differences were found. On the basis of Kolb's model, however, those in Convergence were expected to score higher on the theoretical, internal control and independence personality factors; hence, the research finding by West was contradicted by these personality characteristics. West concluded that the categories of learning style may not accurately represent the personality types described by Kolb and, hence, may not be effective in describing the individual's preferred learning style within the medical education context.

2.3.4 Summary

After reviewing how Kolb developed the categories of learning style and the results of research which used Kolb's inventory, it is possible to generalize four points.

(1) Kolb theoretically developed the Learning Styles Inventory according to an experimental learning model. Kolb formed a four-stage model of the learning process. Linking the four points of the stages in the cycle, two dimensions were drawn. These dimensions and the four-stage cycle created four categories which indicated four different learning styles (see Figure 1).

(2) Kolb's Learning Styles Inventory may indicate student's learning style on the basis of the students' subject majors. Some studies showed differences of learning style among students on the basis of the students' subject majors. This finding implies that students within the same area of subject major tend to share the same type of learning style.

(3) Learning styles assessed by Kolb's Learning Styles Inventory may be relatively stable over a fairly long time. Cahill and Madigan (1984) found that students' learning style showed no significant change over a period of one year. During this period, students had experienced different modes of learning; therefore, this finding may indicate that students' learning style will not change by experiencing different learning situations over one year of time.

(4) Kolb's Learning Styles Inventory will provide only the overall learning style of individuals. Since there is no known relationship

between students' learning style and career choices among medical and nursing students (Wunderlich & Gjerde, 1978; Laschinger & Boss, 1984), Kolb's Learning Styles Inventory may not be useful for assessment beyond the general learning style shared by medical and nursing students. It tends to show overall preferences regarding learning style. Hence, Kolb's Learning Styles Inventory may not provide adequate information for the development of specific education programs and teaching methods congruent with students' learning style.

2.4 Canfield's Learning Styles Inventory

One of the limitations which has been discussed is that Kolb's Learning Styles Inventory can assess only overall learning styles of individuals. More specific data on learning styles is required to provide detailed assessment. Canfield (1976, 1980) designed multi-dimensional inventories to assess both learning and instructional styles.

2.4.1 Multi-Dimensional Assessment of Learning Styles

Dunn (1983) analysed basic elements of learning style. She explained that learning style is comprised of a combination of environmental, emotional, sociological, physical and psychological elements. Furthermore, in a study of more than 20,000 subjects, it was found that there were no fewer than six elements strongly affecting one's learning style and that generally, most people possess between six and 14 elements of learning style.

An assessment called Canfield's Learning Styles Inventory was contrived to assess learning style from various perspectives. Blagg (1985) compared cognitive style and learning style as predictors of academic success. Three different assessments were used: the Hidden Figures Test for cognitive style, the Canfield Learning Styles Inventory for learning style, and the Master's Comprehensive Examination for academic success. The results showed that there was no correlation between academic success and cognitive style as measured by the above instruments. By contrast, "over 20 percent of the variance in scores on the multiple-choice section of the Master's Comprehensive Examination was explained by four learning style variables: Listening, Organization, Independence and Direct Experience" (Blagg, 1985, p.94). Because of the high correlation between students' learning style components and academic success, Blagg concluded that it may be possible to predict the academic success of students from describing the learning style variables of listening and organization. Although the total number of subjects in Blagg's study (N=51) was not large enough to draw definitive conclusions, the study provided some evidence that a multi-dimensional assessment of learning style can be used as a predictor of students' academic success.

2.4.2 Development of Learning and Instructional Styles Assessments

Blagg's study showed that Canfield's Learning Styles Inventory can be used as a predictor of academic success. To correspond to his measure of learning style, Canfield devised the instrument to assess

instructional style. By using these two instruments, it became possible to directly compare students' learning styles with teachers' instructional style.

Raines (1977) conducted a study of the learning style of mathematics students and the instructional style of teachers. The research indicated that students with high academic achievement showed closer correlation of learning style to teachers' instructional style. Using the students and faculty members of the academic area of physical therapy in the United States, Payton, McDonald and Hirt (1980) found "an unexpectedly high level of agreement between students and faculty members in preferred modes for teaching and learning" (p.1281). Within this general trend of similarity, large discrepancies were found in the authority, competition, numeric and reading scales.

2.4.3 Cultural Factors and Learning Style

The results of studies using both Canfield's Learning Styles Inventory and Instructional Styles Inventory showed that there were significant differences between males and females in community college students in the United States (Canfield, 1980; 1976). Accordingly Canfield developed learning style norms for males and females. In addition, comparing those above 25 years of age and those below 25 years, significant differences were found. However, no studies have been conducted on cross-cultural situations in learning style using the Canfield inventories.

In a cross-cultural study by Steward (1971), seven ethnic groups were examined to identify the process of how parents teach their

preschool-age children. This study used a direct observational method and concluded that there are "stable constellations of behavior within ethnic groups" (Steward, 1971, p.21). As to interpreting the results of this study, the term 'group personality pattern' used by Benedict (1959) would seem to be appropriate in referring to cultural differences in learning patterns. Benedict describes 'group personality pattern' as meaning that members of a culture have great similarities in ways of thinking and behaving.

Koenig (1981) conducted a cross-cultural study of the 'cognitive styles' of Native and non-Native peoples in Northern Canada and Alaska. She reached the following conclusions:

> ...the non-native sample was the most analytical in thinking style. A portion of the Inuit group was almost as strongly analytical as the non-natives. The Indian group while not strongly analytical was definitely not identified with any other style. In contrast, the Metis group showed no tendency towards being analytical but rather tended towards the relational style (pp. 176-177).

The findings indicate to a modest degree that each cultural group tends to have a dominant cognitive style.

In addition to Koenig's study, Bland (1975) reported that "a basic difference in cognitive strengths and abilities does exist between Navajo, Hopi, and Jicarilla school children and Caucasian school children" (p.91). Koenig's concept of 'cognitive styles' and Bland's concept of 'cognitive strengths and abilities' statistically support Benedict's more general notion of 'group personality pattern'.

Further detailed studies of Native peoples have been undertaken using the Illinois Test of Psycholingustic Abilities. In a review of such studies discussed, Kaulback (1984) concluded that:

> ...both Indian and Inuit children are most successful at processing visual information and have the most difficulty performing well on tasks saturated with verbal content (Kaulback, p.30).

Since non-Native children tend to show better performance on non-verbal tasks, it can be inferred that Native children may gather information in a manner different from that of non-Native children. In classroom situations, these results may reflect a difference in the preferred learning style of Native students. However, it should be noted that the Illinois Test of Psycholingustic is basically designed to measure students' performances in English. Since Native children have grown up with a different cultural and lingustic environment, it is not appropriate to draw a conclusion based only on this type of test.

2.4.4 Summary

After discussing the multi-dimensional assessment of learning and instructional styles, it is possible to generalize three points. (1) The multi-dimensional assessment of learning style provides some information as a predictor of students' academic success. The high correlation between students' learning style and academic success as indicated by Canfield's inventory suggests that administration of Canfield's Learning Syles Inventory may provide some information about the predicted academic success of students.

(2) By using Canfield's Learning Styles Inventory, it may be possible to compare students' learning style with teachers' instructional style. Canfield designed the assessment of instructional style to correspond to his Learning Styles Inventory. Each of the assessments contain sixteen scales of learning and instructional styles. These scales will assist in providing relatively detailed information concerning the level of congruence between learning and instructional styles.

(3) Cultural differences should be considered as an influential factor of learning and instructional styles. Although learning and instructional styles have been found to differ on the basis of sex and age, cultural differences have not been clearly indicated. Therefore, Canfield's Learning Styles Inventory and Instructional Styles Inventory could be used to examine learning and instructional styles on the basis of cultural differences.

2.5 Rationale for Instrument

Witkin formed the dichotomous concepts of field-dependent and field-independent cognitive styles which classified human cognition into two categories. It is, however, difficult to identify an individual's cognitive style by using only one set of concepts. Therefore, an increase in the number of research dimensions regarding human cognition may be required in order to improve an assessment of cognitive styles.

Kolb theoretically developed the Learning Styles Inventory according to an experimental learning model which contained the four categories of learning style. However, the research using Kolb's inventory indicated that there were no relationships between the

students' learning styles and the career choices among medical and nursing students. These findings may suggest that Kolb's Learning Styles Inventory may not be useful for providing adequate information for the development of specific education programs and teaching methods congruent with the students' learning style.

In order to provide more specific data on learning styles, Canfield designed multi-dimensional inventories to assess both learning and instructional styles. Since a high correlation was found between the students' learning style components and academic success, administration of Canfield's Learning Syles Inventory may be useful to predict the academic success of students. In addition, Canfield designed the inventory of instructional style in correspondence to the inventory of learning style. The study of the learning style of mathematics students and the instructional style of teachers suggested that students with high academic achievement showed closer correlation of learning style to teachers' instructional style. Despite these research findings, the previous research has not found cultural differences in learning and instructional styles.

Utilizing Canfield's Learning Styles Inventory and Instructional Styles Inventory, this study was conducted to provide detailed information on learning styles of Cree, Dene, Metis and non-Native students, and instructional styles of Native and non-Native teachers in Northern Saskatchewan schools. Furthermore, these two inventories were used to measure the level of congruence between learning styles of students and instructional styles of teachers with different cultural backgrounds in Northern Saskatchewan schools.

CHAPTER 3

3. METHOD OF THE STUDY

CLS-Form E and CIS OF Canfield's inventories were the major instruments used to assess learning and instructional styles. This Chapter includes a discussion of the scales, the scoring procedures, and inventory reliability and validity. The null hypotheses, the sample selection, the sample, data collection and statistical analyses used in the study are also described.

3.1 Scales of CLS-Form E and CIS

CLS-Form E is an instrument designed to measure the learning style preferences of individuals. CIS is designed to measure instructional style preferences. Scores on these two inventories may be compared to assess the existence of congruence between learning and instructional styles.

CLS-Form E is composed of 30 items which require the subject to rank four options in order of preference for each item. It is to be used with students who have fifth grade reading levels or above. On the other hand, CIS consists of 25 items which also contain four ranking choices for each. As with CLS-Form E, the subjects are required to rank these four options in order of preference.

There are three categories of scales common to CLS-Form E and CIS: namely, (1) Conditions, (2) Content and (3) Mode. Furthermore, each

instrument includes an independent category: (4) Expectation, for CLS Form-E and (5) Responsibility, for CIS (Canfield, 1980, 1976).

(1) **CONDITIONS:** This category measures student preferences for learning conditions and measures those conditions under which students perform best. The conditions are divided into eight scales with both CIS-Form E and CIS.

(a) Peer [P]

Learning Style: Working in student teams; good relations with other students; having student friends.

Instructional Style: Having students work in teams; encouraging good relations among students; having students become friends.

(b) Organization [O]

Learning Style: Desiring course work which is logically and clearly organized; meaningful assignments and sequence of activities.

Instructional Style: Organizing course work logically and clearly; giving meaningful assignments and sequence of instructional activities.

(c) Goal Setting [G]

Learning Style: Setting one's own objectives; using feedback to modify goals and procedures; making one's own decisions on objectives.

Instructional Style: Letting students set their own objectives; providing feedback to help them modify goals and procedures; letting students make their own decisions on objectives.

(d) Competition [C]

Learning Style: Desiring competition with others; the need to know how one is doing in relation to others.

Instructional Style: Creating situations where students are compared with one another; getting students to compete among themselves.

(e) Instructor [Is]

Learning Style: Knowing the instructor personally; having mutual understanding; liking one another.

Instructional Style: Encouraging the students to know the instructor personally; developing mutual understanding; liking one another.

(f) Detail [De]

Learning Style: Requiring specific information on assignments, requirements, rules, etc.

Instructional Style: Providing specific information on assignments, rules, requirements, etc.

(g) Independence [Id]

Learning Style: Working alone and independently; determining one's own study plan; doing things for oneself.

Instructional Style: Encouraging students to work alone and independently; letting them plan for themselves.

(h) Authority [A]

Learning Style: Desiring classroom discipline and maintenance of order; having informed and knowledgeable instructors.

Instructional Style: Maintaining classroom discipline and order; setting high standards and demanding student performance.

(2) CONTENT: This category measures the comparative interest of students and teachers in the curriculum. The content consists of the four different scales of typical curriculum in both CLS-Form E and CIS.

In this category, the scales of learning style assessed by CLS Form E possess the same meanings as those of instructional style by CIS.

(a) Numeric [N]

Learning and Instructional Style: Learning and teaching about numbers and logic; computing, solving mathematical problems, etc.

(b) Qualitative [Q]

Learning and Instructional Style: Learning and teaching about words or language; writing, editing, talking.

(c) Inanimate [Ia]

Learning and Instructional Style: Learning and teaching about working with things: building, repairing, designing, operating.

(d) People [P]

Learning and Instructional Style: Learning and teaching about working with people; interviewing, counseling, selling, helping.

(3) MODE: This category measures the comparative preferences for the different modes of learning and instructional processes. The mode consists of four different preferred instructional processes from the learners' perspective (CLS-Form E) and four different preferred approaches of the instructors (CIS).

(a) Listening and Lecturing [L]

Learning Style: (Listening) Hearing information; tapes, lectures, speeches, etc.

Instructional Style: (Lecturing) Giving information by lectures, tapes, speeches, etc.

(b) Reading [R]

Learning Style: Examining the written word; reading texts, pamphlets, etc.

Instructional Style: Providing written words as in reading texts, pamphlets, etc.

(c) Iconics [Ic]

Learning Style: Viewing visual materials: movies, slides, pictures, graphs, etc.

Instructional Style: Showing visual materials such as movies, slides, pictures, graphs, etc.

(d) Direct Experience [Di]

Learning Style: Students engaged in laboratory, shop and field trip exercises, etc.

Instructional Style: Organizing students for shop, laboratory and field trip exercises, etc.

(4) EXPECTATION: This category measures the individual's predicted level of performance. There are four levels of expectation for performance which correspond to the four scales of CLS-Form E.

A: A outstanding level.

B: A good level.

C: A satisfactory level.

D: An unsatisfactory level.

Based on these four expectation scales, the overall expectancy score will be calculated into a single score. The higher point on the score indicates the stronger prediction of success.

(5) RESPONSIBILITY: This category measures the comparative amount of responsibility a teacher feels towards the students' learning process.

There are four levels of perceived responsibility assessed by the four scales of CIS.

I: Takes primary or major responsibility for student learning.

I/S: Takes most responsibility but shares with student.

S/I: Takes minor responsibility and student has major learning responsibility.

S: Primary or total responsibility for learning is on the student.

Based on these four responsibility scales, the overall responsibility locus will be calculated as a summary score of perceived responsibility for the students' learning process.

3.2 Scoring of CLS-Form E and CIS

Subjects are required to rank four options (from 1 to 4) in order of preference on 30 items of CLS-Form E. This ranking gives the score for each item (refer to Figure 2). The score of each scale is calculated by adding across each row of the answer sheet. Six items which are randomly distributed throughout the total relate to each learning style scale (component). The totals of the six items are recorded in the column headed 'DO NOT WRITE IN THIS COLUMN'.

To arrive at the overall Expectancy score, the following calculation formula is utilized:

$$3A + B - D$$

A: The total score of 5.a. of the answer sheet

B: The total score of 5.b. of the answer sheet

D: The total score of 5.d. of the answer sheet

CIS consists of twenty-five items each of which contains four options. As with CLS-Form E, a subject is required to rank these four options in order of preference. The computation process is the same as in CLS-Form E except that each row of the answer sheet has five items. The calculation formula for the overall responsibility score is also the same as that for Expectancy on CLS-Form E.

Figure 2

Answer Sheet of Learning Style Inventory

					DO NOT WRITE IN THIS COLUMN
1.a.___	6.a.___	11.a.___	16.a.___	21.a.___	26.a.___	_____
b.___	b.___	b.___	b.___	b.___	b.___	_____
c.___	c.___	c.___	c.___	c.___	c.___	_____
d.___	d.___	d.___	d.___	d.___	d.___	_____
2 a.___	7.a.___	12.a.___	17.a.___	22.a.___	27.a.___	_____
b.___	b.___	b.___	b.___	b.___	b.___	_____
c.___	c.___	c.___	c.___	c.___	c.___	_____
d.___	d.___	d.___	d.___	d.___	d.___	_____
3.a.___	8.a.___	13.a.___	18.a.___	23.a.___	28.a.___	_____
b.___	b.___	b.___	b.___	b.___	b.___	_____
c.___	c.___	c.___	c.___	c.___	c.___	_____
d.___	d.___	d.___	d.___	d.___	d.___	_____
4 a.___	9.a.___	14.a.___	19.a.___	24.a.___	29.a.___	_____
b.___	b.___	b.___	b.___	b.___	b.___	_____
c.___	c.___	c.___	c.___	c.___	c.___	_____
d.___	d.___	d.___	d.___	d.___	d.___	_____
5.a.___	10.a.___	15.a.___	20.a.___	25.a.___	30.a.___	_____
b.___	b.___	b.___	b.___	b.___	b.___	_____
c.___	c.___	c.___	c.___	c.___	c.___	_____
d.___	d.___	d.___	d.___	d.___	d.___	_____

In each scale of six questions, the mean scores of 15.00 for CLS and 12.50 for CIS indicate neither a high nor a low preference. Since a

first choice on each item gives a score of one, the lower the score, the higher the preference. In this study, the degrees of preference on scales of CLS and CIS are labelled as follows:

[CLS]

6.00 to less than 12.00: very high preference

12.00 to less than 13.50: high preference

13.50 to less than 14.50: slightly high preference

14.50 to less than 15.50: neither high nor low preference

15.50 to less than 16.50: slightly low preference

16.50 to less than 18.00: low preference

18.00 to 24.00: very low preference

[CIS]

5.00 to less than 10.00: very high preference

10.00 to less than 11.00: high preference

11.00 to less than 12.00: slightly high preference

12.00 to less than 13.00: neither high nor low preference

13.00 to less than 14.00: slightly low preference

14.00 to less than 15.00: low preference

15.00 to 20.00: very low preference

The scores labelled as very high preference indicated that for each of the questions, the option selected was a first or a second choice (2.00X6=12.00 for CIS and 2.00X5=10.00 for CLS). The label of very low preference indicated that the option was a third or fourth choice within the six questions (3.00X6=18.00 for CIS and 3.00X5=15.00 for CLS). Differences within 0.50 of the means of 15.00 for CLS and 12.50 for CIS were considered to indicate neither a high nor a low preference. These

ranges of scores and the labels were used to explain the mean scale scores of any group independently from other groups.

When comparing mean scores within groups classified by culture, sex and age, the expressions of 'strong preference' or 'positive preference'; and 'weak preference', 'negative response' or 'negative reaction' were used to describe the degrees of preference. Both inventories required subjects to rank four options in order of preference in each of the questions which produce scores on 16 learning and instructional styles scales. Since four options were available in each question, the first choice influenced the other three choices, although the second indicated a choice that was relatively strong. Since the third choice determined the fourth, they were not independent choices. Because the inventories used a forced-choice format it was not possible to interpret responses as a Likert-type scale. This aspect of the Canfield inventories dictated the type of analyses which could be used, and impacted on the findings.

3.3 Reliability

Reliability tests for both CLS-Form S-A and CIS have been conducted by Canfield (1980; 1976).

CLS-Form S-A was tested by utilizing the split-half reliability test on 1,397 subjects. The correlation coefficients between the two halves and the odd-numbered items of the test and its results are described in Table 1. As the figures describe, the estimated reliabilities of the entire test in both the split halves and the odd-numbered items show extremely high correlations (.96 to .99). These

results indicate that a subject has similar responses to the two sections of the instrument.

Table 1

Split Half Reliabilities of CLS-Form S-A

Scale	First Half vs. Second Half	Odd No. Items vs. Even No. Items
(1) Conditions		
Peer	.97	.97
Organization	.96	.97
Goal Setting	.97	.97
Competition	.98	.98
Instructor	.96	.97
Detail	.97	.98
Independence	.97	.98
Authority	.98	.98
(2) Content		
Numeric	.98	.98
Qualitative	.98	.99
Inanimate	.98	.98
People	.98	.98
(3) Mode		
Listening	.98	.97
Reading	.99	.99
Iconics	.98	.98
Direct Experience	.96	.96
(4) Expectation		
"A"	.98	.99
"B"	.97	.97
"C"	.98	.98
"D"	.99	.99

(Canfield, 1980, p.35)

Table 2

Test-Retest Correlations OF CIS

Scale	Correlation
(1) Conditions	
Peer	.89
Organization	.92
Goal Setting	.86
Competition	.88
Instructor	.81
Detail	.88
Independence	.88
Authority	.93
(2) Content	
Numeric	.92
Qualitative	.93
Inanimate	.94
People	.91
(3) Mode	
Lecturing	.86
Reading	.89
Iconics	.88
Direct Experience	.93
(4) Responsibility	
I	.87
I/S	.84
S/I	.85
S	.96
Overall Locus	.94

(Canfield, 1976, p.15)

CLS-Form E is designed to measure the same dimensions for students as CLS-Form S-A. In response to demands for an inventory suitable to lower grades, and people with limited reading abilities, CLS-Form E was developed to be readable at the fifth grade level. Since the present study assessed the learning styles of students from grades seven to

nine, CLS-Form E was considered to be appropriate as an instrument for this study.

The reliability of CIS was examined by utilizing the test-retest reliability coefficient. Canfield administered CIS to a total of 62 students at a midwestern university in the United States with a delay of 7 days between the two tests. Pearson r correlations between the scores of the two testing times are shown in Table 2 (Canfield, 1976, p.15). The range of values among the correlations is between .81 and .96, showing very high correlation between the two set of scores. The result of the test-retest coefficient is taken to indicate that the characteristics being measured by CIS are stable over time.

From this review of the reliability tests performed on CLS-Form S-A and CIS, it was concluded that the instruments would be reliable in measuring learning and instructional styles. Therefore, CLS-Form E and CIS were accepted as adequate instruments for the study.

3.4 Validity

There are no direct means of confirming whether CLS-Form E and CIS measure what they are designed to measure. Accordingly, the validity of these instruments was indirectly inspected through the results of previous studies. Furthermore, research using CLS-Form E has seldom been conducted, so it was necessary to presume the validity of CLS-Form E by inquiring into the validity of CLS-Form S-A.

With regard to the validity of CLS-Form S-A, Steven Brainard and Jerry Ommen have provided three examples from research conducted at Longview Community College (Canfield, 1980, p. 41-42).

The first study was that of a group of 230 female secretarial students who were compared to 1,150 female students of the total sample of students at Longview Community College. The secretarial students indicated significantly lower preference for Organization (.05 level), higher preference for Competition (.01 level), higher preference for Inanimates (.05 level) and lower preference for People (.01 level). Female secretarial students are commonly understood as having a preference for working with things, rather than people. In this respect, the results of the study identified some general characterstics assumed to be true of secretarial students.

The second example of research at Longview Community College gave more specific results regarding the common understanding of student characteristics. A group of 24 data processing students was compared to 3,114 male and female students of the total student body. The data processing students indicated significantly lower preference for Peer (.01 level) and Instructor (.05 level), higher preference for Detail and Organization (.01 level), higher preference for Numeric (.01 level), and lower preference for People (.05 level). Generally, students enrolled in data processing progams were understood as having preferences for working with numbers and desiring specific information in well-organized courses. Hence, the results of the study were found to represent characteristics typical of data processing students.

The third example focused on another aspect of learning style preference and involved a group of 73 female students enrolled in a special developmental program. This group was compared to 1,306 regular college female students at Longview Community College. The special

developmental program students were found to indicate lower preference for Organization (.01 level) and Independence (.01 level); higher preference for Numeric (.05 level); lower preference for Qualitative (.01 level); higher preference for Inanimate (.01 level); and lower preference for Listening (.01 level). These students were generally understood to prefer working, operating, designing and repairing things independently. Hence, the results of the study were found to represent learning style characteristics of typical students enrolled in the special developmental program.

From these three examples, it may be concluded that, to some extent, CLS-Form S-A will assess preferences in learning styles and that Form E will produce similar results.

Few validity studies of CIS have been conducted. One study that did examined instructional styles among 311 physical therapy faculty members in the United States. The results of the study are given in Table 3 and are graphed in Figure 3. According to the results, the physical therapy faculty members prefer Organization in Instructional Conditions, People in Instructional Content and Direct Experiences in Instructional Mode. Physical therapists generally require contact with patients in treatment. Obtaining organized knowledge and direct experience about working with people develops these important skills for the work of physical therapy. Since the instructional style preferences of the physical therapy faculty members measured by CIS are understandable from common knowledge about them, CIS were found to correctly assess instructional style preferences of instructors in physical therapy faculties.

Table 3

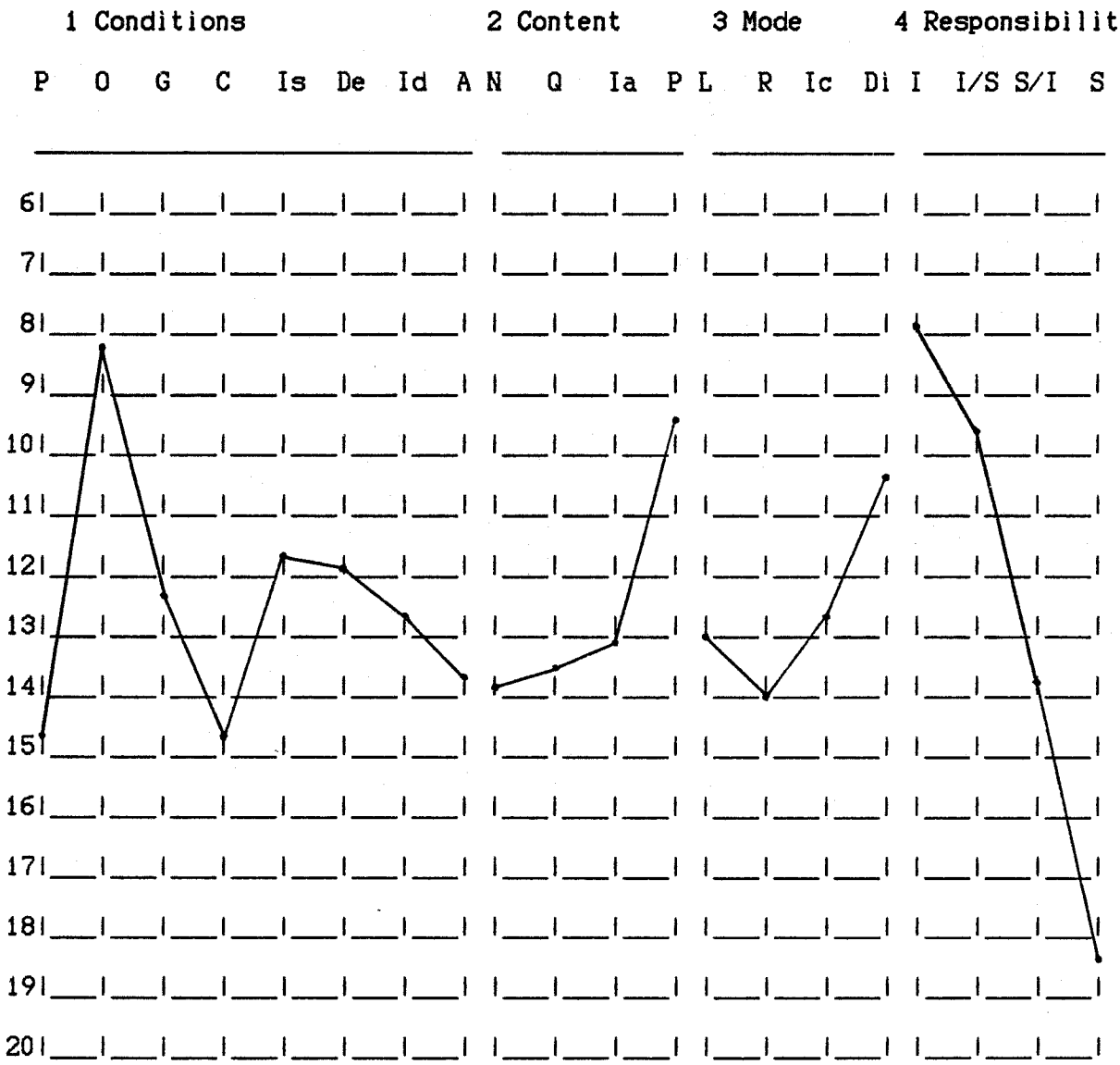
Means and Standard Deviations of Instructors on CIS

Items	Means	Standard Deviation
(1) Conditions		
Peer[P]	14.7	2.7
Organization[O]	8.2	2.0
Goal Setting[G]	12.3	2.9
Competition[C]	14.7	2.9
Instructor[Is]	11.7	3.2
Detail[De]	11.9	3.0
Independence[Id]	12.7	3.2
Authority[A]	13.7	2.6
(2) Content		
Numeric[N]	13.9	3.2
Qualitative[Q]	13.5	2.4
Inanimate[Ia]	13.1	2.8
People[P]	9.4	3.1
(3) Mode		
Lecturing[L]	13.0	2.8
Reading[R]	14.0	2.4
Iconics[Ic]	12.7	2.3
Direct Experience[Di]	10.3	3.1
(4) Responsibility		
I	7.9	1.9
I/S	9.7	1.8
S/I	13.8	1.9
S	18.4	2.1

(Payton, McDonald & Hirt, 1980, p.1279)

Figure 3

Mean Raw Score Profile of CIS



3.5 Null Hypotheses

The proposed study tested the following null hypotheses:

1. There would be no statistically significant differences found in the learning styles of the four cultural groups: Cree, Dene, Metis and non-Native students.

2. There would be no statistically significant differences found in the learning styles of students on the basis of sex.

3. There would be no statistically significant differences found in the learning styles of students on the basis of age.

4. There would be no statistically significant differences found in predicted levels of performance of students on the basis of culture, sex and age.

5. There would be no statistically significant differences found between the instructional styles of Native and non-Native teachers.

6. There would be no statistically significant differences found in the instructional styles of teachers on the basis of sex.

7. There would be no statistically significant differences found in the instructional styles of teachers on the basis of age.

8. There would be no statistically significant differences found in perceived responsiblity of teachers for the students' learning process on the basis of culture, sex and age.

9. Congruence would be more likely to be found between learning styles of Cree, Dene, Metis and non-Native students and instructional style of Native teachers, than it would be between learning styles of

Cree, Dene, Metis and non-Native students and instructional style of Native teachers.

3.6 Sample Selection

To assess the learning and instructional styles of students and teachers with different cultural backgrounds, the researcher focused in the areas of Northern Saskatchewan where a variety of small communities had relatively intact Native cultures. Because of financial reasons,only six schools assessible by car in the northwest area of Northern Saskatchewan were selected. To execute the research in this area, permission was requested by letter from the two school boards: Northern Lights School Division No. 113 and the Board of Education of the Ile a la Crosse School Division. After receiving permission from the two school boards, permission was also requested by letter from the six school principals. The researcher received permission from the principals by letter and telephone, and data collection was carried out from Feburary to April, 1986. For the student sample, Division III (grade seven to nine) was selected because the English reading level of students was adequate to respond to the inventory. A second consideration was the high drop-out rate in these grades among Native students.

The teacher sample was collected the same six schools. Since not many Native teachers were teaching in Division III, all Native and non-Native teachers on staff in each school were asked to respond to the questions of the inventory. Therefore, the teacher sample consisted of teachers who taught at various grade levels and did not necessarily

teach the students in the student sample. All of the Native teachers in the six schools had a Cree or Metis background. Since the size of the teacher sample was very small, all Native teachers were treated as one group.

3.7 The Sample

The study sample consisted of students and teachers from six schools in remote communities in Northern Saskatchewan. The total sample of 464 consisted of 385 students and 79 teachers.

Data describing the characteristics of the students are shown in Table 4. All students were asked to indicate their sex, age and grade on a student profile sheet. They also were asked to indicate whether they thought of themselves as: (1) Cree, (2) Dene, (3) Metis or (4) non-Native. Identification of the cultural groups was, therefore, based on students' self-perceptions: 81 Cree (21.0%), 65 Dene (16.9%), 134 Metis (34.8%) and 105 non-Native (27.3%). The sample consisted of 178 male students (46.2%) and 207 female students (53.8%).

The students ranged in age from 12 to 19 years. The majority (84.7%) were between 12 and 15 years of age. Since the student sample was collected from grade seven to grade nine, this proportion represented typical age groups for these grades in this part of the province.

The distribution of the student sample on the basis of grade was: 128 students (33.2%) in grade seven, 117 students (30.4%) in grade eight, and 122 students (31.7%) in grade nine. Eighteen students, or 4.7 percent of the sample, were enrolled in mixed classes from two

schools. However, grades seemingly did not represent actual levels of students' academic performance since each school tended to have different grade standards. Therefore, grade was not treated as an independent variable in this study.

Table 4

Demography of Students in Frequencies and Percentages (n=385)

Group	Number	Percent
Culture		
Cree	81	21.0
Dene	65	16.9
Metis	134	34.8
Non-Native	105	27.3
Sex		
Male	178	46.2
Female	207	53.8
Age		
12 Years	48	12.5
13 Years	88	22.9
14 Years	109	28.3
15 Years	81	21.0
16 Years	30	7.8
17 Years	19	4.9
18 Years	7	1.8
19 Years	3	0.8
Grade		
Grade 7	128	33.2
Grade 8	117	30.4
Grade 9	122	31.7
Mixed	18	4.7
School		
School #1	26	6.8
School #2	59	15.3
School #3	46	11.9
School #4	59	15.3
School #5	174	45.2
School #6	21	5.5

In the distribution of schools, 174 students (45.2%) were from school #5 in the larger community while only 21 students (5.5%) were from the smallest school which was part of the study.

Data describing the characteristics of 79 teachers are shown in Table 5. All teachers were asked to indicate their sex and age and whether they thought of themselves as: (1) Native or (2) non-Native. The majority of teachers (81.0%) identified their cultural background as non-Native; in contrast, only 15 teachers (19.0%) identified themselves as Native. Since only a small proportion of Native teachers compared to

Table 5

Demography of Teachers in Frequencies and Percentages (n=79)

Group	Number	Percent
Culture		
Native	15	19.0
Non-Native	64	81.0
Sex		
Male	45	57.0
Female	34	43.0
Age in Years		
20 to 29	25	31.6
30 to 39	33	41.8
40 to 49	13	16.5
50 to 59	7	8.9
Over 60	1	1.3
School		
#1	14	17.7
#2	11	13.9
#3	11	13.9
#4	14	17.7
#5	16	20.3
#6	13	16.5

non-Native teachers are employed in Northern Saskatchewan, the teacher sample in this study contained a correspondingly smaller proportion of Native teachers.

The distribution of teachers on the basis of age showed that 33 teachers or 41.8 percent were between 30 and 39 years of age, and 25 teachers or 31.6 percent were between 20 and 29 years old. Hence, the majority of teachers in this study ranged from age 20 to 39. Only 13 teachers (16.5%) were between 40 and 49 years old. Seven teachers were at ages 50 to 59, and one teacher was over 60 years.

Teachers were quite evenly distributed among the six schools used in the study. The largest number, 16 (20.3%), were from school #5 and the smallest mumber, 11 (13.9%), were from schools #2 and #3 respectively.

3.8 Data Collection

The researcher visited six schools in Northern Saskatchewan between Feburary and April, 1986. Before the research was conducted at each school, the researcher, who is Japanese, spent at least one day introducing himself and the Japanese culture to students and teachers. This included a geographical and historical introduction, and information about life style, music, and the paper art called origami. This approach to students and teachers were employed to reduce the possible fear of the researcher being a stranger. In fact, after having spent one or more days for the introduction, students and teachers became accustomed to the Japanese-accented English of the researcher and became very cooperative in the study.

In each school, during class time, Canfield's Learning Styles Inventory was administered to groups of students from grades seven to nine. For most grade seven classes, and some of the grade eight and nine classes, the researcher conducted the assessment with an oral explanation. Since some students were observed to have difficulties comprehending the questions of the inventory written in English, they were excluded from the study on the advice of class teachers. In each school, Canfield's Instructional Styles Inventory was administered to teachers individually or in small groups. The researcher administered all instruments.

3.9 Statistical Analyses

Canfield's Learning Styles Inventory can be analyzed by the use of parametric tests such as the z-test, the t-test and analysis of variance (ANOVA). As the subject must answer by rank ordering one to four, each item generates a rectangular distribution of responses. The scores for each of the 16 scales are calculated by adding across each row of six items which refer to each specific scale (see Figure 2). Assuming that subjects respond honestly and accurately, the distribution of scores on each scale will approximate a normal curve.

According to the order of hypotheses, the following statistical analyses were used:

Hypothesis #1 was tested by comparing the mean scores of cultural groups of students, and by a series of one-way analysis of variance (one-way ANOVA) for 16 scales of learning style. The mean scores of the cultural groups were then compared at each age level. Keeping age

differences constant, a series of one-way ANOVA were used for 16 scales of learning style of cultural groups at each age level. In addition, multiple discriminant analysis was used to examine overall cultural differences on 16 learning style scales.

Hypothesis #2 was tested by comparing the mean scores of male and female students and by a series of one-way ANOVA for 16 scales of learning style. In addition, multiple discriminant analysis was used to examine overall sex differences on 16 learning style scales.

Hypothesis #3 was tested by comparing the mean scores of age groups of students in each cultural group, and by a series of one-way ANOVA for 16 scales of learning style. Keeping cultural differences constant, a series of one-way ANOVA were used for 16 scales of learning style of age groups in each cultural group. In addition, multiple discriminant analysis was used to examine overall sex differences on 16 learning style scales.

Hypothesis #4 was tested by using one-way ANOVA to examine differences in predicted levels of academic performance of students classified on the basis of culture, sex and age.

Hypothesis #5 was tested by comparing the mean scores of Native and non-Native teachers. A series of one-way ANOVA were used for 16 scales of instructional style of Native and non-Native teachers. In addition, multiple discriminant analysis was used to examine overall cultural differences on 16 instructional style scales.

Hypothesis #6 was tested by comparing the mean scores of male and female teachers at different age levels. Keeping age constant, a series of one-way ANOVA were used for 16 scales of instructional style of male

and female teachers. In addition, multiple discriminant analysis was used to examine overall sex differences on 16 instructional style scales.

Hypothesis #7 was tested by comparing the mean scores of different age groups of teachers. Keeping sex constant, a series of one-way ANOVA were used for 16 scales of instructional style of age groups. In addition, multiple discriminant analysis was used to examine overall age differences on 16 instructional style scales.

Hypothesis #8 was tested by using one-way ANOVA to examine differences in perceived responsibility for the students' learning process of all teachers classified on the basis of culture, sex and age.

Hypothesis #9 was tested by using a series of one-way ANOVA to compare mean scores on the instructional and learning style scales when the student and teacher samples were classified on the basis of culture.

CHAPTER 4

4. RESULTS OF DATA ANALYSES

This chapter describes the results of the statistical analyses of data in relation to each of the nine hypotheses.

Chi-square and one-way analysis of variance (one-way ANOVA) were used to examine whether or not each independent variable (culture, sex and age) influenced the scores on the learning and instructional styles inventories when combined with other independent variables. The results of independence tests for the student and teacher samples are shown in Table 6 and 7.

Table 6

Independence Tests of the Student Sample

	Culture	Sex	Age
Culture			
Sex	Chi-Square X^2=1.65 Independent		
Age	ANOVA F=22.97 * Related	ANOVA F=0.21 Independent	

Note. *$p<.0001$.

As shown in Table 6, there were significant differences found among the means of the cultural groups when classified on the basis of age ($F=22.97$, $p<.0001$). This result indicated differences related to age

within the cultural classifications of the student sample. Therefore, analyses of this sample considered both age and culture together. No significant differences were found either between sex and culture, or between sex and age. Hence, in the analyses, sex was treated independently from culture and age.

Table 7

Independence Tests of the Teacher Sample

	Culture	Sex	Age
Culture			
Sex	Chi-Square X^2=0.36 Independent		
Age	Chi-Square X^2=6.34 Independent	Chi-Square X^2=15.43 * Related	

Note. *$p<.01$.

As shown in Table 7, there were significant differences found between the means of male and female teachers when classified on the basis of age (X^2=6.34, $p<.01$). This result indicated that there were age differences within male and female groups of the teacher sample. Therefore, analyses of the teacher sample considered both age and sex together. On the other hand, no significant differences were found either between culture and sex, or between culture and age. Hence, in the analyses, culture was treated independently from sex and age.

4.1 Hypothesis 1

Hypothesis #1. There would be no statistically significant differences found in the learning styles of the four cultural groups: Cree, Dene, Metis and non-Native students.

Since there were significant differences found among the means of cultural groups of students when classified on the basis of age, culture could not be treated separately from age when analyzing data for hypothesis #1.

The data for hypothesis #1 were analyzed in three steps. General learning style preferences of the cultural groups were compared by one-way ANOVA. Since only a general picture of differences was required, age was ignored, but was considered in a second one-way ANOVA. Each scale of learning style was examined separately. Raw mean scores on learning style scales were also compared. Finally, overall cultural differences in learning style were tested by the use of multiple discriminant analysis.

4.1.1 Overall Learning Style Preferences of Cultural Groups

Mean scores on the 16 learning style scales among Cree, Dene, Metis and non-Native students are shown in Table 8.

On the basis of mean scores, Cree students could be classified as expressing a high or a slightly high preference for Learning Conditions which included Peer ($\underline{M}$=12.98), and Instructor ($\underline{M}$=13.56). They least preferred Competition ($\underline{M}$=16.88) and Independence ($\underline{M}$=16.73). In the category of Learning Content, Cree students indicated a very high

preference for Inanimate (M=11.90) and a low preference for Numeric (M=16.28). In the category of Learning Mode, Direct Experience (M=13.14) and Iconics (M=13.20) were the most highly preferred scales while Reading (M=17.17) was the least preferred. Responses to other scales were near the mean score of 15.00.

Table 8

Means Scores of Cree, Dene, Metis and Non-Native Students on the Learning Style Scales (N=385)

Scale	Cree	Dene	Metis	Non-Native
(1) Conditions				
Peer[P]	12.98	13.82	12.60	12.62
Organization[O]	14.86	14.75	14.26	13.83
Goal Setting[G]	15.25	15.63	15.90	15.88
Competition[C]	16.88	15.80	17.24	17.66
Instructor[Is]	13.56	13.54	13.13	12.03
Detail[De]	14.23	14.31	13.97	13.97
Independence[Id]	16.73	16.54	17.37	16.65
Authority[A]	15.60	15.62	15.52	17.35
(2) Content				
Numeric[N]	16.28	15.03	16.24	16.63
Qualitative[Q]	15.95	14.75	15.11	15.44
Inanimate[Ia]	11.90	13.28	12.72	12.50
People[P]	15.88	16.94	15.91	15.53
(3) Mode				
Listening[L]	16.49	15.52	16.04	17.10
Reading[R]	17.17	15.25	16.84	18.26
Iconics[Ic]	13.20	14.74	13.05	11.58
Direct Experience[Di]	13.14	14.57	14.07	13.07

Dene students, in the category of Learning Conditions, expressed a slightly high preference for Instructor (M=13.54) and Peer (M=13.82) and a low preference for Independence (M=16.54). In the category of Learning Content, they showed a high preference for Inanimate (M=13.28)

and a low preference for People (M=16.94). In the category of Learning Mode, Dene students showed neither high nor low preferences for Reading (M=15.25), Iconics (M=14.74) and Direct Experience (M=14.57), and a slightly low preference for (M=15.52).

In the category of Learning Condition, Metis students indicated high preferences for Peer (M=12.60) and Instructor (M=13.13) and a low preference for Independence (M=17.37). In Learning Mode, they expressed a high preference for Inanimate (M=12.72) and a slightly low preference for Numeric (M=16.24). In Learning Mode, Iconics (M=13.05) was the most highly preferred scale and Reading (M=16.84) was the least preferred.

Non-Native students in Learning Conditions expressed their high preference for Instructor (M=12.03) and Peer (M=12.62) and low preference for Competition (M=17.66) and Authority (M=17.35). In Learning Content, they most highly preferred Inanimate (M=12.50) and least preferred Numeric (M=16.63). Furthermore, in Learning Mode, non-Native students showed a very high preference for Iconics (M=11.58) and a very high preference for Reading (M=18.26).

On the basis of the mean scores of the four cultural groups, the preferred learning style of each cultural group could be described as follows:

Cree students preferred to have good relationships with other students, to know the instructor personally, to learn about working with things, to take part in field trips and practice exercises; and to view movies, slides, pictures and graphs. They least preferred competing with other students, working independently, learning about numbers and logic, and learning through written materials.

Dene students preferred to know the instructors personally; to have good relationships with other students; and to learn about working with things. They disliked learning independently, and learning about working with people.

Metis students preferred to have good relationships with other students; to know the instructor personally; to learn about working with things; and to learn by visual materials. They did not like to work independently; to learn about numbers and logic; nor to learn by working through written materials.

Non-Native students preferred to know the instructors personally; to have good relationships with other students; to learn by working with things; and to learn by visual materials. They disliked competing with other students; having strict classroom discipline; learning about numbers and logic; and learning through written materials.

The group differences in learning style scales were further analyzed by one-way ANOVA as shown in Table 9. There were significant differences found in seven learning style scales. In the category of Learning Conditions, Competition ($F=6.10$, $p<.001$), Instructor ($F=4.55$, $p<.01$) and Authority ($F=6.81$, $p<.001$) scales showed differences among the means of cultural groups. In Learning Mode, the groups differed on Listening ($F=4.14$, $p<.01$), Reading ($F=10.57$, $p<.001$), Iconics ($F=11.25$, $p<.001$) and Direct Experience ($F=3.77$, $p<.01$). In the category of Learning Content, no significant group differences were found.

Table 9
One-Way Analyses of Variance of Scores on the Learning Style Scales among Cree, Dene, Metis and Non-Native Students with Newman-Keuls Comparisons (n=385)

Scale		SS	df	MS	F		Newman-Keuls
(1) Conditions							
Peer	Between	75.46	3	25.15	2.26		3 4 1 2
	Within	4246.74	381	11.15			
Organization	Between	61.62	3	20.54	2.25		4 3 2 1
	Within	3482.34	381	9.14			
Goal Setting	Between	25.29	3	8.43	0.83		1 2 4 3
	Within	3886.13	381	10.20			
Competition	Between	147.38	3	49.13	6.10	***	2 1 3 4
	Within	3069.18	381	8.06			
Instructor	Between	145.02	3	48.34	4.55	**	4 3 2 1
	Within	4049.94	381	10.63			
Detail	Between	5.00	3	1.67	0.24		4 3 1 2
	Within	2600.42	381	6.83			
Independence	Between	47.57	3	15.86	1.38		2 4 1 3
	Within	4375.48	381	11.48			
Authority	Between	243.72	3	81.24	6.81	***	3 1 2 4
	Within	4548.14	381	11.94			
(2) Content							
Numeric	Between	107.98	3	36.00	2.34		2 3 1 4
	Within	5861.28	381	15.38			
Qualitative	Between	60.31	3	20.10	1.77		2 3 4 1
	Within	4321.03	381	11.34			
Inanimate	Between	72.14	3	24.05	1.72		1 4 3 2
	Within	5325.70	381	13.98			
People	Between	82.16	3	27.39	2.36		4 1 3 2
	Within	4499.74	381	11.59			
(3) Mode							
Listening	Between	117.45	3	39.15	4.14	**	2 3 1 4
	Within	3606.32	381	9.47			
Reading	Between	371.28	3	123.76	10.57	***	2 3 1 4
	Within	4459.41	381	11.70			2 3 1 4
							2 3 1 4
Iconics	Between	410.97	3	136.99	11.25	***	4 3 1 2
	Within	707.05	381	8.42			4 3 1 2
							4 3 1 2
Direct Experience	Between	134.97	3	44.99	3.77	**	4 1 3 2
	Within	4552.37	381	11.95			

Note 1. Groups: 1 = Cree; 2 = Dene; 3 = Metis; 4 = Non-Native. **$p<.01$. ***$p<.001$. Note 2. Herein and hereafter groups underlined by a line differ significantly from groups underlined by another line.

In the category of Learning Conditions, the Student-Newman-Keuls (SNK) tests for differences between means revealed significant differences among Dene (M=15.80), Cree (M=16.88), Metis (M=17.24) and non-Native (M=17.66) students on the Competition scale. This result would suggest that Dene students showed less negative reaction towards a competitive learning situation than did Cree, Metis and non-Native students. On the Instructor scale, the SNK tests showed significant differences among the means of non-Native (M=12.03), Metis (M=13.13), Dene (M=13.54), and Cree (M=13.56) students. This result would indicate that non-Native students had higher preference for knowing the instructor personally as a condition of learning than did Metis, Dene and Cree students, although it was a high priority for all groups. On the Authority scale, the SNK tests showed significant differences among the means of Metis (M=15.52), Cree (M=15.60), Dene (M=15.62) and non-Native (M=17.35) students. This result would suggest that non-Native students held the lowest preference of all groups toward strict discipline.

In the category of Learning Mode, the SNK tests for differences between means showed significant differences among Dene (M=15.52), Metis (M=16.04) and non-Native (M=17.10) students on the Listening scale. This result would suggest that non-Native students were the most negative of all groups toward learning by listening. On the Reading scale, the SNK tests showed significant differences among the means of Dene (M=15.25), Metis (M=16.84), Cree (M=17.17) and non-Native (M=18.26) students. The groups differed in three ways. First, although Dene students expressed a low preference for learning through written

materials in the mean score, they gave a slightly more positive response than did Metis, Cree and non-Native students. Second, Metis were more positive on the Reading scale than were non-Native students. Third, Cree students also differed from non-Native students in expressing more preference for the Reading scale than did non-Native students. These results would suggest that Dene students had the least negative reaction to learning through written materials of all groups while non-Native students were the most negative. On the Iconic scale, the SNK tests showed significant differences among the means of non-Native ($\underline{M}$=11.58), Metis ($\underline{M}$=13.05), Cree ($\underline{M}$=13.20), and Dene ($\underline{M}$=14.74) students. Again, the groups differed in three ways. First, non-Native students had much higher preference for seeing movies, slides, pictures and graphs as a mode of learning, than did Metis, Cree and Dene students. Second, Metis had higher preference for the Iconic scale than did Dene students. Third, Cree students also showed higher preference for the Iconic scale than did Dene students. These results would suggest that non-Native students had the highest preference for the audio-visual of all groups while Dene students expressed a significantly low preference. On the Direct Experience scale, the SNK tests for differences among means showed significant differences among non-Native ($\underline{M}$=13.07), Cree ($\underline{M}$=13.14) and Dene ($\underline{M}$=14.57) students. This result would indicate that non-Native and Cree students expressed higher preference for learning by direct experience than did Dene students.

4.1.2 Cultural Differences In Learning Style Preferences at Each Age Level

Hypothesis #1 was further tested by comparing the mean scores of the groups at each age level. In addition, a series of one-way ANOVA were conducted to test for differences. The 12-year-old Dene students and non-Native students from 16 to 19 years of age consisted of less than five members at each age level, which was below the minimum required for one-way ANOVA. Therefore, these groups were excluded from further analyses.

(1) Learning Conditions

On the Peer scale, the mean scores of the groups at each age level are shown in Table 10. Among the groups at age 12 (Dene students were removed), Metis students ($\underline{M}$=11.95) most highly preferred learning in teams and maintaining good relationships with other students. At age 13, non-Native students ($\underline{M}$=12.27) showed the highest preference on this scale, followed by Metis ($\underline{M}$=12.39) students. At age 14, non-Native students ($\underline{M}$=12.43) showed the highest preference; at age 15, it was Cree students ($\underline{M}$=12.27). With non-Native students removed, Metis students ($\underline{M}$=13.00) at age 16 and Cree students ($\underline{M}$=13.20) at ages 17-19 showed the highest preference for peer affiliation. However, one-way ANOVA revealed that there were no significant differences (see Table 11) among

Table 10

Mean Scores of Peer Scale Classified on the Basis of Culture of Students (n=378)

Cultural Groups	Age	12	13	14	15	16	17-19
	n	45	88	109	81	26	29
Cree		13.00	13.26	12.71	12.74	13.38	13.20
Dene		--	14.14	14.07	12.92	14.25	14.26
Metis		11.95	12.39	12.58	12.84	13.00	13.60
Non-Native		13.53	12.27	12.43	13.00	--	--

Table 11

One-Way Analyses of Variance of Scores on the Peer Scale among Cree, Dene, Metis and Non-Native Students with Newman-Keuls Comparisons

Age in Years		SS	df	MS	F	Newman-Keuls
12	Between	22.96	2	11.48	1.07	3 1 4
	Within	452.69	42	10.78		
13	Between	30.23	3	10.08	0.68	4 3 1 2
	Within	1251.55	84	14.90		
14	Between	30.22	3	10.07	0.86	4 3 1 2
	Within	1231.05	105	11.72		
15	Between	0.59	3	0.20	0.02	4 3 1 2
	Within	713.63	77	9.27		
16	Between	7.13	2	3.56	0.31	3 1 2
	Within	263.38	23	11.45		
17-19	Between	5.28	2	2.64	0.38	1 3 2
	Within	181.68	26	6.99		

Note. Groups: 1 = Cree; 2 = Dene; 3 = Metis; 4 = Non-Native.

the means of the four cultural groups at any age level. Hence, this result would suggest that the age groups shared, more or less, the same degree of preference for learning in teams and keeping good relationships with other students.

On the Organization scale, the mean scores of the groups at each age level are shown in Table 12. At the ages of 12, 13 and 15, non-Native students showed the highest preference for course work that was organized logically, clearly and sequentially. At age 14, Cree students ($\underline{M}$=13.57) showed the highest preference for organization. With non-Native students excluded at ages 16-19, Dene students ($\underline{M}$=13.38) at age 16 and Metis students ($\underline{M}$=12.40) at ages 17-19 showed the highest preference. Dene students at age 13 ($\underline{M}$=17.43) expressed the lowest preference for highly organized materials of all groups at every age level.

Furthermore, one-way ANOVA indicated that there were significant differences (see Table 13) among the means of the cultural groups at age 13 ($F=4.30$, $\underline{p}<.01$). The SNK tests for differences between means revealed significant differences among the mean scores of non-Native ($\underline{M}$=13.59), Cree ($\underline{M}$=15.79) and Dene ($\underline{M}$=17.43) students. This result would indicate that non-Native students at age 13 favored organization as a condition of learning more than did either Cree or Dene students who gave less favorable responses.

On the Goal Setting scale, the mean scores of the cultural groups at each age level are shown in Table 14. Non-Native students at ages 12 ($\underline{M}$=14.47), 14 ($\underline{M}$=15.77) and 15 ($\underline{M}$=15.00) showed the highest preference

Table 12

Mean Scores of Organization Scale Classified on the Basis of Culture of Students (n=378)

Cultural Groups	Age	12	13	14	15	16	17-19
	n	45	88	109	81	26	29
Cree		15.22	15.79	13.57	14.84	15.13	15.80
Dene		--	17.43	14.93	15.23	13.38	13.89
Metis		15.52	14.78	14.19	13.86	13.40	12.40
Non-Native		14.67	13.59	14.07	13.42	--	--

Table 13

One-Way Analyses of Variance of Scores on the Organization Scale among Cree, Dene, Metis and Non-Native Students with Newman-Keuls Comparisons

Age in Years		SS	df	MS	F	Newman-Keuls
12	Between	6.45	2	3.23	0.26	4 1 3
	Within	504.13	42	12.00		
13	Between	128.24	3	42.75	4.30 **	4 3 1 2
	Within	834.62	84	9.94		
14	Between	16.48	3	5.49	0.65	1 4 3 2
	Within	892.45	105	8.50		
15	Between	32.99	3	11.00	1.57	4 3 1 2
	Within	540.08	77	7.01		
16	Between	16.70	2	8.35	1.24	2 3 1
	Within	155.15	23	6.75		
17-19	Between	29.18	2	14.59	1.38	3 2 1
	Within	275.79	26	10.61		

Note. Groups: 1 = Cree; 2 = Dene; 3 = Metis; 4 = Non-Native.
**$p<.01$.

Table 14

Mean Scores of Goal Setting Scale Classified on the Basis of Culture of Students (n=378)

Cultural Groups	Age 12	13	14	15	16	17-19
	n 45	88	109	81	26	29
Cree	15.00	14.16	16.00	16.21	14.25	14.60
Dene	--	14.00	16.00	15.00	15.88	16.00
Metis	16.48	14.78	16.12	15.41	17.50	16.00
Non-Native	14.47	16.80	15.77	15.00	--	--

Table 15

One-Way Analyses of Variance of Scores on the Goal Setting Scale among Cree, Dene, Metis and Non-Native Students with Newman-Keuls Comparisons

Age in Years		SS	df	MS	F	Newman-Keuls
12	Between	38.27	2	19.14	1.41	4 1 3
	Within	570.97	42	13.59		
13	Between	132.48	3	44.16	3.64 *	2 1 3 4
	Within	1018.80	84	12.13		
14	Between	2.18	3	0.73	0.07	4 1 2 3
	Within	1145.79	105	10.91		
15	Between	16.10	3	5.37	0.83	4 2 3 1
	Within	496.08	77	6.44		
16	Between	47.13	2	23.56	3.25	1 2 3
	Within	166.88	23	7.26		
17-19	Between	8.11	2	4.06	0.52	1 2 3
	Within	203.20	26	7.81		

Note. Groups: 1 = Cree; 2 = Dene; 3 = Metis; 4 = Non-Native.
*p<.05.

for setting their own learning goals of all groups, but these means could not be considered as an indication of a high preference. Dene students at age 13 (M=14.00) and age 15 (M=15.00) showed the highest preference for setting their own objectives and making their own decisions on objectives, but again these means could not be considered as an indication of a high preference. With non-Native students removed, Cree students at age 16 (M=14.25) and ages 17-19 (M=14.60) showed the highest preference of the group for setting their own learning goals, but these mean scores did not indicate either a high or a low preference. On the other hand, Metis students at age 16 (M=17.50) showed the lowest preference for this scale of all groups at every age level.

One-way ANOVA found significant differences (see Table 15) among the means of the cultural groups at age 13 (F=3.64, $p<.05$). The SNK tests for differences between means revealed significant differences among the mean scores of Cree (M=14.16), Metis (M=14.78) and non-Native (M=16.80) students. This result would indicate that non-Native students expressed a lower preference for setting their own learning goals than did Cree and Metis students.

On the Competition scale, the previous one-way ANOVA on the basis of culture without consideration of age (see Table 9) had found significant differences among the means of the four cultural groups at the .001 level, suggesting that Dene students were more amenable to competitive learning conditions than was true of other groups. The mean scores of the cultural groups at each age level are shown in Table 16. Among the cultural groups at age 12, Metis students (M=16.05) showed a

Table 16

Mean Scores of Competition Scale Classified on the Basis of Culture of Students (n=378)

Cultural Groups	Age	12	13	14	15	16	17-19
	n	45	88	109	81	26	29
Cree		16.78	16.79	17.71	16.16	17.00	16.40
Dene		--	14.43	15.00	16.85	16.50	15.84
Metis		16.05	18.06	17.09	17.89	16.10	18.00
Non-Native		17.33	17.32	17.70	18.58	--	--

Table 17

One-Way Analyses of Variance of Scores on the Competition Scale among Cree, Dene, Metis and Non-Native Students with Newman-Keuls Comparisons

Age in Years		SS	df	MS	F	Newman-Keuls
12	Between	14.74	2	7.37	0.68	3 1 4
	Within	451.84	42	10.76		
13	Between	70.26	3	23.42	4.28 **	2 1 4 3
	Within	459.36	84	5.47		
14	Between	84.87	3	28.29	3.31 *	2 3 4 1
	Within	896.21	105	8.54		
15	Between	59.03	3	19.68	2.31	1 2 3 4
	Within	654.70	77	8.50		
16	Between	3.60	2	1.80	0.17	3 2 1
	Within	248.90	23	10.82		
17-19	Between	18.48	2	9.24	1.43	2 1 3
	Within	167.73	26	6.45		

Note. Groups: 1 = Cree; 2 = Dene; 3 = Metis; 4 = Non-Native.
*$p<.05$. **$p<.01$.

slightly low preference for competitive learning conditions but the highest among the groups of this age. Dene students at age 13 (M=14.43) indicated a slighty high preference and the highest among the groups of this age. The 14-year-old (M=15.00) Dene students indicated neither a low nor a high preference but the highest among the groups of this age. Cree students (M=16.16) at age 15 were the least negative. With non-Native students removed, Metis students (M=16.10) at age 16 showed less negative response to competition than did other groups. At ages 17-19, Dene students (M=15.84) were less negative to competition, but the mean score indicated a slightly low preference. The 15-year-old non-Native students (M=18.58) revealed the lowest preference for this scale of all the groups at every age group. Metis students at age 13 (M=18.06) and ages 17-19 (M=18.00) also indicated very low preferences at each age level.

Furthermore, one-way ANOVA on the basis of culture at each age level indicated that there were significant differences (see Table 17) on the Competitive scale among the means of the groups at age 13 ($F=4.28$, $p<.01$) and age 14 ($F=3.31$, $p<.05$). The SNK tests for differences between means at age 13 revealed significant differences among the mean scores of Dene (M=14.43), Cree (M=16.79), non-Native (M=17.32) and Metis (M=18.06) students. This result would indicate that Dene students at age 13 differed significantly from Cree, Metis and non-Native in slightly favoring competition. At age 14, the SNK tests indicated significant differences among the mean scores of Dene (M=15.00), Metis (M=17.09), non-Native (M=17.70) and Cree (M=17.71)

Table 18

Mean Scores of Instructor Scale Classified on the Basis of Culture of Students (n=378)

Cultural Groups	Age	12	13	14	15	16	17-19
	n	45	88	109	81	26	29
Cree		13.78	13.47	13.14	14.00	14.50	12.00
Dene		--	13.43	14.00	13.15	14.00	13.32
Metis		12.81	11.89	14.05	13.27	12.30	11.60
Non-Native		11.73	11.98	12.33	12.08	--	--

Table 19

One-Way Analyses of Variance of Scores on the Instructor Scale among Cree, Dene, Metis and Non-Native Students with Newman-Keuls Comparisons

Age in years		SS	df	MS	F	Newman-Keuls
12	Between	24.58	2	12.29	1.34	4 3 1
	Within	385.73	42	9.18		
13	Between	41.87	3	13.96	1.20	3 4 1 2
	Within	979.21	84	11.66		
14	Between	58.89	3	19.63	0.19	4 1 2 3
	Within	1287.15	105	12.26		
15	Between	27.16	3	9.05	0.93	4 2 3 1
	Within	747.91	77	9.71		
16	Between	24.40	2	12.20	1.21	3 2 1
	Within	232.10	23	10.09		
17-19	Between	15.45	2	7.73	0.86	3 1 2
	Within	233.31	26	8.97		

Note. Groups: 1 = Cree; 2 = Dene; 3 = Metis; 4 = Non-Native.

students. This result would indicate that Dene students showed higher preference for competitive learning situation than did Metis, non-Native and Cree students. Both results suggest that, in comparison to Cree, Metis and non-Native students, Dene students had a significantly less negative reaction to competitive learning conditions. This result supported the previous finding of the one-way ANOVA without consideration of age.

On the Instructor scale, the previous one-way ANOVA on the basis of culture without consideration of age (see Table 9) had found significant differences among the means of the four groups at the .01 level, indicating that non-Native students most likely preferred to wish to know their instructors personally. The mean scores of the groups at each age level (see Table 18) showed that non-Native students at age 12 ($\underline{M}$=11.73), age 14 ($\underline{M}$=12.08) and age 15 ($\underline{M}$=11.98) indicated the highest preference for the Instructor scale among the groups of each age level. At age 13, the Metis students ($\underline{M}$=11.89) expressed the highest preference, while non-Native students ($\underline{M}$=11.98) also expressed a very high preference. With non-Native students excluded, the Metis students at age 16 ($\underline{M}$=12.30) and ages 17-19 ($\underline{M}$=11.60) gave the highest preference for the scale. Despite the previous result of one-way ANOVA without consideration of age, one-way ANOVA on the basis of culture at each age level found no significant differences (see Table 19). Therefore, it could be concluded that, within an overall rating of high preference, there were no significant differences in scores on the Instructor scale among the cultural groups when means were considered in terms of age level.

Table 20

Mean Scores of Detail Scale Classified on the Basis of Culture of Students (n=378)

Cultural Groups	Age	12	13	14	15	16	17-19
	n	45	88	109	81	26	29
Cree		14.56	14.47	14.10	13.26	16.25	13.80
Dene		--	15.43	12.53	15.69	14.13	14.63
Metis		13.48	15.83	13.77	13.30	14.90	14.20
Non-Native		15.47	14.00	13.43	13.08	--	--

Table 21

One-Way Analyses of Variance of Scores on the Detail Scale among Cree, Dene, Metis and Non-Native Students with Newman-Keuls Comparisons

Age in Years		SS	df	MS	F	Newman-Keuls
12	Between	35.12	2	17.56	1.99	3 1 4
	Within	371.19	42	8.84		
13	Between	48.32	3	16.11	1.97	4 1 2 3
	Within	686.95	84	8.18		
14	Between	24.15	3	8.05	0.83	2 4 3 1
	Within	1016.58	105	9.68		
15	Between	65.52	3	21.84	2.55	4 1 3 2
	Within	659.10	77	8.56		
16	Between	18.57	2	9.29	1.06	2 3 1
	Within	201.28	23	8.75		
17-19	Between	3.01	2	1.51	0.16	1 3 2
	Within	250.02	26	9.62		

Note. Groups: 1 = Cree; 2 = Dene; 3 = Metis; 4 = Non-Native.

On the Detail scale, the mean scores of the groups at each age level are shown in Table 20. Among 12-year-olds, Metis students (M=13.48) most highly favored receiving information on assignments, requirements and rules; at age 13, it was non-Native students (M=14.00); at age 14, Dene students (M=12.53); and at age 15, non-Native students (M=13.08) expressed most preference. After non-Native students were removed, Dene students at age 16 (M=14.13) and Cree students (M=13.80) at ages 17-19 showed the highest among the groups of each age level, but all groups were in the rating of slightly high preference. One-way ANOVA found no significant differences among the means of the four cultural groups at any age level (see Table 21). Hence, these results would suggest that the four cultural groups did not differ significantly at any age level on this scale.

On the Independence scale, the mean scores of the groups at each age level are shown in Table 22. Non-Native students (M=15.73) at age 12 showed the highest preference among the groups, but the mean scores indicated a slightly low preference among all groups for studying alone and independently; at age 13, it was Cree students (M=15.26); at age 14, non-Native students (M=16.40); and at age 15, Dene students (M=14.38) who were least negative. After non-Native students were removed, Cree students at age 16 (M=14.50) expressed the highest preference and were the only students at any age to give a high rather than low rating to independence. Dene students (M=17.05) at ages 17-19 showed a higher preference than other among groups of this age level, but the mean scores showed a low preference for independent learning among all groups. On the other hand, Metis students at the ages of 12 (M=18.57),

Table 22

Mean Scores of Independence Scale Classified on the Basis of Culture of Students (n=378)

Cultural Groups	Age	12	13	14	15	16	17-19
	n	45	88	109	81	26	29
Cree		17.44	15.26	17.90	17.16	14.50	18.00
Dene		--	15.57	17.93	14.38	17.63	17.05
Metis		18.57	15.78	17.34	17.05	18.30	18.80
Non-Native		15.73	17.11	16.40	16.00	--	--

Table 23

One-Way Analyses of Variance of Scores on the Independence Scale among Cree, Dene, Metis and Non-Native Students with Newman-Keuls Comparisons

Age in Years		SS	df	MS	F	Newman-Keuls
12	Between	70.50	2	35.25	2.47	4 1 3
	Within	600.30	42	14.29		
13	Between	58.15	3	19.38	1.39	1 2 3 4
	Within	1168.94	84	13.92		
14	Between	38.03	3	12.68	1.34	4 3 1 2
	Within	991.71	105	9.44		
15	Between	80.75	3	26.92	2.83 *	2 4 3 1
	Within	731.50	77	9.50		
16	Between	69.87	2	34.94	3.04	1 2 3
	Within	263.98	23	11.48		
17-19	Between	13.49	2	6.75	0.85	2 1 3
	Within	205.75	26	7.91		

Note. Groups: 1 = Cree; 2 = Dene; 3 = Metis; 4 = Non-Native.
*p<.05.

16 (M=18.30) and 17-19 (M=18.80) showed very low preferences for independent learning. Furthermore, one-way ANOVA found significant differences (see Table 22) only between the means of Dene (M=14.38) and Metis students (M=17.05) at age 15 (F=2.83, p<.05). This result would suggest that Metis students showed lower preference for independent learning at this age level than Dene students who had a slightly high preference for this scale.

On the Authority scale, the previous one-way ANOVA on the basis of culture without consideration of age (see Table 9) had found significant differences among the means of the four cultural groups at the .01 level, indicating that non-Native students responded the most negatively to strict classroom discipline than was true of other groups. The mean scores of the groups at each age level are shown in Table 24. Cree students (M=14.22) at age 12 indicated the highest preference among the groups of this age level, but they showed only a slightly high preference for strict classroom discipline. Dene students (M=15.57) at age 13, Metis students (M=14.84) at age 14, and Cree students (M=15.84) at age 15 showed the highest preferences among the groups of these levels, but all means indicated neither a high nor a low preference for strict classroom discipline among any groups. With non-Native students removed, Dene students at age 16 (M=14.25) and ages 17-19 (M=15.00) showed the highest preference for this scale among the groups of each age level, but their scores were not high. In contrast, non-Native students indicated low or very low preferences for strict classroom discipline: at age 12 (M=17.07), age 13 (M=16.91), age 14 (M=17.83), age 15 (M=18.83).

Table 24

Mean Scores of Authority Scale Classified on the Basis of Culture of Students (n=378)

Cultural Groups	Age	12	13	14	15	16	17-19
	n	45	88	109	81	26	29
Cree		14.22	16.79	14.86	15.84	15.38	16.20
Dene		--	15.57	15.53	16.77	14.25	15.00
Metis		15.19	16.50	14.84	16.30	14.50	15.60
Non-Native		17.07	16.91	17.83	18.83	--	--

Table 25

One-Way Analyses of Variance of Scores on the Authority Scale among Cree, Dene, Metis and Non-Native Students with Newman-Keuls Comparisons

Age in Years		SS	df	MS	F	Newman-Keuls
12	Between	52.85	2	26.43	2.06	1 3 4
	Within	537.73	42	12.80		
13	Between	11.71	3	3.90	0.32	2 3 1 4
	Within	1013.01	84	12.06		
14	Between	183.47	3	61.16	5.31 **	3 1 2 4
	Within	1208.33	105	11.51		
15	Between	74.39	3	24.80	2.35	1 3 2 4
	Within	812.23	77	10.55		
16	Between	5.66	2	2.83	0.14	2 3 1
	Within	449.88	23	19.56		
17-19	Between	6.21	2	3.10	0.36	2 3 1
	Within	224.00	26	8.62		

Note. Groups: 1 = Cree; 2 = Dene; 3 = Metis; 4 = Non-Native.
**p<.01.

Furthermore, one-way ANOVA found significant differences (see Table 25) at age 15 among the Metis ($\underline{M}$=14.84), Cree ($\underline{M}$=14.86), Dene ($\underline{M}$=15.53) and non-Native ($\underline{M}$=17.83) students (F=5.31, $\underline{p}$<.01). This result would suggest that non-Native students showed lower preference for strict classroom discipline than did the others at age 15, a finding which supported the previous result of one-way ANOVA without consideration of age.

(2) Learning Content

On the Numeric scale, the mean scores of the cultural groups at each age level are shown in Table 26. When the Dene students were removed, Cree students ($\underline{M}$=16.67) at age 12 showed a low preference for learning about numbers and logic, while other groups rated it very low. After Dene students were included, Dene students at age 13 ($\underline{M}$=14.71), age 14 ($\underline{M}$=14.53), age 15 ($\underline{M}$=15.08), age 16 ($\underline{M}$=15.88) and ages 17-19 ($\underline{M}$=15.05) expressed slightly higher preference than other groups at each age level although all mean scores were in the low categories. Metis students at ages 17-19 ($\underline{M}$=19.80) had the lowest preference for this scale among all the groups in all ages.

Furthermore, one-way ANOVA found significant differences (see Table 27) at ages 17-19 (non-Native students removed) among Dene ($\underline{M}$=15.05), Cree ($\underline{M}$=15.06) and Metis ($\underline{M}$=19.80) students (F=4.63, $\underline{p}$<.05). This result would suggest that Metis students showed a lower preference for learning about numbers and logic than did Dene and Cree students at ages 17-19.

Table 26

Mean Scores of Numeric Scale Classified on the Basis of Culture of Students (n=378)

Cultural Groups	Age	12	13	14	15	16	17-19
	n	45	88	109	81	26	29
Cree		16.67	16.42	15.95	16.26	16.88	15.06
Dene		--	14.71	14.53	15.08	15.88	15.05
Metis		16.71	15.00	16.53	15.78	16.10	19.80
Non-Native		17.47	16.30	16.46	16.50	--	--

Table 27

One-Way Analyses of Variance of Scores on the Numeric Scale among Cree, Dene, Metis and Non-Native Students with Newman-Keuls Comparisons

Age in Years		SS	df	MS	F	Newman-Keuls
12	Between	5.89	2	2.95	0.19	1 3 4
	Within	658.02	42	15.67		
13	Between	36.37	3	12.12	0.69	2 3 4 1
	Within	1479.22	84	17.61		
14	Between	49.35	3	16.45	1.01	2 1 4 3
	Within	1710.85	105	16.29		
15	Between	16.12	3	5.37	0.31	2 3 1 4
	Within	1333.88	77	17.32		
16	Between	4.47	2	2.23	0.23	2 3 1
	Within	220.65	23	9.59		
17-19	Between	90.02	2	45.01	4.63 *	2 1 3
	Within	252.95	26	9.73		

Note. Groups: 1 = Cree; 2 = Dene; 3 = Metis; 4 = Non-Native.
*p<.05.

On the Qualitative scale, the mean scores of the cultural groups at each age level are shown in Table 28. Non-Native students (M=14.00) at age 12 showed a slightly high preference for learning about words and language, while other groups were lower. Dene students (M=15.00) at age 13, Metis students (M=14.72) at age 14 and non-Native students (M=15.00) at age 15 expressed neither a high nor a low preference for learning about words and language. Other groups at each age level gave lower preference ratings for the Qualitative scale. After non-Native students were removed, Dene students (M=13.13) at age 16 showed a high preference for learning about words and language and, furthermore, Metis students (M=12.40) at ages 17-19 showed an even higher preference for this learning scale.

In addition, one-way ANOVA found significant differences (see Table 29) at age 16 (when non-Native students were removed) among the Dene (M=13.13), Metis (M=16.60) and Cree (M=17.63) students ($F=4.65$, $p<.01$). This result would suggest that at age 16 Dene students showed a much higher preference for learning about words and language than did Metis and Cree students.

On the Inanimate scale, the mean scores of the cultural groups at each age level are shown in Table 30. Cree students at age 12 (M=11.67), age 13 (M=11.32), age 14 (M=12.10) and age 16 (M=12.00) more highly favored learning about working with things than did the other groups at these age levels. At age 15, Dene students (M=11.54) showed a very high preference for learning about working with things. After non-Native strudents were removed, Cree students (M=12.00) at age 16 showed the highest preference among the groups, and Metis students

Table 28

Mean Scores of Qualitative Scale Classified on the Basis of Culture of Students (n=378)

Cultural Groups	Age	12	13	14	15	16	17-19
	n	45	88	109	81	26	29
Cree		16.22	15.84	15.43	15.89	17.63	15.60
Dene		--	15.00	16.00	15.54	13.13	13.63
Metis		15.19	15.72	14.72	15.19	16.60	12.40
Non-Native		14.00	16.45	14.93	15.00	--	--

Table 29

One-Way Analyses of Variance of Scores on the Qualitative Scale among Cree, Dene, Metis, Non-Native Students with Newman-Keuls Comparisons

Age in Years		SS	df	MS	F	Newman-Keuls
12	Between	29.21	2	14.60	1.39	4 3 1
	Within	442.79	42	10.54		
13	Between	17.67	3	5.89	0.54	2 3 1 4
	Within	917.05	84	10.92		
14	Between	21.42	3	7.14	0.57	3 4 1 2
	Within	1309.66	105	12.47		
15	Between	8.44	3	2.81	0.23	4 3 1 2
	Within	954.70	77	12.40		
16	Between	90.23	2	45.12	4.65 **	2 3 1
	Within	223.15	23	9.70		
17-19	Between	26.49	2	13.24	2.28	3 2 1
	Within	150.82	26	5.80		

Note. Groups: 1 = Cree; 2 = Dene; 3 = Metis; 4 = Non-Native.
*p<.01.

Table 30

Mean Scores of Inanimate Scale Classified on the Basis of Culture of Students (n=378)

Cultural Groups	Age	12	13	14	15	16	17-19
	n	45	88	109	81	26	29
Cree		11.67	11.32	12.10	12.32	12.00	12.00
Dene		--	13.86	14.20	11.54	14.13	13.42
Metis		12.10	11.78	13.33	13.16	12.20	11.20
Non-Native		13.27	11.89	12.97	12.08	--	--

Table 31

One-Way Analyses of Variance of Scores on the Inanimate Scale among Cree, Dene, Metis and Non-Native Students with Newman-Keuls Comparisons

Age in Years		SS	df	MS	F	Newman-Keuls
12	Between	18.06	2	9.03	0.49	1 3 4
	Within	778.74	42	18.54		
13	Between	33.57	3	11.19	0.75	1 3 4 2
	Within	1250.51	84	14.89		
14	Between	42.06	3	14.02	0.98	1 4 3 2
	Within	1504.62	105	14.33		
15	Between	30.82	3	10.27	0.84	2 4 1 3
	Within	947.28	77	12.30		
16	Between	22.64	2	11.32	0.89	1 3 2
	Within	292.48	23	12.72		
17-19	Between	23.33	2	11.66	1.03	3 1 2
	Within	293.43	26	11.29		

Note. Groups: 1 = Cree; 2 = Dene; 3 = Metis; 4 = Non-Native.

Table 32

Mean Scores of People Scale Classified on the Basis of Culture of Students
(n=378)

Cultural Groups	Age	12	13	14	15	16	17-19
	n	45	88	109	81	26	29
Cree		15.44	16.42	16.52	15.42	13.88	16.80
Dene		--	16.43	15.27	17.85	17.00	17.84
Metis		16.05	17.61	15.42	15.70	15.10	16.60
Non-Native		15.27	15.36	15.97	16.42	--	--

Table 33

One-Way Analyses of Variance of Scores on the People Scale among Cree, Dene, Metis and Non-Native Students with Newman-Keuls Comparisons

Age in Years		SS	df	MS	F	Newman-Keuls
12	Between	5.89	2	2.95	0.26	4 1 3
	Within	476.11	42	11.34		
13	Between	67.56	3	22.52	1.72	4 1 2 3
	Within	1102.81	84	13.13		
14	Between	22.20	3	7.40	0.59	2 3 4 1
	Within	1309.60	105	12.47		
15	Between	55.42	3	18.47	1.97	1 3 4 2
	Within	722.97	77	9.39		
16	Between	39.76	2	19.88	1.85	1 3 2
	Within	247.78	23	10.77		
17-19	Between	8.65	2	4.32	0.47	3 1 2
	Within	238.53	26	9.17		

Note. Groups: 1 = Cree; 2 = Dene; 3 = Metis; 4 = Non-Native.

(M=11.20) at ages 17-19 had the highest preference for this scale among the groups. Overall, the mean scores of all cultural groups at each age level indicated high or very high preference for the Inanimate scale. In addition, since one-way ANOVA did not yield any significant differences (see Table 31) among the means of the cultural groups at any age level, the high preference for learning about working with things could be a general tendency shared by all the cultural groups at any age level.

On the People scale, the mean scores of the cultural groups at each age level are shown in Table 32. Non-Native students at age 12 (M=15.27) and age 13 (M=15.36) expressed neither a high nor a low preference, while other groups rated this scale as a low preference. Dene students (M=15.27) at age 14 and Cree students (M=15.42) at age 15 indicated neither a high nor a low preference for this scale, but other groups were lower. After non-Native students were removed, Cree students (M=13.88) at age 16 responded most positively to learning about working with people. At ages 17-19, Metis students (M=16.60) rated the People scale as a slightly low while other groups rated it even lower. No significant differences were found among the means of the cultural groups at any age level by one-way ANOVA. Therefore, all the cultural groups at every age level appeared to share a similar tendency of neither a high nor a low preference for learning about working with people. Most scores tended towards the low rating.

(3) Learning Mode

On the Listening scale, the previous one-way ANOVA on the basis of culture without consideration of age (see Table 9) had found significant differences among the means of the four cultural groups at the .01 level, indicating that non-Native students responded less positively to learning by listening than did Dene and Metis students. The mean scores of the cultural groups at each age level are shown in Table 34. At age 12, from which Dene students were removed, Metis students ($\underline{M}$=16.10) expressed a slightly low preference for this scale although theirs was the highest preference among the groups. After Dene students were included, Dene students at age 13 ($\underline{M}$=15.43), age 14 ($\underline{M}$=15.73), age 15 ($\underline{M}$=15.23) and age 16 ($\underline{M}$=14.88) indicated neither a high nor a low preference. Other groups tended to rate Listening as a lower preference. At ages 17-19, Cree students ($\underline{M}$=15.60) showed a slightly low preference for this scale while other groups indicated even lower preferences. Non-Native students ($\underline{M}$=18.33) at the age of 12 expressed the lowest preference of all the groups at every age level for the Listening scale. Despite these trends, no significant differences (see Table 35) were found among the means of the cultural groups at any age level, a finding which contradicted the previous result of one-way ANOVA without consideration of age.

On the Reading scale, the previous one-way ANOVA on the basis of culture without consideration of age (see Table 9) had found significant differences among the means of the four cultural groups at the .001 level, indicating that Dene students had the least negative reaction to

Table 34

Mean Scores of Listening Scale Classified on the Basis of Culture of Students (n=378)

Cultural Groups	Age	12	13	14	15	16	17-19
	n	45	88	109	81	26	29
Cree		16.11	17.32	16.23	15.84	17.75	15.60
Dene		--	15.43	15.73	15.23	14.88	15.74
Metis		16.10	15.56	15.95	16.51	15.50	15.80
Non-Native		18.33	17.07	17.23	16.08	--	--

Table 35

One-Way Analyses of Variance of Scores on the Listening Scale among Cree, Dene, Metis and Non-Native Students with Newman-Keuls Comparisons

Age in Years		SS	df	MS	F	Newman-Keuls
12	Between	49.88	2	24.94	2.69	3 1 4
	Within	390.03	42	9.29		
13	Between	48.03	3	16.01	1.57	2 3 4 1
	Within	855.06	84	10.18		
14	Between	36.09	3	12.03	1.29	2 3 1 4
	Within	982.02	105	9.35		
15	Between	17.40	3	5.80	0.54	2 1 4 3
	Within	828.99	77	10.77		
16	Between	37.13	2	18.56	2.99	2 3 1
	Within	142.88	23	6.21		
17-19	Between	0.11	2	0.05	0.01	1 2 3
	Within	179.68	26	6.91		

Note. Groups: 1 = Cree; 2 = Dene; 3 = Metis; 4 = Non-Native.

learning through written materials while non-Native students were the most negative of all. The mean scores of the cultural groups at each age level are shown in Table 36. At age 12, Metis students ($\underline{M}$=16.38) showed a slightly low preference for learning through written materials while other groups gave it a very low rating. Metis students ($\underline{M}$=16.72) at age 13 showed less negative reaction than did other groups. At age 14, Dene students ($\underline{M}$=15.73) showed a slightly low preference for learning through written materials which was, however, the highest preference among the groups. At age 15, non-Native students ($\underline{M}$=14.92) expressed neither a high nor a low preference, although it was the highest preference compared to other groups who indicated a slightly low preference. After non-Native students were removed at ages 16-19, Dene students ($\underline{M}$=16.00) at age 16 expressed a slightly low preference, and Dene students ($\underline{M}$=14.16) ages 17-19 showed a slightly high preference for this scale; at both age levels, they expressed the highest preferences among the groups.

Furthermore, one-way ANOVA indicated that there were significant differences (see Table 37) among the means of the cultural groups at age 12 (F=6.42, $\underline{p}$<.01) and age 14 (F=4.10, $\underline{p}$<.01). The SNK tests for differences between the means showed significant differences among the Metis ($\underline{M}$=16.38), Cree ($\underline{M}$=17.00) and non-Native ($\underline{M}$=20.27) students at age 12. This result would imply that non-Native students had a much lower preference for learning through written materials than did Metis and Cree students. The SNK tests also revealed a significant difference between the Dene ($\underline{M}$=15.07) and non-Native ($\underline{M}$=18.67) students at age 14. The result would indicate that non-Native students showed a lower

Table 36

Mean Scores of Reading Scale Classified on the Basis of Culture of Students (n=378)

Cultural Groups	Age	12	13	14	15	16	17-19
	n	45	88	109	81	26	29
Cree		17.00	17.79	17.24	16.21	19.13	15.40
Dene		--	17.14	15.07	15.54	16.00	14.16
Metis		16.38	16.72	16.88	17.11	16.70	17.20
Non-Native		20.27	18.52	18.67	14.92	--	--

Table 37

One-Way Analyses of Variance of Scores on the Reading Scale among Cree, Dene, Metis and Non-Native Students with Newman-Keuls Comparisons

Age in Years		SS	df	MS	F	Newman-Keuls
12	Between	139.31	2	69.66	6.42 **	3 1 4
	Within	455.89	42	10.85		
13	Between	46.26	3	15.42	1.45	3 2 1 4
	Within	890.60	84	10.60		
14	Between	137.13	3	45.71	4.10 **	2 3 1 4
	Within	1169.83	105	11.14		
15	Between	54.78	3	18.26	1.56	4 2 1 3
	Within	898.87	77	11.67		
16	Between	43.64	2	21.82	1.80	2 3 1
	Within	278.98	23	12.13		
17-19	Between	38.16	2	19.08	1.58	2 1 3
	Within	314.53	26	12.10		

Note. Groups: 1 = Cree; 2 = Dene; 3 = Metis; 4 = Non-Native.
*p<.01.

preference for this scale than did non-Native students. Both results could suggest, as did the previous result of one-way ANOVA without consideration of age, that non-Native students had a lower preference for learning through written materials than did any other cultural group.

On the Iconics scale, the previous one-way ANOVA on the basis of culture without consideration of age (see Table 9) had found significant differences among the means of the four cultural groups at the .001 level, indicating that non-Native students had the highest preference for the audio-visual, while Dene students had the lowest preference. The mean scores of the cultural groups at each age level are shown in Table 38. Non-Native students at age 12 ($\underline{M}$=9.73), age 13 ($\underline{M}$=11.36) and age 14 ($\underline{M}$=11.37) showed very high preferences for learning by visual materials. At age 15, Metis students ($\underline{M}$=13.22) had a higher preference for this scale than did the others. After non-Native students were removed at ages 16-19, Metis students at age 16 ($\underline{M}$=12.30) expressed the highest preference among the groups. In addition, at ages 17-19, Metis students ($\underline{M}$=14.60) did not show neither a high nor a low preference for this scale while other groups tended to rate the Iconics slightly lower.

Furthermore, one-way ANOVA indicated that there were significant differences (see Table 39) among the means of the cultural groups at age 12 (F=8.21, $\underline{p}$<.001) and age 14 (F=4.20, $\underline{p}$<.01). The SNK tests for differences between the means showed significant differences among the non-Native ($\underline{M}$=9.73), Metis ($\underline{M}$=13.43) and Cree ($\underline{M}$=15.00) students at age 12. This result would indicate that non-Native students very highly favored visual materials as a mode of learning compared to Metis and

Table 38

Mean Scores of Inconics Scale Classified on the Basis of Culture of Students (n=378)

Cultural Groups	Age	12	13	14	15	16	17-19
	n	45	88	109	81	26	29
Cree		15.00	12.21	12.52	13.84	12.38	15.40
Dene		--	14.29	15.33	15.00	14.63	14.63
Metis		13.43	12.61	12.91	13.22	12.30	14.60
Non-Native		9.73	11.36	11.37	14.50	--	--

Table 39

One-Way Analyses of Variance of Scores on the Iconics Scale among Cree, Dene, Metis and Non-Native Students with Newman-Keuls Comparisons

Age in Years		SS	df	MS	F	Newman-Keuls
12	Between	189.17	2	94.58	8.21 ***	4 3 1
	Within	484.08	42	11.53		
13	Between	61.85	3	20.62	2.45	4 1 3 2
	Within	707.05	84	8.42		
14	Between	159.64	3	53.21	4.20 **	4 1 3 2
	Within	1331.17	105	12.68		4 1 3 2
15	Between	37.12	3	12.37	0.99	3 1 4 2
	Within	961.80	77	12.49		
16	Between	29.11	2	14.56	1.31	3 1 2
	Within	255.85	23	11.12		
17-19	Between	2.49	2	1.24	0.08	3 2 1
	Within	414.82	26	15.95		

Note. Groups: 1 = Cree; 2 = Dene; 3 = Metis; 4 = Non-Native.
*p<.01. ***p<.001.

Cree students. Among the groups of 14 year olds, the SNK tests revealed significant differences in two ways. First, a significant difference was found between the non-Native (M=11.37) and Dene (M=15.33) students. This result would imply that non-Native students showed a higher preference for the audio-visual mode of learning than did Dene students. Second, a significant difference was found between the mean scores of Metis (M=12.91) and Dene (M=15.33). This result would indicate that Metis students likewise had a higher preference for the audio-visual as a mode of learning than did Dene students. As the previous result of one-way ANOVA had suggested, results could also indicate that non-Native students had the highest preference for learning by visual materials, and Dene students had the lowest.

On the Direct Experience scale, the previous analyses of one-way ANOVA on the basis of culture without consideration of age (see Table 9) had found significant differences among the means of the four cultural groups at the .01 level, indicating that non-Native and Cree students had higher preferences for learning through direct experience than did Dene students. The mean scores of the cultural groups at each age level are shown in Table 40. Non-Native students at age 12 (M=11.67) and age 14 (M=12.73) had the highest preference on this scale of all the groups at these age levels. At age 13, Cree students (M=12.68) showed a higher preference for direct experience as a mode of learning than did the other groups. At age 15, Metis students (M=13.16) had a higher preference for this learning mode than did the other groups, but no scores were strongly positive. After non-Native students were removed, Cree students (M=10.75) at age 16 had the highest preference. The

Table 40

Mean Scores of Direct Experience Scale Classified on the Basis of Culture of Students (n=378)

Cultural Groups	Age	12	13	14	15	16	17-19
	n	45	88	109	81	26	29
Cree		11.89	12.68	14.00	14.11	10.75	13.60
Dene		--	13.14	13.87	14.23	14.50	15.74
Metis		14.10	15.11	14.26	13.16	15.50	12.40
Non-Native		11.67	13.05	12.73	14.50	--	--

Table 41

One-Way Analyses of Variance of Scores on the Direct Experience Scale among Cree, Dene, Metis and Non-Native Students with Newman-Keuls Comparisons

Age in Years		SS	df	MS	F	Newman-Keuls
12	Between	61.88	2	30.94	2.67	4 1 3
	Within	486.03	42	11.57		
13	Between	68.43	3	22.81	1.99	1 4 2 3
	Within	964.65	84	11.48		
14	Between	43.50	3	14.50	1.13	4 2 1 3
	Within	1345.79	105	12.82		
15	Between	24.94	3	8.31	0.67	3 1 2 4
	Within	960.12	77	12.47		
16	Between	107.12	2	53.56	7.60 **	1 2 3
	Within	162.00	23	7.04		
17-19	Between	52.67	2	26.34	2.63	3 1 2
	Within	260.08	26	10.00		

Note. Groups: 1 = Cree; 2 = Dene; 3 = Metis; 4 = Non-Native.
*p<.01.

preference rating of this group was the highest among the all groups at all age levels. At ages 17-19, Metis students ($\underline{M}$=12.40) showed the highest preference for direct experience of any groups.

Furthermore, one-way ANOVA indicated that there were significant differences (see Table 41) among the means of the cultural groups at age 16 (F=7.60, $\underline{p}$<.05), from which non-Native students were excluded. The SNK tests showed significant differences among the Cree ($\underline{M}$=10.75), Dene ($\underline{M}$=14.50) and Metis ($\underline{M}$=15.74) students at age 16. This result, confirming the previous result of one-way ANOVA, would indicate that Cree students had a higher preference for learning through direct experience than did Dene or Metis students.

4.1.3 Discriminant Analysis of Learning Style and Culture

Looking at each learning style component separately without considering interrelations may produce a distorted picture of the group differences. Therefore, it was considered necessary to examine the pattern of weights on the 16 learning style scales using mulitiple discriminant analysis in order to get a more accurate account of the nature of group differences (Tatsuoka, 1970).

As shown in Table 42, a four-group discriminant function analysis (or multiple discriminant function analysis) was conducted to determine whether or not a set of scores on the learning style scales could be used to successfully predict cultural group memberships of the students who had identified themselves as Cree, Dene, Metis and non-Native. In the canonical correlation for discriminant function one, Wilks' Lambda was calculated to be 0.76, equivalent to an F ratio of 103.03. The

probability of obtaining an F ratio this large by chance was less than .0001. In addition, Wilks' Lambda of canonical correlation for discriminant function two was 0.93 which was equivalent to an F ratio of 28.07. The probability of obtaining F ratio this large by chance was less than .05. Consequently, the learning style scales were found to discriminate among the four cultural groups by two functions. The obtained Wilks' Lambda=0.98 for a third function in canonical correlative did not reach the .05 level of significance. Hence, function three was eliminated.

In function one (see Table 43), Dene students provided a positive correlation coefficient of 0.78; in contrast, non-Native students showed

Table 42

Canonical Discriminant Functions of Cultural Differences

Fun.	Eigenvalue	Percent of Variance	Canonical Correlation	After Fun.	Wilks' Lambda	F-Ration	df	Sig.
1	0.22	74.31	0.42	: 0	0.76	103.03	27	0.0000
2	0.05	17.59	0.22	: 1	0.93	28.07	16	0.0310
3	0.02	8.10	0.15	: 2	0.98	8.94	7	0.2573

Table 43

Canonical Discriminant Functions Evaluated at Group Means of Four Cultural Groups

Group	Cases	Function 1	Function 2	Function 3
Cree	81	0.12	-0.34	0.19
Dene	65	0.78	0.31	0.08
Metis	134	0.05	-0.09	-0.20
Non-Native	105	-0.64	0.18	0.06

a negative correlation coefficient of -0.64. Consequently, Dene students showed an antithetic relationship with non-Native students in canonical discriminant function one. Neither Cree nor Metis students yielded a large significant correlation coefficient. Function one, therefore, provided a fair identification of the Dene and non-Native students' preferences on the 16 learning style scales. In function two, Cree students provided a negative correlation coefficiant of -0.34; in contrast, Dene students showed a positive correlation coefficient of 0.31. However, neither correlation on function two was large enough to identify the Dene and Cree students' preferences of learning style.

Both negative and positive coefficients of over 0.25 differentiated among the cultural groups of students, giving eight scales which revealed strong differences in function one (see Table 44): Iconics (0.63), Reading (-0.56), Competition (-0.44), Listening (-0.42), Numeric (-0.27), Authority (-0.40), Instructor (0.36) and Direct Experience (0.29) in function one. The one-way ANOVA findings of differences on the scales of Competition ($p<.001$ in total, $p<.01$ at age 13, $p<.05$ at age 14); Instructor ($p<.01$ in total); Numeric ($p<.05$ at ages 17-19); Qualitative ($p<.01$ at age 16); Listening ($p<.01$ in total); Reading ($p<.001$ in total, $p<.01$ at age 12, $p<.01$ at age 14); Iconics ($p<.001$ in total, $p<.001$ at age 12, $p<.01$ at age 14); and Direct Experience ($p<.01$ in total, $p<.01$ at age 16) matched the results of discriminant analysis. However, the Inanimate and People scales, which appeared strongly in the discriminant analysis did not show any significant differences in the one-way ANOVA. On the other hand, significant differences on the Peer, Organization, Goal Setting, Detail, Independence and Authority scales

revealed by the one-way ANOVA did not appear to be important in the discriminant analysis.

Table 44

Pooled Within-Groups Correlations Between Canonical Discriminant Functions and Discriminanting Variables of Cree, Dene, Metis and non-Native Students

	Function 1	Function 2	Function 3
Iconics	0.63 *	0.03	0.02
Reading	-0.56 *	-0.17	0.29
Competition	-0.44 *	-0.22	-0.36
Listening	-0.42 *	-0.11	0.30
Numeric	-0.27 *	-0.23	-0.08
Authority	-0.40	0.50 *	0.45
Instructor	0.36	-0.37 *	0.04
People	0.16	0.34 *	-0.03
Detail	0.04	-0.17 *	-0.00
Direct Experience	0.29	0.24	-0.59 *
Independece	0.03	-0.01	-0.49 *
Qualitative	-0.11	-0.36	0.43 *
Peer	0.23	0.22	0.39 *
Goal Setting	-0.07	0.19	-0.39 *
Organization	0.24	-0.24	0.32 *
Inanimate	0.24	0.25	-0.27 *

Note: Variables are ordered by the function with largest correlation and the magnitude of that correlation.

As indicated in Table 45, Dene students were classified correctly in 36 cases out of 65 or 55.4 percent of the cases. Correct classification for non-Native students was 63 cases out of 105 (60.0%). Cree students were correctly classified in only 31 cases out of 81 (38.3%). Metis students were correctly classified even less accurately with only 23.9 percent fitting into their self-identified group. A total of 41 Metis students out of 134 (30.6%) were classified as

non-Native students. The overall classification rate was 42.08%. Accordingly, Dene and non-Native students showed high correct classification rates while Metis students were more often classified as non-Native students. Cree students were seemingly classified across all cultural groups.

Table 45

Summary of Classification Results for Four Cultural Groups

Actual Group	Cases	Predicted Group Membership 1	2	3	4
1 Cree	81	31	22	11	17
		38.3%	27.2%	13.6%	21.0%
2 Dene	65	12	36	6	11
		18.5%	55.4%	9.2%	16.9%
3 Metis	134	25	36	32	41
		18.7%	26.9%	23.9%	30.6%
4 Non-Native	105	16	15	11	63
		15.2%	14.3%	10.5%	60.0%

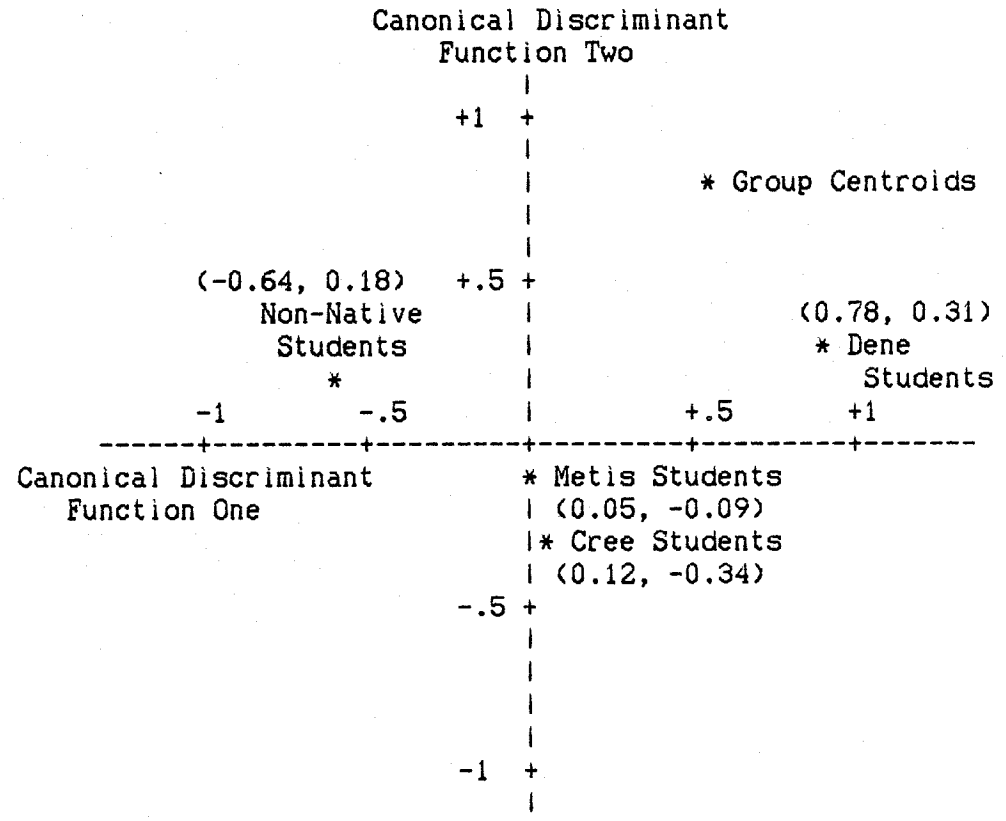
Percent of grouped cases correctly classified: 42.08 %

Furthermore, the group centroids of the four cultural groups were drawn by the figures of canonical discriminant function one and two as shown in Figure 4. According to the positions of the group centroids, Cree (0.12, -0.34) and Metis (0.05, -0.09) students shared fairly close positions in the graph, whereas, Dene (0.78, 0.31) and non-Native (-0.64, 0.18) students appeared in relatively different positions. In particular, function one differentiated Dene students from non-Native students. These positions would suggest that, considering the 16 learning style scales, Dene students were shown as possessing a

relatively different learning style from that of non-Native students, while Cree and Metis students shared a fairly similar learning style located between Dene and non-Native students.

Figure 4

Group Centroids of the Four Cultural Groups



4.2 Hypothesis 2

Hypothesis #2. There would be no statistically significant differences found in the learning styles of students on the basis of sex.

There were no significant differences found between sex and age, or between sex and culture in the student sample (see Table 6). Accordingly, sex was treated as an independent variable in the student sample.

The data for hypothesis #2 were analyzed in thses steps. First, learning style preferences of male and female students were identified by comparing the mean scores of the sex groups on 16 scales of the inventory. Furthermore, a series of one-way ANOVA on the basis of sex were conducted to determine similarities and differences between the mean scores of male and female students. Finally, overall sex differences on the 16 learning style scales were tested by the use of multiple discriminant analysis.

4.2.1 Learning Style Preferences of Male and Female Students

As shown in Table 46, scores on 12 of 16 learning style scales showed significant differences; six were at the .001 level, three at the .01 level, and three at the .05 level of significance.

(1) Learning Conditions

On the Peer scale, both male ($\underline{M}$=13.34) and female ($\underline{M}$=12.50) students showed a high preference for learning in teams and keeping good relationships with other students. Furthermore, one-way ANOVA indicated

a significant difference between male and female students (F=6.15, p<.05). The result would suggest that female students preferred peer affiliation highly more than did male students.

Table 46

One-Way Analyses of Variance of Scores on the Learning Style Scales of Male and Female Students with Newman-Keuls Comparison (n=385)

Scale	df	M of Male	M of Female	F-Ratio	F-Prob.	Newman-Keuls	
(1) Conditions							
Peer	1	13.34	12.50	6.15	.0135 *	2	1
Organization	1	14.50	14.23	0.77	.3801	2	1
Goal Setting	1	15.15	16.19	10.56	.0013 **	1	2
Competition	1	16.99	17.07	0.08	.7777	1	2
Instructor	1	12.23	13.64	18.13	.0000 ***	1	2
Detail	1	14.55	13.68	8.00	.0049 **	2	1
Independence	1	16.06	17.62	21.19	.0000 ***	1	2
Authority	1	17.15	15.11	34.74	.0000 ***	2	1
(2) Content							
Numeric	1	15.61	16.61	6.26	.0128 *	1	2
Qualitative	1	16.42	14.37	38.89	.0000 ***	2	1
Inanimate	1	10.93	14.00	77.02	.0000 ***	1	2
People	1	17.05	15.05	35.70	.0000 ***	2	1
(3) Mode							
Listening	1	16.51	16.18	1.06	.3039	2	1
Reading	1	17.07	16.99	0.05	.8199	2	1
Iconics	1	12.35	13.49	9.65	.0020 **	1	2
Direct Experience	1	14.09	13.33	4.53	.0340 *	2	1

Note. Groups: Male = 1; Female = 2.
*p<.05. **p<.01. ***p<.001.

On the Organization scale, both male (M=14.50) and female (M=14.23) students expressed neither a high nor a low preference for course work organized logically, clearly and sequentially. In addition, no significant difference was found between the means of male and female

students. Therefore, it could be concluded that there was no difference between male and female students in their preference for carefully organized materials and that neither group felt strongly about it.

On the Goal Setting scale, male students (M=15.15) expressed neither a high nor a low preference for setting their own learning goals while female students (M=16.19) showed a slightly low preference for this scale. Furthermore, one-way ANOVA revealed a significant difference between male and female students (F=10.56, p<.01). The result would indicate that female students had a lower preference for setting their own learning goals than did male students.

On the Competition scale, both male (M=16.99) and female (M=17.07) students had low preferences for competitive learning conditions. No significant difference was found between the means. While both disliked competition, it could be concluded that there was no difference between male and female students.

On the Instructor scale, male students (M=12.23) expressed a high preference for knowing the instructor personally while female students (M=13.64) showed a slightly high preference for this scale. Furthermore, one-way ANOVA revealed a significant difference between the means of male and female students (F=18.13, p<.001). The result would indicate that male students were more interested in knowing the instructor personally than were female students.

On the Detail scale, male students (M=14.55) expressed neither a high nor a low preference for receiving detailed information on assignments, requirements and rules while female students (M=13.68) showed a slightly high preference for this scale. Furthermore, one-way

ANOVA indicated a significant difference between male and female students ($F=8.00$, $p<.01$). The result would suggested that female students favored having detailed information more than did male students.

On the Independence scale, male students ($M=16.06$) expressed a slightly low preference for learning alone and independently while female students ($M=17.62$) had a low preference for this scale. Furthermore, one-way ANOVA showed a significant difference between male and female students ($F=21.19$, $p<.001$). The result would suggest that female students felt more negatively toward learning alone and independently than did male students.

On the Authority scale, male students ($M=17.15$) showed a low preference for strict classroom discipline while female students ($M=15.11$) did not show either a high or a low preference for this scale. Furthermore, one-way ANOVA indicated a significant difference between male and female students ($F=34.74$, $p<.001$). The result would imply that male students were more opposed to strict rules as a condition of learning than were female students.

(2) Learning Content

On the Numeric scale, male students ($M=15.61$) expressed a slightly low preference for learning about numbers and logic while female ($M=16.61$) students showed a low preference for this scale. Furthermore, one-way ANOVA indicated a significant difference between male and female students ($F=6.26$, $p<.05$). The result would suggest that female students

expressed a significantly stronger dislike for learning about numbers and logic than did male students.

On the Qualitative scale, male students ($\underline{M}$=16.42) gave a slightly low preference for learning about words and language while female students ($\underline{M}$=14.37) expressed a slightly high preference for this scale. Furthermore, one-way ANOVA showed a significant difference between male and female students (F=38.89, $\underline{p}$<.001). The result would imply that male students were somewhat opposed to learning about words and language while female students were somewhat in favour.

On the Inanimate scale, male students ($\underline{M}$=10.93) had a very high preference for learning about working with things while female students ($\underline{M}$=14.00) showed a only slightly high preference for this scale. Furthermore, one-way ANOVA indicated a significant difference between male and female students (F=77.02, $\underline{p}$<.001). The result would suggest that male students much more highly preferred learning about inanimate objects than did female students.

On the People scale, male students ($\underline{M}$=17.05) expressed a low preference for learning about working with people, while female students ($\underline{M}$=15.05) did not show either a high or a low preference for this scale. Furthermore, one-way ANOVA indicated a significant difference between male and female students (F=35.70, $\underline{p}$<.001). The result would suggest that female students had a lower preference for learning about working with people than did female students, who were ambivalent.

(3) Learning Mode

On the Listening scale, male students ($\underline{M}$=16.51) showed a low preference for learning by listening while female students ($\underline{M}$=16.18) expressed a slightly low preference. However, no significant difference was found between male and female students.

On the Reading scale, both male ($\underline{M}$=17.07) and female ($\underline{M}$=16.99) students had low preferences for learning through written materials. No significant difference was found between the means of male and female students.

On the Iconics scale, both male ($\underline{M}$=12.35) and female ($\underline{M}$=13.49) students had a high preference for learning by visual materials. Furthermore, a significant difference was found between male and female students (F=9.65, $\underline{p}$<.01). In sum, male students had a somewhat higher preference for the audio-visual mode of learning than did female students.

On the Direct Experience scale, male students ($\underline{M}$=14.09) showed a slightly high preference for learning by direct experience while female students ($\underline{M}$=13.33) students expressed a high preference for this scale. Furthermore, a significant difference was found between male and female students (F=4.53, $\underline{p}$<.05). In sum, female students had a higher preference for learning by direct experience than did male students.

4.2.2 Discriminant Analysis of Learning Style and Sex

As shown in Table 47, a two-group discriminant function analysis was conducted to determine whether or not a set of scores on the

learning style scales could be used to successfully predict the group memberships of male and female students. In function one, Wilks' Lambda was calculated to be 0.68, equivalent to an F ratio of 145.62. The probability of obtaining an F ratio this large by chance was less than .0001, affirming that learning style scales could be used to predict the group memberships of male and female students. In addition, function one as shown in Table 48 indicated a positive correlation coefficient for male students of 0.74, and a negative correlation coefficient for female students of -0.63. Consequently, male students showed an antithetic relationship to female students in function one. Differences in male and female student preferences of learning style by 16 variables are shown in Table 49.

Table 47

Canonical Discriminant Functions of Male and Female Students

Fun.	Eigenvalue	Percent of Variance	Canonical Correlation	After Fun.	Wilks' Lambda	F-Ratio	df	Sig.
1	0.47	100.00	0.56	: 0	0.68	145.62	6	0.0000

Table 48

Canonical Discriminant Functions Evaluated at Group Means of Male and Female Students

Group	Cases	Function 1
Male	178	0.74
Female	207	-0.63

Both negative and positive correlation coefficiants of over 0.25 differentiated between male and female students, with six scales differentiating strongly on function one (see Table 49): Inamimate (-0.66), Qualitive (0.53), Authority (0.44), People (0.38), Independence (-0.38), and Instructor (-0.26). These six scales confirmed the one-way ANOVA finding of differences at the .001 significance level (see Table 50). The remaining scales of learning style could, by and large, be shared equally by male and female students. These equally-shared scales, except for the Peer scale, generally confirmed the finding of no significant differences between the means of male and female students on these scales.

Table 49

Pooled Within-Groups Correlations Between Canonical Discriminant Function and Discriminating Variables of Male and Female Students

Scale	Function 1
Inanimate	-0.66
Qualitative	0.53
Authority	0.44
People	0.38
Independence	-0.38
Instructor	-0.26
Detail	0.21
Iconics	-0.21
Goal Setting	-0.20
Numeric	-0.19
Direct Experience	0.16
Reading	0.06
Competition	0.01
Organization	0.00
Listening	0.00
Peer	0.00

Note: Variables are ordered by the function with the largest correlation and the magnitude of that correlation.

The classification of male and female students shown in Table 50 indicated that male students were classified correctly 74.2 percent of the time while female students were classified correctly in 71.5 percent of the cases. The overall classification rate was 72.73%.

Table 50

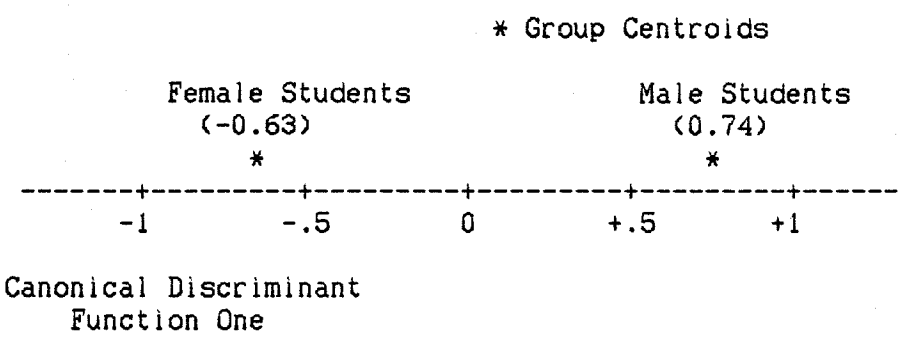
Summary of Classification Results for Male and Female Students

Actual Group	Cases	Predicted Group Membership 1	2
1 Male	178	132 74.2%	46 25.8%
2 Female	207	59 28.5%	148 71.5%

Percent of grouped cases correctly classified: 72.73%

Figure 5

Group Centroids of Male and Female Students



In addition, according to group centroids shown in Figure 5, male and female students revealed relatively large learning style differences (1.37 in canonical discriminant function one). Compared with the distance 1.42 in canonical discriminant function one between Dene and non-Native students (see Figure 4), the amount of learning style

differences revealed by male and female students was slightly smaller, but much greater than the differences among other combinations of cultural groups.

4.3 Hypothesis 3

Hypothesis 3. There would be no statistically significant differences found in the learning styles of students on the basis of age.

Since there was a significant difference found between age (12-19 years old) and culture in the student sample (see Table 6), age could not be treated separately from culture as an independent variable when analyzing data pertinent to hypothesis #3. Therefore, a series of one-way ANOVA were performed on the basis of age in each cultural group. Because age among non-Native students ranged only from 12 to 16, the classification of age for non-Native students was set differently among the three categories of 12-13, 14 and 15-16 years old. In addition, as a second step of analyses for hypothesis #3, overall age differences on all the 16 learning style scales were tested by the use of multiple discriminant function.

4.3.1 Learning Style Preferences Among Students Classified by Age

(1) Age Differences in Learning Style Among Cree Students

Mean scores of the three age groups of Cree students indicated many similarities (see Table 51) in learning style preferences. Furthermore, as shown in Table 52, no significant differences were found among the

scores on the learning style scales among the age groups. This result would suggest that the Cree students did not differ in learning style preferences because of age. This confirmed the similarity found in learning style preferences of Cree students in total (see Table 52); therefore, there was no need for a further examination of age differences among Cree students on learning style scales.

Table 51

Mean Scores of Three Age Groups of Cree Students (n=81)

Scale	Age	12-14	15	16-19	Total Group
	n	49	19	13	
(1) Conditions					
Peer[P]		12.98	12.74	13.31	12.98
Organization[O]		14.73	14.84	15.38	14.86
Goal Setting[G]		15.10	16.21	14.38	15.25
Competition[C]		17.18	16.16	16.77	16.88
Instructor[Is]		13.39	14.00	13.54	13.56
Detail[De]		14.33	13.26	15.31	14.23
Independence[Id]		16.80	17.16	15.85	16.73
Authority[A]		15.49	15.84	15.69	15.60
(2) Content					
Numeric[N]		16.27	16.26	16.38	16.28
Qualitative[Q]		15.73	15.89	16.85	15.95
Inanimate[Ia]		11.71	12.32	12.00	11.90
People[P]		16.29	15.42	15.00	15.88
(3) Mode					
Listening[L]		16.63	15.84	16.92	16.49
Reading[R]		17.41	16.21	17.69	17.17
Iconics[Ic]		12.86	13.84	13.54	13.20
Direct Experience[Di]		13.10	14.11	11.85	13.14

Table 52

One-Way Analyses of Variance of Scores on the Learning Style Scales of Cree Students Classified on the Basis of Age with Newman-Keuls Comparision (n=81)

Scale		SS	df	MS	F	Newman-Keuls
(1) Conditions						
Peer	Between	2.52	2	1.26	0.10	2 1 3
	Within	993.43	78	12.74		
Organization	Between	4.35	2	2.18	0.22	1 2 3
	Within	759.15	78	9.73		
Goal Setting	Between	28.34	2	14.17	1.53	3 2 1
	Within	720.72	78	9.24		
Competition	Between	14.58	2	7.29	0.90	2 3 1
	Within	632.18	78	8.10		
Instructor	Between	5.14	2	2.57	0.24	1 3 2
	Within	846.86	78	10.86		
Detail	Between	33.31	2	16.66	1.79	2 1 3
	Within	727.23	78	9.32		
Independence	Between	13.85	2	6.92	0.56	3 1 2
	Within	958.18	78	12.28		
Authority	Between	1.82	2	0.91	0.07	1 3 2
	Within	1069.54	78	13.71		
(2) Content						
Numeric	Between	0.16	2	0.08	0.01	2 1 3
	Within	862.31	78	11.06		
Qualitative	Between	12.77	2	6.38	0.45	1 2 3
	Within	1119.03	78	14.35		
Inanimate	Between	5.10	2	2.55	0.19	1 3 2
	Within	1026.11	78	13.16		
People	Between	22.13	2	11.07	1.25	3 2 1
	Within	688.63	78	8.83		
(3) Mode						
Listening	Between	11.41	2	5.70	0.49	2 1 3
	Within	904.84	78	11.60		
Reading	Between	23.82	2	11.91	0.95	2 1 3
	Within	981.76	78	12.59		
Iconics	Between	15.08	2	7.54	0.64	1 3 2
	Within	919.76	78	11.79		
Direct Experience	Between	39.53	2	19.77	1.92	3 1 2
	Within	803.97	78	10.31		

Note. Groups: 1 = 12-14 yrs; 2 = 15 yrs; 3 = 16-19 yrs.

(2) Age Differences in Learning Style Among Dene Students

The three age groups of Dene students (see Table 54) showed significant diferences in scores on five of the 16 scales of learning style at the .05 significance level. On the Organization scale, there were significant differences among the means ($F=4.14$, $p<.05$). The SNK test for differences between means revealed significant differences

Table 53

Mean Scores of Three Age Groups of Dene Students (n=65)

Scale	Age	12-14	15	16-19	Total Group
	n	25	13	27	
(1) Conditions					
Peer[P]		13.80	12.92	14.26	13.82
Organization[O]		15.60	15.23	13.74	14.75
Goal Setting[G]		15.60	15.00	15.96	15.63
Competition[C]		15.00	16.85	16.04	15.80
Instructor[Is]		13.76	13.15	13.52	13.54
Detail[De]		13.40	15.69	14.48	14.31
Independence[Id]		16.92	14.38	17.22	16.54
Authority[A]		15.92	16.77	14.78	15.62
(2) Content					
Numeric[N]		14.72	15.08	15.30	15.03
Qualitative[Q]		15.72	15.54	13.48	14.75
Inanimate[Ia]		13.80	11.54	13.63	13.28
People[P]		15.76	17.84	17.59	16.94
(3) Mode					
Listening[L]		15.72	15.23	15.48	15.52
Reading[R]		15.68	15.54	14.70	15.24
Iconics[Ic]		14.72	15.00	14.63	14.74
Direct Experience[Di]		13.88	14.23	15.37	14.57

Table 54

One-Way Analyses of Variance of Scores on the Learning Style Scales of Dene Students Classified on the Basis of Age with Newman-Keuls Comparision (n=65)

Scale		SS	df	MS	F	Newman-Keuls
(1) Conditions						
Peer	Between	15.68	2	7.84	0.75	2 1 3
	Within	652.11	62	10.52		
Organization	Between	48.57	2	24.28	4.14 *	3 2 1
	Within	363.49	62	5.86		
Goal Setting	Between	8.18	2	4.09	0.47	2 1 3
	Within	538.96	62	8.69		
Competition	Between	31.74	2	15.87	2.57	1 3 2
	Within	382.66	62	6.17		
Instructor	Between	3.16	2	1.58	0.16	2 3 1
	Within	606.99	62	9.79		
Detail	Between	46.34	2	23.17	3.39 *	1 3 2
	Within	423.51	62	6.83		
Independence	Between	76.57	2	38.29	4.35 *	2 1 3
	Within	545.58	62	8.80		
Authority	Between	38.57	2	19.29	1.90	3 1 2
	Within	628.81	62	10.14		
(2) Content						
Numeric	Between	4.35	2	2.17	0.19	1 2 3
	Within	701.59	62	11.32		
Qualitative	Between	75.05	2	37.53	4.78 *	3 2 1
	Within	487.01	62	7.86		
Inanimate	Between	49.49	2	24.74	1.90	2 3 1
	Within	809.53	62	13.06		
People	Between	56.98	2	28.49	3.71 *	1 3 2
	Within	476.77	62	7.69		
(3) Mode						
Listening	Between	2.13	2	1.06	0.13	2 3 1
	Within	492.09	62	7.94		
Reading	Between	13.76	2	6.88	0.68	3 2 1
	Within	628.30	62	10.13		
Iconics	Between	1.22	2	0.61	0.04	3 1 2
	Within	907.34	62	14.63		
Direct Experience	Between	30.69	2	15.35	1.23	1 2 3
	Within	773.24	62	12.47		

Note. Groups: 1 = 12-14 yrs; 2 = 15 yrs; 3 = 16-19 yrs.
*$p<.05$.

between the mean scores for ages 12-14 (M=15.60) and ages 16-19 (M=13.74). This result would indicate that the 16-19 year-old group had a higher preference for having course work organized logically, clearly and sequentially than did those at ages 12-14. On the Detail scale, there were significant differences among the means (F=3.39, p<.05). The SNK test revealed significant differences between the mean scores for ages 12-14 (M=13.40) and age 15 (M=15.69). This result would indicate that students at ages 12-14 had a higher preference for getting detailed information as a condition of learning than did those at age 15. The scales of Independence (F=4.35), Qualitative (F=4.78) and People (F=3.71) showed significant differences at the .05 level. According to the SNK, it was found that students at age 15 (M=14.38) had a more positive reaction to learning independently than did those at ages 12-14 (M=16.92) and ages 16-19 (M=17.22). Students at ages 16-19 (M=13.48) had a higher preference for Qualitative content than did those at ages 12-14 (M=15.54) and 15 (M=15.72); and students at ages 12-14 (M=15.76) had a less negative response to learning about working with people than did those at ages 15-19 (M=17.59).

On the remaining 11 scales, there were no significant differences found among the three age groups. This pattern of results would suggest that the three age groups of Dene students did not differ in preferences on these scales, confirming the similarity found in learning style preferences of Dene students in total (see Table 53).

(3) Age Differences in Learning Style Among Metis Students

The mean scores of the three age groups of Metis students indicated only minor variations in learning style preferences. (see Table 55) Furthermore, as shown in Table 56, no significant differences were found

Table 55

Mean Scores of Three Age Groups of Metis Students (n=134)

Scale	Age	12-14	15	16-19	Total Group
	n	82	37	15	
(1) Conditions					
Peer[P]		12.38	12.84	13.20	12.60
Organization[O]		14.66	13.86	13.07	14.26
Goal Setting[G]		15.91	15.41	17.00	15.90
Competition[C]		17.04	17.89	16.73	17.24
Instructor[Is]		13.26	13.27	12.07	13.13
Detail[De]		14.15	13.30	14.67	13.97
Independence[Id]		17.32	17.05	18.47	17.37
Authority[A]		15.29	16.30	14.87	15.52
(2) Content					
Numeric[N]		16.24	15.78	17.33	16.24
Qualitative[Q]		15.06	15.19	15.20	15.11
Inanimate[Ia]		12.67	13.16	11.87	12.72
People[P]		16.06	15.70	15.60	15.91
(3) Mode					
Listening[L]		15.90	16.51	15.60	16.04
Reading[R]		16.72	17.11	16.87	16.84
Iconics[Ic]		12.98	13.22	13.07	13.05
Direct Experience[Di]		14.40	13.16	14.47	14.07

Table 56

One-Way Analyses of Variance of Scores on the Learning Style Scales of Metis Students Classified on the Basis of Age with Newman-Keuls Comparisions (n=134)

Scale		SS	df	MS	F	Newman-Keuls
(1) Conditions						
Peer	Between	11.53	2	5.77	0.53	1 2 3
	Within	1428.71	131	10.91		
Organization	Between	40.16	2	20.08	2.04	3 2 1
	Within	1291.70	131	9.86		
Goal Setting	Between	27.22	2	13.61	1.50	2 1 3
	Within	1185.32	131	9.05		
Competition	Between	22.97	2	11.48	1.22	3 1 2
	Within	1237.39	131	9.45		
Instructor	Between	18.99	2	9.50	0.82	3 1 2
	Within	1521.85	131	11.62		
Detail	Between	26.57	2	13.29	1.38	2 1 3
	Within	1261.31	131	9.63		
Independence	Betwee	21.96	2	10.98	1.07	2 1 3
	Within	1339.38	131	10.22		
Authority	Between	32.99	2	16.50	1.30	3 1 2
	Within	1658.44	131	12.66		
(2) Content						
Numeric	Between	25.63	2	12.82	0.74	2 1 3
	Within	2276.73	131	17.38		
Qualitative	Between	0.55	2	0.28	0.03	1 2 3
	Within	1288.77	131	9.84		
Inanimate	Between	18.35	2	9.18	0.68	3 1 2
	Within	1778.87	131	13.58		
People	Between	4.90	2	2.45	0.23	3 2 1
	Within	1388.02	131	10.60		
(3) Mode						
Listening	Between	12.75	2	6.38	0.69	3 1 2
	Within	1212.06	131	9.25		
Reading	Between	3.86	2	1.93	0.16	1 3 2
	Within	1591.85	131	12.15		
Iconics	Between	1.48	2	0.74	0.05	1 3 2
	Within	1791.15	131	13.67		
Direct Experience	Between	41.92	2	20.96	1.68	2 1 3
	Within	1634.48	131	12.48		

Note. Groups: 1 = 12-14 yrs; 2 = 15 yrs; 3 = 16-19 yrs.

among the scores of the three age groups. This result would suggest that the three age groups of Metis students did not differ in their preferences for any learning style scale. This finding also confirmed the similarities found in learning style among the three age groups and those of Metis students in total (see Table 55); therefore, there was no need for a further examination of age differences of Metis students on learning style scales.

(4) Age Differences in Learning Style Among Non-Native Students

The three age groups of non-Native students (see Table 58) showed significant differences in scores on three of the 16 scales of learning style. On the Reading scale, there were significant differences among the means ($F=11.12$, $p<.001$). The SNK test revealed significant differences among the mean scores for ages 12-13 ($M=18.97$), age 14 ($M=18.67$) and ages 15-16 ($M=14.88$). This result would indicate that students at ages 12-13 and age 14 had a lower preference for learning through written materials than did those at ages 15-16. On the Iconics scale, there were significant differences among the means ($F=8.57$, $p<.001$). The SNK test indicated significant differences between the mean scores for age 14 ($M=11.37$) and ages 15-16 ($M=14.31$). This result would indicate that students at age 14 had a higher preference for the audio-visual mode of learning than did those at ages 15-16. The scores on Direct Experience showed significant differences among the means ($F=3.33$, $p<.05$). According to the SNK test, students at ages 12-13 ($M=12.69$) and age 14 ($M=12.73$) had higher preferences for learning by direct experience than did those at ages 15-16 ($M=15.06$). No significant

differences were found in scores on the remaining 13 learning style scales among the three age groups. This result would suggest that, overall, the non-Native students did not differ because of age in their preferences. This confirmed the similarity in learning style preferences of non-Native students in total (see Table 57).

Table 57

Mean Scores of Three Age Groups of Non-Native Students (n=105)

Scale	Age	12-13	14	15-16	Total Group
	n	59	30	16	
(1) Conditions					
Peer[P]		12.59	12.43	13.06	12.62
Organization[O]		13.86	14.07	13.25	13.83
Goal Setting[G]		16.20	15.77	14.88	15.88
Competition[C]		17.32	17.70	18.81	17.66
Instructor[Is]		11.92	12.33	11.88	12.03
Detail[De]		14.37	13.43	13.50	13.97
Independence[Id]		16.76	16.40	16.69	16.65
Authority[A]		16.95	17.83	17.94	17.35
(2) Content					
Numeric[N]		16.59	16.47	17.06	16.63
Qualitative[Q]		15.83	14.93	14.94	15.44
Inanimate[Ia]		12.24	12.97	12.56	12.50
People[P]		15.34	15.97	15.44	15.53
(3) Mode					
Listening[L]		17.39	17.23	15.75	17.10
Reading[R]		18.97	18.67	14.88	18.26
Iconics[Ic]		10.95	11.37	14.31	11.58
Direct Experience[Di]		12.69	12.73	15.06	13.07

Table 58

One-Way Analyses of Variance of Scores on the Learning Style Scales of Non-Native Students Classified on the Basis of Age with Newman-Keuls Comparisions (n=105)

Scale		SS	df	MS	F	Newman-Keuls
(1) Conditions						
Peer	Between	4.22	2	2.11	0.19	2 1 3
	Within	1138.54	102	11.16		
Organization	Between	7.13	2	3.57	0.38	3 1 2
	Within	967.78	102	9.49		
Goal Setting	Between	22.71	2	11.36	0.43	3 2 1
	Within	1354.39	102	13.28		
Competition	Between	28.04	2	14.02	1.99	1 2 3
	Within	719.62	102	7.06		
Instructor	Between	3.92	2	1.96	0.19	3 1 2
	Within	1042.99	102	10.23		
Detail	Between	21.75	2	10.88	1.12	2 3 1
	Within	987.16	102	9.68		
Independence	Between	2.65	2	1.323	0.10	2 3 1
	Within	1417.32	102	13.90		
Authority	Between	22.01	2	11.01	1.02	1 2 3
	Within	1095.95	102	10.74		
(2) Content						
Numeric	Between	3.87	2	1.94	0.10	2 1 3
	Within	1986.64	102	19.48		
Qualitative	Between	20.74	2	10.37	0.80	2 3 1
	Within	1317.11	102	12.91		
Inanimate	Between	10.67	2	5.33	0.33	1 3 2
	Within	1627.58	102	15.96		
People	Between	8.01	2	4.00	0.23	1 3 2
	Within	1772.12	102	17.37		
(3) Mode						
Listening	Between	34.65	2	17.32	1.89	2 1 3
	Within	936.40	102	9.18		
Reading	Between	217.71	2	108.85	11.12 ***	3 2 1
	Within	998.35	102	9.79		
Iconics	Between	144.31	2	72.16	8.57 ***	1 2 3
	Within	859.25	102	8.42		
Direct Experience	Between	75.22	2	37.61	3.33 *	1 2 3
	Within	1153.31	102	11.31		

Note. Groups: 1 = 12-13 yrs; 2 = 14 yrs; 3 = 15-16 yrs.
*$p<.05$. ***$p<.001$.

4.3.2 Discriminant Analysis of Learning Style and Age

As shown in Table 59, a three-group discriminant function analysis was conducted to determine whether or not a set of scores on learning style scales could be used to successfully predict the group memberships of the three age groups; students at ages 12-13, 14-15 and 16-19 regardless of cultural group. In function one, Wilks' Lambda was calculated to be 0.90 which was equivalent to an F ratio of 38.44. The probability of obtaining an F ratio this large by chance was less than .0001. In addition, Wilks' Lambda of function two was 0.97 which was equivalent to an F ratio of 13.18. The probability of obtaining an F ratio this large by chance was less than .05. Consequently, the learning style scales did discriminate among the three age groups on two functions.

Table 59

Canonical Discriminant Functions of the Three Age Groups of Students

Fun.	Eigenvalue	Percent of Variance	Canonical Correlation	After Fun.	Wilks' Lambda	F-Ration	df	Sig.
1	0.07	66.08	0.25	: 0	0.90	38.44	12	0.0001
2	0.04	33.92	0.18	: 1	0.97	13.18	5	0.0218

On function one (see Table 60), students at ages 12-13 showed a negative correlation coefficient of -0.30; in contrast, students at ages 16-19 showed a positive correlation coefficient of 0.48. Accordingly, students at ages 12-13 related antithetically to students at ages 16-19. Students at ages 14-15 did not relate strongly to function one.

Function one, therefore, provided a fair identification of differences in learning style scales of students at ages 12-13 and 16-19. On function two (see Table 61), students at ages 16-19 related negatively with a correlation coefficient of -0.28; in contrast, students at ages 14-15 showed a positive correlation coefficient of 0.18. However, neither was large enough to identify preferences of learning style. Hence, function two was eliminated.

Table 60

Canonical Discriminant Functions Evaluated at Group Means of Three Age Groups of Students

Group	Cases	Function 1	Function 2
12 and 13	136	-0.30	-0.14
14 and 15	190	0.06	0.18
16 to 19	59	0.48	-0.28

Both negative and positive correlation coefficiants of over 0.25 differentiated among the three age groups of students, on six scales which revealed strong differences in function one (see Table 61): Iconics (0.65), Reading (-0.58), Listening (-0.58), Direct Experience (0.43), Organization (-0.43) and Authority (-0.31). The one-way ANOVA findings of differences on the scales of Organization ($p<.05$ in Dene), Reading ($p<.001$ in non-Native), Iconics ($p<.001$ in non-Native) and Direct Experience ($p<.05$ in non-Native) matched the results of discrimiment analysis. However, the Listening and Authority scales which appeared strongly in the discriminant analysis did not show any significant differences in the one-way ANOVA. On the other hand,

significant differences on the Detail, Independence, Qualitative and People scales in the sample of Dene students by the one-way ANOVA did not appear to be important in the discriminant analysis.

Table 61

Pooled Within-Groups Correlations Between Canonical Discriminant Functions and Discriminating Variables of Three Age Groups of Students

Scale	Function 1	Function 2
Iconics	0.65 *	0.15
Reading	-0.58 *	-0.12
Listening	-0.58 *	0.02
Direct Experience	0.43 *	-0.06
Organization	-0.43 *	-0.16
Authority	-0.31 *	0.09
Goal Setting	0.23 *	-0.07
Peer	0.23 *	-0.13
Inanimate	0.18 *	0.07
Numeric	-0.16 *	0.01
Qualitative	-0.16 *	-0.09
People	0.14 *	-0.00
Detail	-0.04	-0.86 *
Instructor	0.28	0.47 *
Competition	-0.08	0.40 *
Independence	0.09	0.21 *

Note : Variables are ordered by the function with the largest correlation and the magnitude of that correlation.

Furthermore, the classification results in Table 60 indicated that students at ages 12-13 were classified correctly in 71 cases out of 136 (52.2%) and students at ages 16-19 were classified correctly in 28 cases out of 59 (47.5%). Students at age 14-15 were correctly classified in 72 cases out of 190 (37.9%). Students at ages 14-15 tended to distribute themselves among the three age groups. The overall classification rate was 44.42%.

Table 62

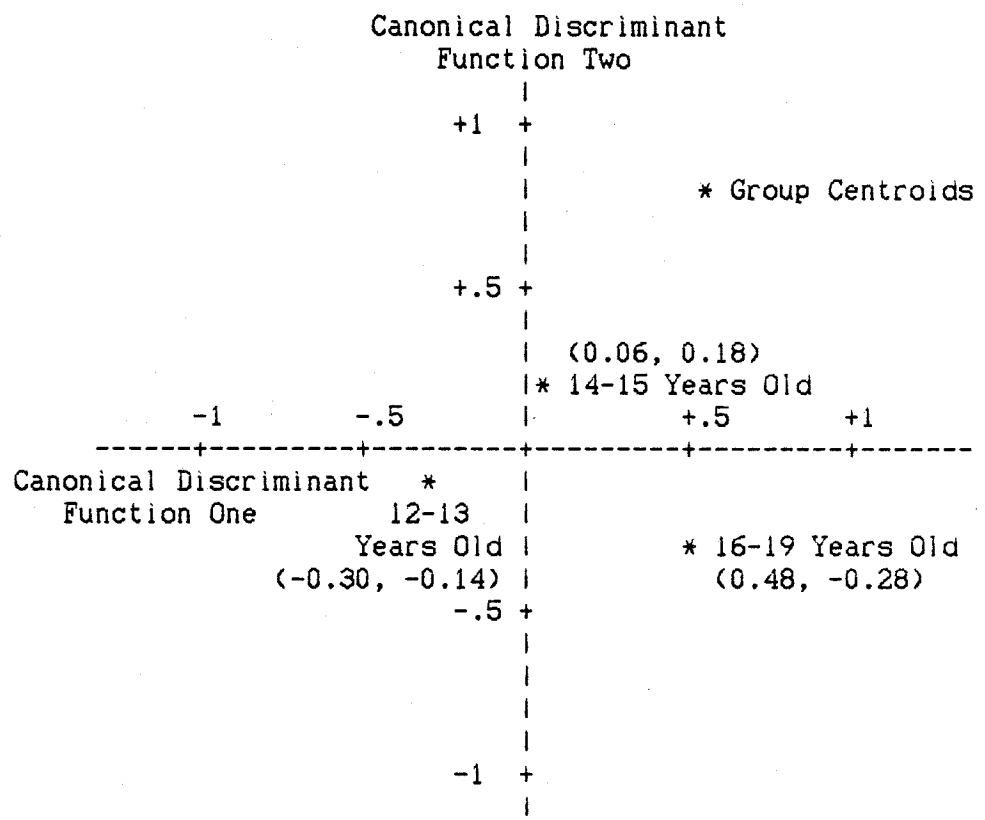
Summary of Classification Results for Three Age Groups of Students

	Age Group	Cases	Predicted Group Membership 1	2	3
1	12 and 13	136	71	30	35
			52.2%	22.1%	25.7%
2	14 and 15	190	58	72	60
			30.5%	37.9%	31.6%
3	16 to 19	59	20	11	28
			33.9%	18.6%	47.5%

Percent of grouped cases correctly classified: 44.42 %

Figure 6

Group Centroids of the Three Age Groups of Students



Based on function one and two, group centroids of the three age groups were drawn as in Figure 6. The difference (0.79) between students at ages 12-13 (-0.30, -0.14) and ages 16-19 (0.48, -0.28) was the greatest, which was, however, a relatively close indicator in comparison with the differrences in culture (see Figure 4) and sex (see Figure 5). The difference between those at ages 14-15 (0.06, 0.18) and ages 16-19 was 0.62 while the difference between those at ages 14-15 and ages 16-19 was pronounced, 0.48. Therefore, it could be concluded that the three age groups of students shared relatively close preferences in learning style compared with the groups classified by culture and sex.

4.4 Hypothesis 4

Hypothesis #4. There would be no statistically significant differences found in predicted levels of performance on the basis of culture, sex and age.

The mean scores of predicted levels of performance are shown in Table 63. Non-Native students ($\underline{M}$=32.11) at ages 12-14 showed the highest predicted level of performance while Cree students ($\underline{M}$=41.37) scored the lowest. At age 15, Dene students ($\underline{M}$=33.62) showed the highest predicted level of performance; on the other hand, Metis students ($\underline{M}$=43.76) were the lowest. At ages 16-19, Dene students ($\underline{M}$=38.85) indicated the highest predicted level of performance while Metis students ($\underline{M}$=45.60) were the lowest. Overall, non-Native students ($\underline{M}$=33.81) showed the highest predicted level of performance. Since predicted levels of performance tended to decline with age, and since

the majority of non-Native students were in the younger age groups, it was not surprising to find an overall higher expectation score. Cree students (M=41.83) scored at the lowest level, followed by Metis students (M=41.25).

Table 63

Mean Scores of Student Predicted Levels of Performance (n=385)

Culture	Age	12-14	15	16-19	M Total Group
	n	245	81	59	
Cree (n=81)		41.37	42.00	43.31	41.83
Dene (n=65)		38.72	33.62	38.85	37.75
Metis (n=134)		39.32	43.76	45.60	41.25
Non-Native (n=105)		32.11	42.50	45.50	33.81
M of Total Group		37.05	41.53	42.00	---

Significant differences were found among the means of the cultural groups (F=4.52, p<.001) in the age category 12 to 14 (see Table 64). The SNK tests indicated significant differences among the means of Cree (M= 41.37), Metis (M=39.32) and non-Native (M=32.11) students. This result would suggest that non-Native students had a higher expectation for their academic performance than did Cree and Metis students at ages 12-14. No significant differences were found among the means of the cultural groups at any other age levels. In short, since 89 non-Native students out of 105 (84.8%) were at ages 12-14, it could be concluded that a majority of non-Native students generally shared high expectations with to academic performance, while Cree and Metis students tended to hold lower expectations. In addition, Dene students

(M=37.75), overall, academic performance to be higher than Cree (M=41.83) and Metis (M=41,25) students, but lower than non-Native students (M=33.81).

Table 64

One-Way Analyses of Variance of Predicted Levels of Performance among Students Classified by Culture at Three Age Levels with Newman-Keuls Comparisons (n=385)

Age Range of Cultural Groups	SS	df	MS	F	Newman-Keuls
12 to 14 (n=245)					
Between	3574.35	3	1191.45	4.52 ***	4 2 3 1
Within	63481.06	241	263.4069		
15 (n=81)					
Between	1013.29	3	337.76	1.35	2 1 4 3
Within	19324.89	77	250.97		
16 to 19 (n=59)					
Between	533.22	3	177.74	0.95	2 1 4 3
Within	10310.78	55	187.47		

Note. Groups: 1 = Cree; 2 = Dene; 3 = Metis; 4 = Non-Native.
***p<.001.

A series of one-way ANOVA on predicted levels of performance were conducted on the basis of sex. No significant difference was found between scores of predicted levels of performance for male (M=38.07) and female (M=39.33) students (see Table 65). This result would suggest that there was no sex difference in predicted levels of performance.

Moreover, with regard to age differences, the mean scores of the 12-14 year-old students (M=32.11) of non-Native background showed higher predicted level of performance (see Table 63) than other age groups of non-Native students. Among Dene students, 15 year-old students (M=33.62) were the highest. The 15 year-old Metis students showed the

lowest predicted level of performance among all age groups of Metis students, as well as among all age groups of all the cultural groups. Among Cree students, all age groups showed a relatively lower predicted level of performance than did other age and cultural groups. However, despite these trends, one-way ANOVA on the basis of age in each cultural group (see Table 66) did not show any significant differences. These results would indicate that there were no age differences in predicted levels of performace.

Table 65

One-Way Analyses of Variance of Scores on Predicted Levels of Performance of Male and Female Students with Newman-Keuls Comparison (n=385)

	df	Male Mean	Female Mean	F-Ratio	F-Prob.	Newman-Keuls
Predicted Levels of Performance	1	38.07	39.33	0.59	.4423	1 2

Note. Groups: 1 = Male; 2 = Female.

From the results of all one-way ANOVA, it could be concluded that there were no sex or age differences in relation to predicted levels of performance. Cultural differences were found among Cree, Metis and non-Native students at only ages 12-14, indicating that non-Native students of thses ages had a higher predicted level of performance than did Cree and Metis students.

Table 66

One-Way Analyses of Variance of Scores on Predicted Levels of Performance among Students Classified by Age and Cultural Groups (n=385)

Cultural by Age Groups	SS	df	MS	F	Newman-Keuls
Cree (n=81)					
Between	39.42	2	19.71	0.09	1 2 3
Within	17194.16	78	220.44		
Dene (n=65)					
Between	278.54	2	139.27	0.97	2 1 3
Within	8941.52	62	144.22		
Metis (n=134)					
Between	822.71	2	411.35	1.67	1 2 3
Within	32300.17	131	246.57		
Non-Native (n=105)					
Between	1709.31	2	854.66	2.51	1 2 3
Within	34680.88	102	340.01		

Note. Groups: 1 = 12-14 yrs; 2 = 15 yrs; 3 = 16-19 yrs.

4.5 Hypothesis 5

Hypothesis #5. There would be no statistically significant differences found between the instructional styles of Native and non-Native teachers.

There were no significant relations found either between culture and sex, or between culture and age in the teacher sample (see Table 7). Accordingly, culture was treated as an independent variable in the teacher sample, and a series of one-way ANOVA on the basis of culture were conducted to address hypothesis #5.

The assessment of instructional style required subjects to rank four options in order of preference in 20 questions. Five questions represented each of four scales of instructional style. In each of the

five questions, a mean score of 12.5 indicated neither a high nor a low preference, and the lower the score, the higher the preference.

The data for hypothesis #5 were analyzed in three steps Instructional style preferences of Native and non-Native teachers were identified by comparing mean scores on the 16 instructional style scales. Furthermore, a series of one-way ANOVA on the basis of cultural groups were conducted to determine similarities and differences between the mean scores of Native and non-Native teachers. Finally, overall cultural differences on the 16 instructional style scales were tested by the use of multiple discriminant function analysis.

4.5.1 Instructional Style Differences Between Native and Non-Native Teachers

As shown in Table 67, significant differences were found on scores of only two of the 16 scales of instructional style.

(1) Instructional Conditions

Significant differences (see Table 67) were found in scales of: Organization ($F=4.16$, $p<.05$) and Independence ($F=10.59$, $p<.01$). No significant differences were found on scores of the remaining 14 scales. However, differing tendencies could be discerned by an examination of mean scores.

On the Peer scale, Native ($M=11.40$) and non-Native ($M=11.76$) teachers expressed a slightly high preference for having students study in teams and encouraging students to have good relationships among themselves.

Table 67

One-Way Analysis of Variance of Scores on the Instructional Style Scales of Native and Non-Native Teachers with Newman-Keuls Comparison (n=79: Native n=15; Non-Native n=64)

Scale	df	M of Native	M of Non-Native	F-Ratio	F-Prob.	Newman-Keuls	
(1) Conditions							
Peer	1	11.40	11.75	0.21	.6462	1	2
Organization	1	11.00	9.73	4.16	.0446 *	2	1
Goal Setting	1	13.06	13.42	0.23	.6365	1	2
Competition	1	14.53	15.09	0.51	.4792	1	2
Instructor	1	11.00	10.11	1.12	.2931	2	1
Detail	1	13.27	13.00	0.12	.7310	2	1
Independence	1	12.20	14.66	10.59	.0017 **	1	2
Authority	1	13.53	12.23	2.56	.1138	2	1
(2) Content							
Numeric	1	14.13	14.28	0.03	.8703	1	2
Qualitative	1	11.20	11.75	0.49	.4871	1	2
Inanimate	1	13.73	13.75	0.00	.9850	1	2
People	1	10.93	10.30	0.46	.4987	2	1
(3) Mode							
Lecturing	1	14.33	13.77	0.73	.3965	2	1
Reading	1	12.40	13.44	2.10	.1512	1	2
Iconics	1	11.80	11.33	0.40	.5296	2	1
Direct Experience	1	11.47	11.31	0.03	.8689	2	1

Note. Groups: Native = 1; Non-Native = 2.
*p<.05. **p<.01.

On the Organization scale, Native teachers (M=11.00) indicated a slightly high preference for organizing course work logically, clearly and sequentially while non-Native teadchers (M=9.73) gave this scale a very high preference. One-way ANOVA indicated a significant difference between the means of Native and non-Native teachers. The result would suggest that non-Native teachers had a greater preference for organization than did Native teachers.

On the Goal Setting scale, both Native (M=13.06) and non-Native (M=13.42) teachers expressed a slightly low preference for letting students set their own study goals and plans.

On the Competition scale, while Native teachers (M=14.53) stated a low preference for getting students to compete among themselves, non-Native teachers (M=15.09) indicated competition to be a very low preference.

On the Instructor scale, Native teachers (M=11.00) expressed a slightly high preference for encouraging the students to know the instructor personally and develop a mutual understanding. Non-Native teachers (M=10.11) gave this scale a high preference rating.

On the Detail scale, both Native (M=13.27) and non-Native (M=13.00) teachers showed slightly low preferences for providing specific information on assignments, requirements and rules.

On the Independence scale, Native teachers (M=12.20) showed neither a high nor a low preference for encouraging students to work alone and independently, while non-Native teachers (M=14.66) indicated a low preference. In addition, one-way ANOVA revealed a significant difference between the means of Native and non-Native teachers (F=10.59, p<.01). The result would indicate that non-Native teachers reacted more negatively than did Native teachers to encouraging students to work alone and independently.

On the Authority scale, non-Native teachers (M=12.23) expressed neither a high nor a low preference for maintaining strict classroom discipline and order, while Native teachers (M=13.53) stated a slightly low preference.

(2) Learning Content

In the category of Learning Content, there were no significant differences found between the means of Native and non-Native teachers (see Table 67). The results of one-way ANOVA showed that Native and non-Native teachers had similar preferences with respect to the instructional style scales of this category.

On the Numeric scale, both Native ($\underline{M}$=14.13) and non-Native ($\underline{M}$=14.28) teachers had high preferences for teaching about numbers and logic.

On the Qualitative scale, both Native ($\underline{M}$=11.20) and non-Native ($\underline{M}$=11.75) teachers showed slightly high preferences for teaching about words and language.

On the Inanimate scale, both Native ($\underline{M}$=13.73) and non-Native ($\underline{M}$=13.75) teachers indicated slightly low preferences for letting students work with things.

On the People scale, both Native ($\underline{M}$=10.93) and non-Native ($\underline{M}$=10.30) teachers expressed high preferences for teaching by letting students learn about working with people.

(3) Learning Mode

In the category of Learning Mode, there were no significant differences found between the means of Native and non-Native teachers (see Table 67). These results of one-way ANOVA showed that Native and non-Native teachers shared similar preferences with respect to the instructional style scales of this category.

On the Lecturing scale, Native teachers (M=14.33) rated Lecturing as a low preference, while non-Native teachers (M=13.77) gave it a slightly low preference rating.

On the Reading scale, Native teachers (M=12.40) stated neither a high nor a low preference, while for non-Native (M=13.44) teachers the preference was low for teaching by providing written materials such as reading texts and panphlets.

On the Iconics scale, both Native (M=11.80) and non-Native (M=11.33) teachers expressed slightly high preferences for teaching by means of visual materials.

On the Direct Experience scale, both Native (M=11.47) and non-Native (M=11.31) teachers indicated a slightly high preference for getting students to learn by direct experience.

4.5.2 Discriminant Analysis of Instructional Style and Culture

As shown in Table 68, a two-group discriminant function analysis was conducted to determine whether or not a set of instructional style scales could be used to successfully predict the group memberships of Native and non-Native teachers. In function one, Wilks' Lambda was calculated to be 0.81, which was equivalent to an F ratio of 15.81. The probability of obtaining an F ratio this large by chance was less than .001. The instructional style scales, therefore, could be used to predict the group menmberships of Native and non-Native teachers. In addition, function one, as shown in Table 69 indicated a negative correlation coefficient for Native teachers of -0.99, and a positive correlation coefficient for non-Native teachers of 0.23. Consequently,

Native teacher showed an antithetic relationship with non-Native teachers in canonical discriminant function one.

Table 68

Canonical Discriminant Functions of Native and non-Native Teachers

Fun.	Eigenvalue	Percent	Canonical Correlation	After Fun.	Wilks' Lambda	F-Ratio	df	Sig.
1	0.24	100.00	0.44	: 0	0.81	15.81	5	0.0074

Table 69

Canonical Discriminant Function Evaluated at Group Means of Native and Non-Native Teachers

Group	Cases	Function 1
Native	15	-0.99
Non-Native	64	0.23

Differences in Native and non-Native teacher preferences in instructional style were provided by variables of the 16 instructional style scales shown in Table 70. Both negative and positive correlation coefficients of over 0.25 differentiated between Native and non-Native teachers, yielding three scales which revealed strong differences in function one (see Table 70): Independence (0.76), Authority (-0.44) and Organization (-0.36). The differences on the scales of Organization ($p<.05$) and Independence ($p<.01$) yielded by the one-way ANOVA matched the results of the discriminant function analysis. However, the Authority scale which appeared strongly in the discriminant analysis did not show any significant difference in the one-way ANOVA.

Preferences for other scales of instructional style were, more or less, equally shared by Native and non-Native teachers. In particular, the scales of Competition (0.00), Peer (0.00), Direct Experience (-0.02), Goal Setting (0.02), and Inanimate (0.02) were strongly shared by Native and non-Native teachers, a finding which matched the results of the one-way ANOVA shown in Table 65.

Table 70

Pooled Within-Groups Correlations Between Canonical Discriminant Function One and Discriminating Variables of Native and Non-Native Teachers

Scale	Function 1
Independence	0.76
Authority	-0.44
Organization	-0.36
Numeric	0.23
Instructor	-0.18
People	-0.16
Reading	0.15
Detail	-0.08
Lecturing	-0.08
Iconics	-0.06
Qualitative	-0.04
Inanimate	-0.02
Goal Setting	0.02
Direct Experience	-0.02
Peer	0.00
Competition	0.00

Note : Variables are ordered by the function with largest correlation and the magnitude of that correlation.

The classification results of Native and non-Native teachers shown in Table 71 indicated that Native teachers were classified correctly in 11 cases out of 15 (73.3%) and non-Native teachers were classified

correctly in 49 cases out of 64 (76.6%). The overall classification rate was 75.95%.

Table 71

Summary of Classification Results for Native and Non-Native Teachers

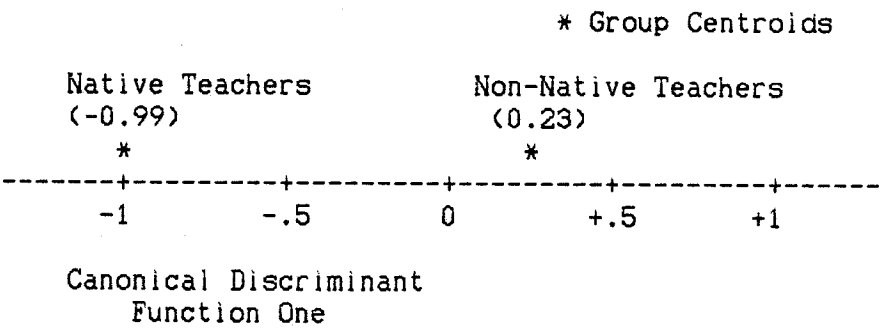
Group	Cases	Predicted Group Membership 1	2
1 Native	15	11 73.3%	4 26.7%
2 Non-Native	64	15 23.4%	49 76.6%

Percent of grouped cases correctly classified: 75.95%

In addition, based on function one, group centroids of Native and non-Native teachers were drawn. (see Figure 7) The distance between Native and non-Native teachers was relatively large (1.22 in canonical discriminant function one). This distance showed a difference between Native and non-Native teachers in instructional style. However, as the

Figure 7

Group Centroids of Native and Non-Native Teachers



one-way ANOVA and correlation coefficients of canonical discriminant function indicated, only three instructional style scales showed significant differences between Native and non-Native teachers.

4.6 Hypothesis #6

Hypothesis #6. There would be no statistically significant differences found in the instructional styles of teachers on the basis of sex.

Since there were significant relations between male and female teachers when classified on the basis of age (see Table 7), a series of one-way ANOVA on the basis of sex at each age level were conducted.

The data for hypothesis #6 were analyzed in two steps. First, instructional style preferences of male and female teachers at each age level were identified by comparing the mean scores on the 16 instructional style scales. Further, a series of one-way ANOVA on the basis of sex were conducted to determine similarities and differences between the mean scores of male and female teachers on the 16 instructional style scales. Then overall sex differences on the scales were tested by the use of multiple discriminant analysis.

4.6.1 Instructional Style Preferences of Male and Female Teachers

Sex differences in instructional style were examined by comparing the mean scores of male and female teachers on the 16 instructional style scales at each age level. Moreover, a series of one-way ANOVA on the basis of sex were conducted for each age group.

Table 72

One-Way Analysis of Variance of Scores on the Instructional Style Scales of Male and Female Teachers at Age 20-29 with Newman-Keuls Comparison
(n=25: Male n=7; Female n=18)

Scale	df	Male Mean	Female Mean	F-Ratio	F-Prob.	Newman-Keuls
(1) Conditions						
Peer	1	10.43	11.44	0.85	.3651	1 2
Organization	1	9.57	10.72	1.09	.3081	1 2
Goal Setting	1	14.43	12.33	3.54	.0726	2 1
Competition	1	15.57	15.50	0.00	.9498	2 1
Instructor	1	9.29	10.56	1.28	.2693	1 2
Detail	1	14.57	13.44	1.15	.2949	2 1
Independence	1	12.86	13.33	0.22	.6426	1 2
Authority	1	13.29	12.67	0.24	.6254	2 1
(2) Content						
Numeric	1	12.57	14.78	2.21	.1503	1 2
Qualitative	1	13.57	10.67	5.38	.0296 *	2 1
Inanimate	1	11.86	15.50	9.08	.0062 **	1 2
People	1	12.00	9.06	5.81	.0243 *	1 2
(3) Mode						
Lecturing	1	14.43	13.17	2.42	.1333	2 1
Reading	1	13.86	13.50	0.08	.7766	2 1
Iconics	1	13.86	12.00	2.49	.1286	2 1
Direct Experience	1	7.86	11.33	7.12	.0138 *	1 2

Note. Groups: Male = 1; Female = 2.
*p<.05. **p<.01.

(1) Sex Differences in Instructional Style Preferences among 20-29 Year-Old Teachers

For the ages of 20-29 (Table 72), there were significant differences between the mean scores of male and female teachers on four of the 16 instructional style scales.

In the category of Learning Conditions, no significant differences were found by the one-way ANOVA. This finding result would suggest that male and female teachers had similar preferences in all eight scales of the category.

On the Peer scale, both male ($\underline{M}$=10.43) and female ($\underline{M}$=11.40) teachers had positive preferences for having students study in teams and encouraging students to have good relationships among themselves. Male teachers expressed a high preference, while female teachers indicated a slightly high preference for this scale.

On the Organization scale, both male ($\underline{M}$=9.43) and female ($\underline{M}$=10.72) teachers had positive preferences for organizing course work logically, clearly and sequentially. For male teachers, organization was a very high preference, while female teachers rated it a high preference.

On the Goal Setting scale, male teachers ($\underline{M}$=14.43) expressed a low preference for letting students set their own study goals and plans, while for female teachers ($\underline{M}$=12.33) goal setting was neither a high nor a low preference.

On the Competition scale, both male ($\underline{M}$=15.57) and female ($\underline{M}$=15.50) teachers expressed a very low preference for getting students to compete among themselves.

On the Instructor scale, male teachers (M=9.29) very highly preferred encouraging the students to know the instructor personally and develop a mutual understanding, while female teachers (M=10.56) gave this scale a rating of high preference.

On the Detail scale, male teachers (M=14.57) stated a low preference for providing specific information on assignments, requirements and rules. Female teachers (M=13.44) rated the Detail scale as a slightly low preference.

On the Independence scale, while male teacher (M=12.86) expressed neither a high nor a low preference for encouraging students to work alone and independently, female teachers (M=13.33) expressed a slightly low preference.

On the Authority scale, male teachers (M=13.29) indicated a slightly low preference for strict classroom discipline and order, while female teachers (M=12.67) indicated neither a high nor a low preference for this scale.

In the category of Learning Content, there were significant differences between the means of male and female teachers on only three instructional style scales (see Table 72).

On the Numeric scale, male (M=12.57) teachers expressed neither a high nor a low prefernce for teaching about numbers and logic, while female teachers (M=14.78) expressed a low preference for this scale of instruction.

On the Qualitative scale, male teachers (M=13.57) indicated a slightly low preference for teaching about words and language, while female teachers (M=10.67) expressed a high preference for this scale.

Furthermore, one-way ANOVA revealed a significant difference between the means of male and female teachers ($F=5.38$, $p<.05$), indicating that female teachers had a greater preference for teaching about words and language than did male teachers.

On the Inanimate scale, male teachers ($M=11.86$) stated a slightly high preference for teaching by letting students learn about working with things, while female teachers ($M=13.75$) showed a slightly low preference for this content. Furthermore, there were significant differences between the means of male and female teachers in this scale, indicating that male teachers had a greater preference for teaching about working with things than did female teachers.

On the People scale, both male teachers ($M=12.00$) indicated neither a high nor a low preference for teaching by letting students learn about working with people. For female teachers ($M=9.06$), this scale was a very high preference. In addition, a significant difference was found between the means of male and female teachers on this scale by one-way ANOVA, indicating that female teachers showed a greater preference for teaching students about working with people than did male teachers.

In the category of Learning Mode, there were significant differences between the means of male and female teachers on only one instructional style scale (see Table 72).

On the Lecturing scale, male teachers ($M=14.43$) expressed a low preference for lecturing, while for female teachers ($M=13.17$) it was a teaching mode of slightly low preference.

On the Reading scale, both male ($\underline{M}$=13.86) and female ($\underline{M}$=13.50) teachers expressed slightly low preferences for teaching by providing written materials such as texts and pamphlets.

On the Iconics scale, male teachers ($\underline{M}$=13.86) showed a slightly low preference for the use of visual materials, while female teachers ($\underline{M}$=12.00) stated neither a high nor a low preference for this approach.

On the Direct Experience scale, male teachers ($\underline{M}$=7.86) expressed a very high preference for getting students to learn through direct experience, while female teachers ($\underline{M}$=11.33) indicated only a slightly high preference for this mode. Furthermore, a significant difference was found between the means of male and female teachers ($F=7.12$, $\underline{p}<.05$), suggesting that male teachers favored the direct experience approach more than did female teachers.

(2) Sex Difference in Instructional Style Among 30-39 Year-Old Teachers

For the ages of 30-39 (Table 73), scores on two of the 16 scales of instructional style showed significant differences. Both scales were in the category of Learning Content. Detailed descriptions of instructional style preferences are omitted here in order to avoid repetition.

In the category of Learning Conditions, no significant difference were found among scores, so that all preference for the scales were considered to be similarily shared by both male and female teachers at ages 30-39. Slightly high to very high preferences were expressed by male teachers for Organization ($\underline{M}$=9.84), Instructor ($\underline{M}$=9.92) and Peer ($\underline{M}$=11.12), while female teachers stated slightly to very high

preferences for Organization (M=10.00) and Authority (M=11.63). Very low to low preferences were for Competition among male (M=15.16) and female (M=14.50) teachers, and male teachers also expressed a very low preference for Independence (M=15.24).

Table 73

One-Way Analysis of Variance of Scores on the Instructional Style Scales of Male and Female Teachers at Age 30-39 with Newman-Keuls Comparison (n=33: Male n=25; Female n=8)

Scale	df	Male Mean	Female Mean	F-Ratio	F-Prob.	Newman-Keuls
(1) Conditions						
Peer	1	11.12	12.25	1.33	.2573	1 2
Organization	1	9.84	10.00	0.03	.8624	1 2
Goal Setting	1	13.88	13.25	0.34	.5648	2 1
Competition	1	15.16	14.50	0.31	.5798	2 1
Instructor	1	9.92	12.25	2.87	.1002	1 2
Detail	1	12.20	12.25	0.00	.9696	1 2
Independence	1	15.24	13.88	1.24	.2733	2 1
Authority	1	12.64	11.63	0.73	.3981	2 1
(2) Content						
Numeric	1	14.60	13.38	1.18	.2867	2 1
Qualitative	1	12.12	9.13	10.06	.0034 **	2 1
Inanimate	1	12.56	16.25	10.86	.0025 **	1 2
People	1	10.92	11.25	0.06	.8155	1 2
(3) Mode						
Lecturing	1	13.80	14.63	0.61	.4410	1 2
Reading	1	13.40	13.75	0.14	.7150	1 2
Iconics	1	11.16	9.38	3.04	.0914	2 1
Direct Experience	1	11.24	12.25	0.56	.4598	1 2

Note. Groups: Male = 1; Female = 2.
**p<.01.

In the category of Learning Content, two instructional style scales showed significant differences: Qualitative (F=10.06, p<.01) and Inanimate (F=10.53, p<.01). On the Qualitative scale, male teachers

(M=12.12) showed neither a high nor a low preference for teaching about words and language, while female teachers (M=9.13) expressed a very high preference for this content. On the Inanimate scale, female teachers (M=16.25) stated a very high preference compared to male teachers (M=12.56) who gave neither a high nor a low preference. On the People scale, male teacher (M=10.92) expressed a high preference, while for female teachers (M=11.25) it was a slightly high preference. In the category of Learning Mode, no significant differences were found, so that all the scale preferences were considered to be similarily shared by both male and female teachers at ages 30-39. High to very high preferences were expressed by both groups for Iconic and Direct Experience.

(3) Sex Difference in Instructional Style Among 40+ Year-Old Teachers

For the ages of 40+ (Table 74), scores on only one of the 16 scales of instructional style related to significant sex difference. Detailed descriptions of instructional style preferences are omitted in order to avoid repetition.

In the category of Learning Conditions, no significant differences were found, so that all preferences for scales were considered to be similarily shared by both male and female teachers of 40 years and older. Very high preferences were expressed for the scales of Organization and Instructor, while slightly low to very low preferences were given for the Competition and Independence scales.

In the category of Learning Content, one instructional style scale showed a significant difference: Inanimate ($F=5.47$, $p<.05$). On this

Table 74

One-Way Analysis of Variance of Scores on the Instructional Style Scales of Male and Female Teachers at 40+ with Newman-Keuls Comparison (n=21: Male n=13; Female n=8)

Scale	df	Male Mean	Female Mean	F-Ratio	F-Prob.	Newman-Keuls
(1) Conditions						
Peer	1	12.46	13.25	0.34	.5652	1 2
Organization	1	9.46	9.88	0.24	.6275	1 2
Goal Setting	1	13.15	13.50	0.09	.7696	1 2
Competition	1	14.92	13.38	1.54	.2303	2 1
Instructor	1	9.46	11.00	1.93	.1805	1 2
Detail	1	14.08	12.63	3.49	.0771	2 1
Independence	1	15.08	12.88	3.57	.0742	2 1
Authority	1	11.38	13.50	2.68	.1180	1 2
(2) Content						
Numeric	1	14.08	14.63	0.12	.7313	1 2
Qualitative	1	12.85	11.25	2.08	.1654	2 1
Inanimate	1	12.31	15.00	5.47	.0305 *	1 2
People	1	10.77	9.13	1.24	.2794	2 1
(3) Mode						
Lecturing	1	14.00	14.25	0.05	.8239	1 2
Reading	1	13.31	11.00	5.18	.0346	2 1
Iconics	1	11.31	11.00	0.11	.7464	2 1
Direct Experience	1	11.38	13.75	3.91	.0626	1 2

Note. Groups: Male = 1; Female = 2.
*p<.05.

scale, female teachers (M=15.00) expressed a very low preference, while male teachers (M=12.31) stated neither a high nor a low preference. On the People scale, both male (M=10.77) and female (M=9.13) teachers showed a very high preference, while both expressed a low preference for the Numeric scale.

In the category of Learning Mode, no significant differences were found, so that all preferences for scales were considered to be

similarily shared by both male and female teachers at age 40+. Slightly high preferences were stated for Iconics by male (M=11.31) and female (M=11.00) teachers, Reading by female teachers (M=11.00), and Direct Experience by male teachers (M=11.38). The Lecturing mode was of low preference for both male (M=14.00) and female (M=13.75) groups.

4.6.2 Discriminant Analysis of Instuctional Style and Sex

As shown in Table 75, a two-group discriminant function analysis was conducted to determine whether or not a set of the instructional style scales could be used to successfully predict the group memberships of male and female teachers. On function one, Wilks' Lambda was calculated to be 0.59, equivalent to an F ratio of 38.78. The probability of obtaining an F ratio this large by chance was less than .0001, affirming that the instructional style scales could be used to predict the group menmberships of male and female teachers.

Table 75

Canonical Discriminant Function of Male and Female Teachers

Fun.	Eigenvalue	Percent of Variance	Canonical Correlation	After Fun.	Wilks' Lambda	F-Ration	df	Sig.
1	0.69	100.00	0.64	: 0	0.59	38.78	6	0.0000

Function one, as showm in Table 76, indicated a negative correlation coefficient for male teachers of -0.99 and a positive correlation coefficient for female teachers of 0.94. Consequently, male

teachers showed an antithetic relationship with female teachers in canonical discriminant function one.

Table 76

Canonical Discriminant Function Evaluated at Group Means of Male and Female teachers

Group	Cases	Function 1
Male	45	-0.99
Female	34	0.94

Identification of differences in male and female teacher preferences for the instructional styles were provided by the 16 variables shown in Table 77. Negative and positive correlation coefficients of over 0.25 differentiated between male and female teachers, with five scales revealing strong differences between male and female teachers (see Table 77): Inanimate (0.73), Qualitative (-0.50), Independence (-0.33), Instructor (0.29) and People (0.28). The one-way ANOVA findings of differences on the scales of: Inanimate ($p<.01$ at ages 20-29; $p<.01$ at ages 30-39; $p<.05$ at ages over 40); Qualitative ($p<.05$ at ages 20-29; $p<.01$ at ages 30-39), People ($p<.05$ at ages 20-29) matched the results of the discriminant function analysis. However, the Instructor and Independence scales which appeared strongly in the discriminant analysis did not show any significant differences in the one-way ANOVA. The Direct Experience scale, which had yielded significant differences by the oen-way ANOVA, was not an important variable in the discrimiant function.

Table 77

Pooled Within-Groups Correlations between Canonical Discriminant Function and Discriminating Variables of Male and Female Teachers

Scale	Function 1
Inanimate	0.73
Qualitative	-0.50
Independence	-0.33
Instructor	0.29
People	-0.28
Goal Setting	-0.15
Direct Experience	0.12
Reading	-0.10
Numeric	0.08
Organization	0.06
Iconics	-0.06
Competition	-0.05
Authority	0.04
Detail	-0.02
Lecturing	0.00
Peer	0.00

Note: Variables are ordered by the function with largest correlation and the magnitude of that correlation.

Table 78

Summary of Classification Results for Male and Female Teachers

Group	Cases	Predicted Group Membership 1	2
1 Male	45	37 82.2%	8 17.8%
2 Female	34	6 17.6%	28 82.4%

Percent of grouped cases correctly classified: 82.28%

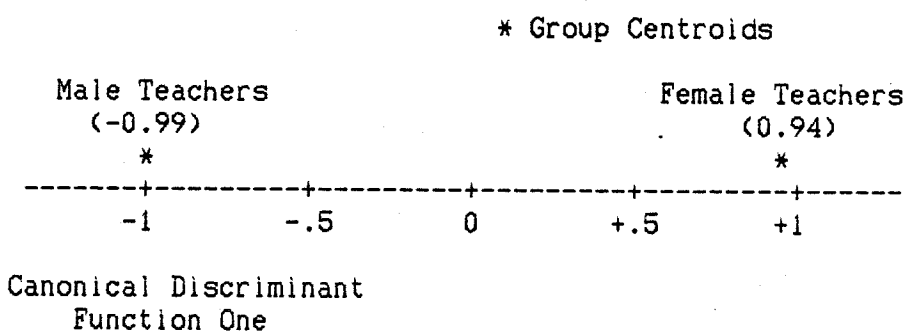
The classification of male and female teachers shown in Table 78 indicated that male teachers were classified correctly in 82.2 percent

of the cases, while female teachers were classified corrrectly 82.4 percent of the time. The overall classification rate was 82.28 percent.

In addition, on the basis of canonical discriminant function one, group centroids of male and female teachers are shown in Figure 8. Considering a difference of 1.22 between Native and non-Native teachers, (Figure 6) male and female teachers (Figure 8) indicated a relatively larger instructional difference of 1.93 in canonical discriminant function one.

Figure 8

Group Centroids of Male and Female Teachers



4.7 Hypothesis 7

Hypothesis #7. There would be no statistically significant differences found in the instructional styles of teachers on the basis of age.

Since there were significant relations found between sex and age in the teacher sample (see Table 7), a series of one-way ANOVA on the basis of age within each sex group were conducted to address hypothesis #7.

The sample of teachers was divided into three age groups: ages 20-29, ages 30-39, and ages 40+.

The data for hypothesis #7 were analyzed in three steps. First, instructional style preferences among the three age groups of males and females were identified by comparing mean scores on the 16 instructional style scales. In addition, a series of one-way ANOVA on the basis of age were conducted to determine similarities and differences among the mean scores of the three age groups. Finally, overall age differences on the 16 instructional style scales were tested by the use of multiple discriminant analysis.

4.7.1 Instructional Style Preferences Among Teachers of Three Age Groups

(1) Age differences in Instructional Style Preferences Among Male Teachers

The mean scores of the three age groups of male teachers are shown in Table 79. In the category of Instructional Conditions, the 20-29 year-old teachers expressed a very high preference for the Instructor scale ($\underline{M}$=9.29) and a very low preference for the Competition scale ($\underline{M}$=15.57). The 30-39 year-old male teachers stated a very high preference for the Organization scale ($\underline{M}$=9.82) and a very low preference for the Independence scale ($\underline{M}$=15.24). The male teachers of 40^{+} showed a very high preference for the Organization ($\underline{M}$=9.46) and Instructor ($\underline{M}$=9.46) scales, and a very low preference for the Independence scale ($\underline{M}$=15.08).

Table 79

Means Scores of Three Age Groups of Male Teachers (n=45)

Scale	Age	20-29	30-39	40+	Total Group
	n	7	25	13	
(1) Conditions					
Peer[P]		10.43	11.12	12.46	11.40
Organization[O]		9.57	9.84	9.46	9.69
Goal Setting[G]		14.43	13.88	13.15	13.76
Competition[C]		15.57	15.16	14.92	15.16
Instructor[Is]		9.29	9.92	9.46	9.69
Detail[De]		14.57	12.20	14.08	13.11
Independence[Id]		12.86	15.24	15.08	14.82
Authority[A]		13.29	12.64	11.38	12.38
(2) Content					
Numeric[N]		12.57	14.60	14.08	14.13
Qualitative[Q]		13.57	12.12	12.85	12.56
Inanimate[Ia]		11.86	12.56	12.31	12.38
People[P]		12.00	10.92	10.77	11.04
(3) Mode					
Lecturing[L]		14.43	13.80	14.00	13.96
Reading[R]		13.86	13.40	13.31	13.44
Iconics[Ic]		13.86	11.16	11.31	11.62
Direct Experience[Di]		7.86	11.24	11.38	10.76

In the category of Instructional Content, the 20-29 year-old teachers showed a slightly high preference for the Inanimate scale (M=11.86) and a slightly low preference for the Qualitative scale (M=13.57). The 30-39 year-old teachers expressed a slightly high preference for the People scale (M=10.92) and a low preference for the Numeric scale (M=14.60). As was the case for the 30-39 year-old teachers, those of 40+ stated a slightly high preference for the People scale (M=10.77) and a low preference for the Numeric scale (M=14.08).

Table 80

One-Way Analysis of Variance of Scores on the Instructional Style Scales Among Three Age Groups of Male Teachers with Newman-Keuls Comparisons (n=45)

Scale		SS	df	MS	F	Newman-Keuls
(1) Conditions						
Peer	Between	23.21	2	11.61	1.66	1 2 3
	Within	293.59	42	6.99		
Organization	Between	1.34	2	0.67	0.14	3 1 2
	Within	206.31	42	4.91		
Goal Setting	Between	8.26	2	4.03	0.60	3 2 1
	Within	288.05	42	6.86		
Competition	Between	1.91	2	0.96	0.13	3 2 1
	Within	314.00	42	7.48		
Instructor	Between	3.15	2	1.57	0.18	1 3 2
	Within	360.50	42	8.58		
Detail	Between	47.81	2	23.90	3.58 *	2 3 1
	Within	280.64	42	6.68		
Independence	Between	32.24	2	16.12	2.35	1 3 2
	Within	288.34	42	6.87		
Authority	Between	20.31	2	10.16	1.41	3 2 1
	Within	302.27	42	7.20		
(2) Content						
Numeric	Between	22.56	2	11.28	1.41	1 3 2
	Within	336.64	42	8.02		
Qualitative	Between	13.06	2	6.53	1.14	2 3 1
	Within	240.05	42	5.72		
Inanimate	Between	2.79	2	1.40	0.16	1 3 2
	Within	355.79	42	8.47		
People	Between	7.76	2	3.88	0.30	3 2 1
	Within	544.15	42	12.96		
(3) Mode						
Lecturing	Between	2.20	2	1.10	0.16	2 3 1
	Within	287.71	42	6.85		
Reading	Between	1.48	2	0.74	0.13	3 2 1
	Within	247.63	42	5.90		
Iconics	Between	41.59	2	20.80	4.22 *	2 3 1
	Within	206.99	42	4.93		
Direct Experience	Between	68.82	2	34.91	4.31 *	1 2 3
	Within	340.49	42	8.11		

Note. Groups: 1 = 20-29 yrs; 2 = 30-39 yrs; 3 = 40^{+} yrs.
*$p<.05$.

In the category of Instructional Mode, the 20-29 year-old teachers indicated a very high preference for the Direct Experience scale ($\underline{M}$=7.86) and a low preference for the Lecturing scale ($\underline{M}$=14.43). Among the 30-39 year-old teachers, a slightly high preference was stated for the Iconics scale ($\underline{M}$=11.16) and a slightly low preference was expressed for the Lecturing scale ($\underline{M}$=13.80). The over 40^{+} year-old teachers stated a slightly high preference for the Iconics scale ($\underline{M}$=11.31) and a low preference for the Lecturing scale ($\underline{M}$=14.00). In general, all age groups of male teachers tended to favor the scales of Peer, Instructor, People and Direct experience.

For the male teachers (see Table 80), only three instructional style scales showed significant differences among the means of three age groups. On the Detail scale, there were significant differences among the means ($F=3.58$, $\underline{p}<.05$). The SNK test for differences between means revealed significant differences between the mean scores of the 30-39 year-old teachers ($\underline{M}$=12.20) and the 40^{+} year-old teachers ($\underline{M}$=14.08). This result would indicate that the older teachers stated a lower preference for providing specific information on assignments, requirements and rules more than was true of the 30-39 year-old teachers. On the Iconics scale, there were significant differences among the means ($F=4.22$, $\underline{p}<.05$). The SNK test revealed significant differences among the mean scores for the 20-29 year-old teachers ($\underline{M}$=13.83), the 30-39 year-old teachers ($\underline{M}$=11.16) and the 40^{+} year-old teachers ($\underline{M}$=11.31). This result would indicate that, while teachers at ages 20-29 expressed a slightly low preference for teaching by the use of visual materials, this mode was given a slightly high preference by

those of ages 30-39 and 40+. The scale of Direct Experience showed significant differences among the means of the three age groups ($F=4.31$, $p<.05$). The SNK test revealed significant differences between the mean scores for teachers at the ages 20-29 ($M=7.86$), 30-39 ($M=11.24$) and 40+ years ($M=11.38$). This result would indicate that, while teachers at ages 20-29 expressed a very high preference for getting students to learn by direct experience, those at ages 30-39 and 40+ indicated only a slightly high preference for this mode of teaching.

(2) Age Differences in Instructional Style Preferences Among Female Teachers

The mean scores of the three age groups of female teachers are shown in Table 81. In the category of Instructional Conditions, the 20-29 year-old teachers expressed a high preference for the Instructor scale ($M=10.56$) and a very low preference for the Competition scale ($M=15.50$). The 30-39 year-old teachers stated a high preference for the Organization scale ($M=10.00$) and a slightly low preference for the Independence scale ($M=13.88$). The 40+ year-old female teachers indicated a very high preference for the Organization ($M=9.88$) scale and slightly low preferences for the Goal Setting ($M= 13.50$) and Authority ($M=13.50$) scales.

In the category of Instructional Content, the 20-29 year-old teachers stated a very high preference for the People scale ($M=9.06$). and a very low preference for the Inanimate scale ($M=15.50$). The 30-39 year-old teachers expressed a very high preference for the Qualitative scale ($M=9.13$) and a very low preference for the Inanimate scale

(M=16.25). The 40+ year-old teachers showed a very high preference for the People scale (M=9.13) and a very low preference for the Inanimate scale (M=15.00). All age groups of female teachers in this category preferred teaching about working with people and disliked teaching about working with things.

Table 81

Means Scores of Three Age Groups of Female Teachers (n=34)

Scale	Age	20-29	30-39	40+	Total Group
	n	18	8	8	
(1) Conditions					
Peer[P]		11.44	12.25	13.25	12.06
Organization[O]		10.72	10.00	9.88	10.35
Goal Setting[G]		12.33	13.25	13.50	12.82
Competition[C]		15.50	14.50	13.38	14.76
Instructor[Is]		10.56	12.25	11.00	11.06
Detail[De]		13.44	12.25	12.63	12.97
Independence[Id]		13.33	13.88	12.88	13.35
Authority[A]		12.67	11.63	13.50	12.62
(2) Content					
Numeric[N]		14.78	13.38	14.63	14.41
Qualitative[Q]		10.67	9.13	11.25	10.44
Inanimate[Ia]		15.50	16.25	15.00	15.56
People[P]		9.06	11.25	9.13	9.59
(3) Mode					
Lecturing[L]		13.17	14.63	14.25	13.76
Reading[R]		13.50	13.75	11.00	12.97
Iconics[Ic]		12.00	9.38	11.00	11.15
Direct Experience[Di]		11.33	12.25	13.75	12.12

In the category of Instructional Mode, the 20-29 year-old female teachers expressed a slightly high preference for the Direct Experience scale (M=11.33) and a slightly low preference for the Reading scale (M=13.50). Among the 30-39 year-old teachers, a very high preference

Table 82

One-Way Analysis of Variance of Scores on the Instructional Style Scales Among Three Age Groups of Female Teachers with Newman-Keuls Comparisons (n=34)

Scale		SS	df	MS	F	Newman-Keuls
(1) Conditions						
Peer	Between	18.44	2	9.22	1.45	1 2 3
	Within	197.44	31	6.37		
Organization	Between	5.28	2	2.64	0.5162	3 2 1
	Within	158.49	31	5.11		
Goal Setting	Between	9.44	2	4.72	0.72	1 2 3
	Within	203.50	31	6.56		
Competition	Between	25.74	2	12.87	1.66	3 2 1
	Within	240.38	31	7.75		
Instructor	Between	15.94	2	7.97	0.97	1 3 2
	Within	255.94	31	8.26		
Detail	Between	9.15	2	4.58	0.64	2 3 1
	Within	221.82	31	7.16		
Independence	Between	4.01	2	2.01	0.26	3 1 2
	Within	239.75	31	7.73		
Authority	Between	14.15	2	7.08	0.73	2 1 3
	Within	299.88	31	9.67		
(2) Content						
Numeric	Between	11.37	2	5.69	0.45	2 3 1
	Within	390.86	31	12.61		
Qualitative	Between	20.01	2	10.00	1.38	2 1 3
	Within	224.38	31	7.24		
Inanimate	Between	6.38	2	3.19	0.57	3 1 2
	Within	174.00	31	5.61		
People	Between	28.92	2	14.46	2.20	1 3 2
	Within	203.32	31	6.56		
(3) Mode						
Lecturing	Between	14.24	2	7.12	1.94	1 3 2
	Within	113.88	31	3.67		
Reading	Between	40.97	2	20.49	3.21	3 1 2
	Within	198.00	31	6.39		
Iconics	Between	38.39	2	19.19	2.54	2 3 1
	Within	223.88	31	7.54		
Direct Experience	Between	32.53	2	16.26	1.51	1 2 3
	Within	333.00	31	10.74		

Note. Groups: 1 = 20-29 yrs; 2 = 30-39 yrs; 3 = 40^{+} yrs.

was for the Iconics scale (M=9.38) and a low preference was for the Lecturing scale (M=14.63). The 40^{+} year-old teachers showed a slightly high preference for the Reading (M=11.00) and Iconics (M=11.00) scales and a low preference for the Lecturing scale (M=14.25).

In contrast to the three age groups of male teachers who differed significantly on three instructional style scales, no significant differences were found among the means of the three age groups of female teachers (see Table 82). This result would indicate that age was not a factor that influenced preferences of instructional style among female teachers.

4.7.2 Discrimiant Analysis of Instructional Style and Age

As shown in Table 83, a three-group discriminant function analysis was conducted to determine whether or not a set of instructional style scales could be used to successfully predict the membership of the three age groups: teachers at ages 20-29, ages 30-39 and ages 40^{+}. On function one, Wilks' Lambda was calculated to be 0.68, equivalent to an F ratio of 28.36. The probability of obtaining an F ratio this large by chance was less than .01. Wilks' Lambda on function two was 0.85 which was equivalent to an F ratio of 11.63. The probability of obtaining an F ratio this large by chance was less than .05. Consequently, the instructional style scales were considered to discriminate among the three age groups by two functions.

On function one (see Table 84), teachers at ages 20-29 showed a positive correlation coefficient of 0.70, while teachers at ages 30-39 showed a negative correlation coefficient of -0.46. Accordingly,

Table 83

Canonical Discriminant Functions of the Three Age Groups of Teachers

Fun.	Eigenvalue	Percent of Variance	Canonical Correlation	After Fun.	Wilks' Lambda	F-Ratio	df	Sig.
1	0.26	59.83	0.45	: 0	0.68	28.36	12	0.0049
2	0.17	40.17	0.38	: 1	0.85	11.634	5	0.0402

teachers at ages 20-29 revealed an antithetic relationship with teachers at ages 30-39 in canonical discriminant function one. Teachers at age 40+ did not show significant correlation on function one. Function one, therefore, provided a fair identification of differences in the instructional style scales of teachers at ages 20-29 and ages 30-39. On function two (see Table 84), teachers at ages 30-39 provided a negative correlation coefficiant of -0.30 and teachers at ages 40+ showed a strong positive correlation coefficient of 0.67. Accordingly, function two identified the instructional style differences of teachers at ages

Table 84

Canonical Discriminant Functions Evaluated at Group Means of Three Age Groups of Teachers

Group	Cases	Function 1	Function 2
20 To 29	25	0.70	-0.17
30 To 39	33	-0.46	-0.30
40+	21	-0.11	0.67

30-39 and 40+. Hence, teachers at ages 20-29 and ages 30-39 could be differentiated on the basis of correlation coefficients on the 16

instructional style scales in function one, and teachers at ages 30-39 and 40+ were identified by function two (see Table 85).

Table 85

Pooled Within-Groups Correlations between Canonical Discriminant Functions and Discriminating Variables of Three Age Groups of Teachers

	Function 1	Function 2
Iconics	0.62 *	-0.03
Independence	-0.53 *	-0.06
Detail	0.47 *	0.35
Authority	0.31 *	-0.00
Inanimate	0.31 *	-0.15
Organization	0.28 *	-0.04
Lecturing	-0.16 *	-0.14
Qualitative	-0.08 *	0.02
Numeric	-0.04 *	-0.02
Peer	-0.15	0.60 *
Direct Experience	-0.35	0.39 *
Competition	0.09	-0.35 *
Reading	-0.14	-0.34 *
Instructor	-0.23	-0.25 *
Goal Setting	-0.19	-0.19 *
People	-0.14	0.16 *

Note: Variables are ordered by the function with the largest correlation and the magnitude of that correlation.

Negative and positive correlation coefficients of over 0.25 differentiate the age groups of teachers, with seven scales on function one and six scales on function two. On function one, teachers of ages 20-29 and 30-39 were differentiated on the scales of Iconics (-0.62), Independence (-0.53), Detail (0.47), Direct Experience (-0.35), Authority (0.31), Inanimate (0.31), and Organization (0.28). Two of these seven scales confirmed the one-way ANOVA findings of differences on the scales of Detail ($p<.05$ in male teachers) and Iconics ($p<.05$ in male teachers). On function two, teachers of ages 30-39 and 40+ were

differentiated on the scales of Peer (0.60), Direct Experience (0.39), Competition (-0.35), Detail (0.35), Reading (-0.34), and Instructor (-0.25). Two of these six scales confirmed the one-way ANOVA findings of differences on the scale of Detail ($p<.05$ in male teachers) and Direct Experience ($p<.05$ in male teachers).

The classification into age groups (see Table 86) indicates that teachers at ages 20-29 were classified correctly in 72.0 percent of the cases and teachers at ages 30-39 were classified correctly in 60.6 percent of the cases. Teachers at ages 40 and older were correctly classified in 66.7 percent of the cases. The overall classification rate was 65.82%.

Table 86

Summary of Classification Results for Three Age Groups of Teachers

Group		Cases	Predicted Group Membership 1	2	3
1	20 To 29	25	18 72.0%	3 12.0%	4 16.0%
2	30 To 39	33	8 24.2%	20 60.6%	5 15.2%
3	40+	21	2 9.5%	5 23.8%	14 66.7%

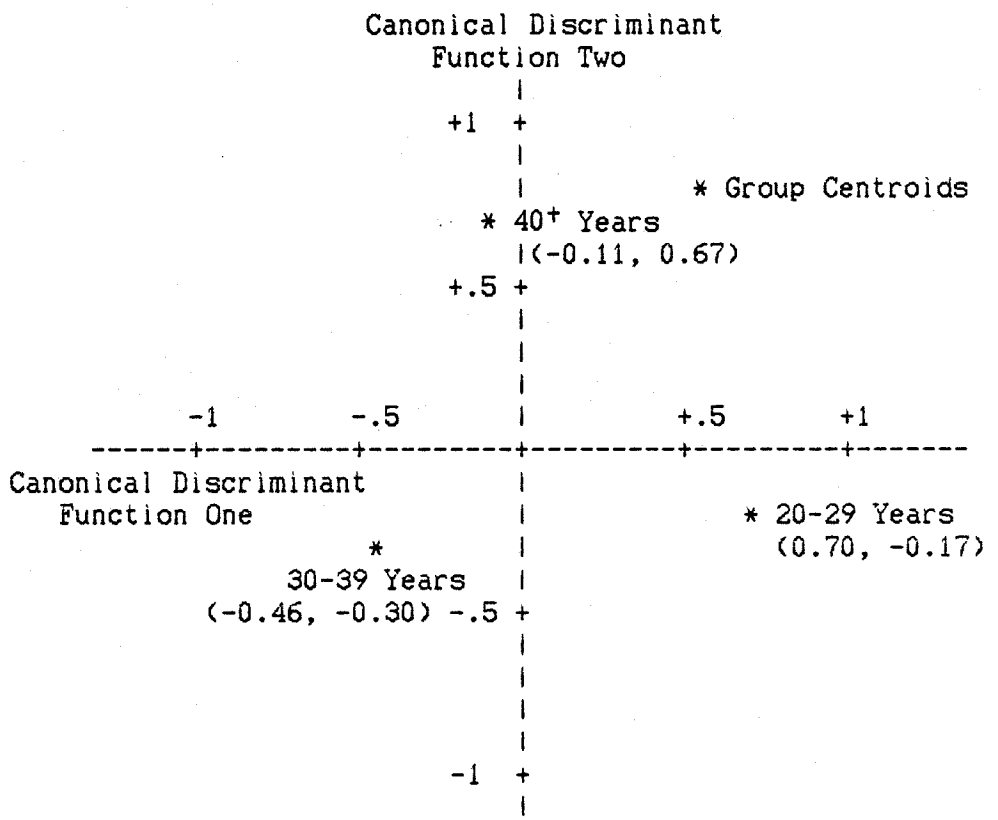
Percent of grouped cases correctly classified: 65.82%

In addition, according to group centroids of the three age groups shown in Figure 9, differences between three age groups were 1.17 between the groups at ages 20-29 (0.70, -0.17) and ages 30-39 (-0.46, -0.30), 1.19 between the groups of ages 20-29 and ages 40+ (-0.11,

0.67), and 1.06 between the groups of ages 30-39 and ages 40+. Considering a difference of 1.22 between Native and non-Native teachers (see Figure 7), differences among three age groups were relatively similar, but much smaller than that between male and female teachers, 1.93 (see Figrue 8).

Figure 9

Group Centroids of the Three Age Groups of Teachers



4.8 Hypothesis 8

Hypothesis #8. There would be no statistically significant differences found in perceived responsiblity for the students' learning process on the basis of culture, sex and age.

The mean scores of Native and non-Native teachers on perceived responsibility for the students' learning process are shown in Table 87. Non-Native teachers (M=15.50) showed higher perceived responsibility than did Native teachers (M=18.60). However, one-way ANOVA did not yield any significant difference between the means of Native and non-Native teachers. This finding would suggest that Native and non-Native teachers did not differ in perceived responsibility for the students' learning process.

Table 87

One-Way Analyses of Variance of Scores on Perceived Responsibility for Students' Learning Process Between Native and Non-Native Teachers with Newman-Keuls Comparison (n=79)

	df	Native Mean	Non-Native Mean	F-Ratio	F-Prob.	Newman-Keuls
Responsibility	1	18.60	15.50	2.40	.1251	1 2

Note. Groups: 1 = Native; 2 = Non-Native.

Mean scores of male and female teachers on perceived responsibility for the students' learning process are shown in Table 88. At ages 20-29, female teachers (M=14.28) showed slightly higher perceived responsibility than male teachers (M=15.71). At ages 30-39, female teachers (M=16.64) again showed higher perceived responsibility than male teachers (M=15.88). Furthermore, at ages 40+, female teachers (M=16.00) had higher perceived responsibility scores than did male teachers (M=17.92). However, one-way ANOVA found no significant difference between the means of male and female teachers at every age level. This would suggest that male and female teachers at every age

level did not differ in perceived responsibility for the students' learning process.

Table 88

One-Way Analyses of Variance of Perceived Responsibility for Students' Learning Process of Teachers Classified by Sex at Three Age Levels with Newman-Keuls Comparison (n=79)

Age	df	Male Mean	Female Mean	F-Ratio	F-Prob.	Newman-Keuls
20 to 29 (n=25)	2	15.71	14.28	0.27	.6073	2 1
30 to 39 (n=33)	2	16.64	15.88	0.07	.7887	2 1
40+ (n=21)	2	17.92	16.00	0.26	.6187	2 1

Note. Groups: 1 = Male; 2 = Female.

With regard to age differences (see Table 89), the mean scores of the 20-29 year-old male (M=15.71) and female teachers (M=14.28) showed the highest perceived responsibility among the three age groups at every age level, while the 40+ year-old male (M=17.92) teachers yielded the lowest perceived responsibility. However, despite these trends, one-way ANOVA on the basis of age and sex did not show any significant differences. These results would indicate that there were no age differences in perceived responsibility for the students' learning process.

Overall, according to the mean scores, non-Native teachers showed higher perceived responsibility for the students' learning process than did Native teachers; female teachers were higher than male teachers; and the 20-29 year-old teachers were higher than the 30-39 and 40+ year-old teachers. However, no significant differences were found among teachers classified by culture, sex and age. These results would suggest that

teachers shared the same degree of perceived responsibility for the student's learning process.

Table 89

One-Way Analysis of Variance of Perceived Responsibility for Students' Learning Process in Male and Female Teachers Classified by Age with Newman-Keuls Comparisons (n=79)

Sex	Means of Age Groups 20-29	30-39	40+	SS	df	MS	F	Newman-Keuls		
Male (n=45)										
	15.71	16.64	17.92	25.09	2	12.54	0.2161	1	2	3
				2438.11	42	58.05				
Female (n=34)										
	14.28	15.88	16.00	23.40	2	11.70	0.2776	1	2	3
				1306.49	31	42.45				

Note. Groups: 1 = 20-29 yrs; 2 = 30-39 yrs; 3 = 40+ yrs.

4.9 Hypothesis 9

Hypothesis #9. Congruence would be more likely to be found between learning styles of Cree, Dene, Metis and non-Native students and instructional style of Native teachers, than it would be between learning styles of Cree, Dene, Metis and non-Native students and instructional style of non-Native teachers.

The data of hypothesis #9 were analysed in two steps. First, differences and similarities of learning/instructional style between students and teachers were identified by one-way ANOVA on the basis of culture. Second, the likelihood of congruence between the mean scores on learning/instructional style between students and teachers was examined by the match-mismatch combinations of cultural group and

component preference which were indicated by the use of the Newman-Keuls comparisons.

Table 90

Mean Scores of the Learning/Instructional Style Scales Among Cree, Dene, Metis and Non-Native Students, and Native and Non-Native Teachers
(n=464)

Scale	Students				Teachers	
	1	2	3	4	5	6
(1) Conditions						
Peer	12.98	13.82	12.60	12.62	13.68 (11.40)	14.10 (11.75)
Organization	14.86	14.75	14.26	13.83	13.20 (11.00)	11.68 (9.73)
Goal Setting	15.25	15.63	15.90	15.88	15.68 (13.06)	16.11 (13.42)
Competition	16.88	15.80	17.24	17.66	17.44 (14.53)	18.11 (15.09)
Instructor	13.56	13.54	13.13	12 03	13.20 (11.00)	12.13 (10.11)
Detail	14.23	14.31	13.97	13.97	15.92 (13.27)	15.60 (13.00)
Independence	16.73	16.54	17.37	16.65	14.64 (12.20)	17.59 (14.66)
Authority	15.60	15.62	15.52	17.35	16.24 (13.53)	14.68 (12.23)
(2) Content						
Numeric	16.28	15.03	16.24	16.63	16.96 (14.13)	17.14 (14.28)
Qualitative	15.95	14.75	15.11	15.44	13.44 (11.20)	14.10 (11.75)
Inanimate	11.90	13.28	12.72	12.50	16.48 (13.73)	16.50 (13.75)
People	15.88	16.94	15.91	15.53	13.12 (10.93)	12.36 (10.30)
(3) Mode						
Lecturing /Listening	16.49	15.52	16.04	17.10	17.20 (14.33)	16.52 (13.77)
Reading	17.17	15.25	16.84	18.26	14.88 (12.40)	16.13 (13.44)
Iconics	13.20	14.74	13.05	11.58	14.16 (11.80)	13.59 (11.33)
Direct Experience	13.14	14.57	14.97	13.07	13.76 (11.47)	13.58 (11.31)

Note 1. Groups: 1 = Cree Students; 2 = Dene Students; 3 = Metis Students; 4 = Non-Native Students; 5 = Native Teachers; 6 = Non-Native Teachers.
Note 2. The means for teachers are converted; the teacher means in brackets are the raw means.

Table 91

One-Way Analysis of Variance of Scores on the Learning/Instructional Style Scales Among Cree, Dene, Metis and Non-Native Students, and Native and Non-Native Teachers with Newman-Keuls Comparisons of Students and Teachers (n=464)

Scale		SS	df	MS	F	Newman-Keuls
(1) Conditions						
Peer	Between	161.59	5	32.32	2.95 *	3 4 1 5 2 6
	Within	5023.76	458	10.97		
Organization	Between	462.08	5	92.42	10.58 ***	6 5 4 3 2 1
	Within	4001.44	458	8.74		
Goal Setting	Between	34.05	5	6.81	0.67	1 2 5 4 3 6
	Within	4641.47	458	10.13		
Competition	Between	212.16	5	42.43	4.98 ***	2 1 3 5 4 6
	Within	3906.07	458	8.53		
Instructor	Between	186.84	5	37.37	3.42 *	4 6 3 5 2 1
	Within	5003.53	458	10.92		
Detail	Between	172.55	5	34.51	3.65 **	3 4 1 2 6 5
	Within	4332.05	458	9.46		
Independence	Between	154.23	5	30.85	2.75 *	5 2 4 1 3 6
	Within	5297.00	458	11.23		
Authority	Between	349.32	5	69.86	5.89 ***	6 3 1 2 5 4
	Within	5436.93	458	11.87		
(2) Content						
Numeric	Between	167.92	5	33.58	2.21 *	2 3 1 4 5 6
	Within	6959.52	458	15.20		
Qualitative	Between	183.69	5	36.74	3.26 **	5 6 2 3 4 1
	Within	5156.81	458	11.26		
Inanimate	Between	1077.85	5	215.57	15.47 ***	1 4 3 2 5 6
	Within	6384.00	458	13.94		
People	Between	879.78	5	175.96	14.39 ***	6 5 4 1 3 2
	Within	5598.80	458	12.22		
(3) Mode						
Lecturing /Listening	Between	129.52	5	25.90	2.82 *	2 3 1 6 4 5
	Within	4203.66	458	9.18		
Reading	Between	475.30	5	95.06	8.45 ***	5 2 6 3 1 4
	Within	5149.67	458	11.24		
Iconics	Between	450.28	5	90.06	7.65 ***	4 3 1 6 5 2
	Within	5392.00	458	11.77		
Direct Experience	Between	135.73	5	27.15	2.17	4 1 6 5 3 2
	Within	5720.91	458	12.49		

Note. Groups: 1 = Cree Students; 2 = Dene Students; 3 = Metis Students; 4 = Non-Native Students; 5 = Native Teachers; 6 = Non-Native Teachers.
*p<.05. **p<.01. ***p<.001.

4.9.1 Differences and Similarities of Learning/Instructional Style Between Students and Teachers on the Basis of Culture

Accepting that the scales of instructional style measured by Canfield's Instructional Styles Inventory represented the scales of learning style as measured by Canfield's Learning Styles Inventory, every mean score on the instructional style scales (a 5-20 point scale) was multiplied by 1.2 to make it possible to compare scores to those of the Learning Styles Inventory (a 6-24 point scale). The mean scores on the learning style and instructional style scales are shown in Table 90, with the results of one-way ANOVA reported in Table 91.

As shown in Table 91, 14 of 16 learning/instructional style scales showed significant differences among the means of six cultural groups. Since the purpose of this analysis was to compare the mean scores of the student sample by cultural group to those of the teacher sample by cultural group, significant differences within the cultural groups of teachers or students were excluded from this analysis. In cases where one-way ANOVA indicated similarities between teachers and some students but differences from other students those groups showing similarity were considered as being congruent in preference of learning/instructional style, although the mean scores of these groups were found to fall in different label ranges. The preferences of instructional style scales among teachers were examined by the raw mean scores (see Table 90) using the ranges of a 5-20 point scale (see page 47).

(1) Learning/Instructional Conditions

In the category of Learning/Instructional Conditions, seven scales out of eight showed significant differences among the means of the cultural groups. However, the Instructor scale indicated significant differences within students groups and, therefore, was excluded from further analyses.

On the Peer scale, one-way ANOVA revealed significant differences among the means of students and teachers ($F=2.95$, $p<.05$). Furthermore, the SNK tests showed significant differences among the mean scores of non-Native teachers (Converted Mean, CM=14.10; Raw Mean, RM=11.75), Metis (M=12.60) and non-Native (M=12.62) students. Since non-Native teachers on the mean score expressed a slightly high preference for this scale, and Metis and non-Native students indicated a high preference, this result would indicate that non-Native teachers had a less positive response to letting the students study in teams than did Metis and non-Native students. It could be interpreted that non-Native teachers were incongruent with Metis and non-Native students within a general trend of high preference. Native teachers (CM=13.68, RM=11.40) also expressed a slightly high preference for this scale, but one-way ANOVA did not show any significant differences between these teachers and any student group.

On the Organization scale, one-way ANOVA indicated significant differences among the means of the groups of students and teachers ($F=10.58$, $p<.001$). Furthermore, the SNK tests showed significant differences among the mean scores of non-Native teachers (CM=11.68,

RM=9.73), and non-Native (M=13.83), Metis (M=14.26), Dene (M=14.75) and Cree (M=14.86) students. Since non-Native teachers on the mean score indicated a very high preference for this scale, and all student groups expressed from a slightly high to neither a high nor a low preference, this result would suggest that non-Native teachers had higher preference for teaching from well-organized materials than did Cree, Dene, Metis and non-Native students. It could be interpreted that the instructional style of non-Native teachers on the Organization scale was incongruent with the learning style of the four cultural groups of students. On the other hand, Native teachers (CM=13.20, RM=11.00) showed a slightly high preference which was not significantly different from that of Cree, Dene, Metis and non-Native students.

On the Goal Setting scale, no significant differences were found by one-way ANOVA. Cree students (M=15.25) expressed neither a high nor a low preference for setting their own learning goals, and Dene (M=15.63), Metis (M=15.90) and non-Native (M=15.88) students indicated a slightly low preference. On the other hand, both Native and non-Native teachers indicated a slightly low preference. Hence, both groups of teachers had preferences similar to those of Dene, Metis and non-Native students and also close to Cree students.

On the Competition scale, one-way ANOVA revealed significant differences among the means of the groups of students and teachers ($F=4.98$, $p<.001$). The SNK tests indicated significant differences among the mean scores of non-Native teachers (CM=18.11, RM=15.09), Dene (M=15.80) and non-Native (M=17.66) students. This result would suggest that non-Native teachers had much lower preference for getting students

to compete among themselves than did Dene students who expressed a slightly low preference. Non-Native teachers had similar preference for this scale to that of non-Native students who showed a low preference and differed significantly from Dene students. Therefore, the instructional style of non-Native teachers was incongruent with the learning style of Dene students and congruent with non-Native students. On the other hand, Native teachers (CM=17.44, RM=14.53) expressed a low preference for this scale which was congruent with Cree (M=16.88), Metis (M=17.24) and non-Native (M=17.66) students. To sum up, non-Native teachers were incongruent with Dene students and congruent with non-Native students, while Native teachers were congruent with Cree, Metis and non-Native students.

On the Instructor scale, one-way ANOVA showed no significant differences among the means of students and teachers. Hence, it would suggest that there were no differences among instructional style preferences of teachers and learning style preferences of students on the Instructor scale. All groups stated high preference.

On the Detail scale, one-way ANOVA showed significant differences among the means of the groups ($F=3.65$, $p<.01$). The SNK tests indicated significant differences among the mean scores of non-Native teachers (CM=15.60, RM=13.00), non-Native (M=13.97), Metis (M=13.97), Cree (M=14.23) and Dene (M=14.31) students. Since non-Native teachers expressed a slightly low preference for providing specific information on assignments, requirements and rules, and all student groups indicated slightly high preference, the result would suggest that non-Native teachers had a less positive response for this scale than did all the

students. Hence, it could be interpreted that the instructional style of non-Native teachers was incongruent with the learning styles of all the student groups on this scale. Native teachers (CM=15.92, RM=13.27) also indicated a slightly low preference for this scale, but one-way ANOVA did not indicate significant differences from preferences of any student group.

On the Independence scale, one-way ANOVA revealed significant differences among the means of the groups ($F=2.75$, $p<.05$). The SNK tests indicated significant differences among the mean scores of Native (CM=14.64, RM=12.20) and non-Native (CM=17.59, RM=14.66) teachers, and Metis students (M=17.37). Since Native teachers expressed neither a high nor a low preference for encouraging students to work alone and independently, and non-Native teachers and Metis students indicated a low preference, the result would suggest that Native teachers had a more positive response to this scale than did non-Native teachers and Metis students. It could be interpreted that the instructional style of Native teachers on this scale was incongruent with Metis students and differed significantly from the instructional style preference of non-Native teachers. In addition, because all student groups expressed a low preference to the same category as that of non-Native teachers, non-Native teachers were congruent with all the students.

On the Authority scale, one-way ANOVA showed significant differences among the means of the groups ($F=5.89$, $p<.001$). The SNK tests indicated significant differences among the mean scores of non-Native teachers (CM=14.68, RM=12.23), and Metis (M=15.52), Cree (M=15.60), Dene (M=15.62) and non-Native (M=17.35) students. Since

non-Native teachers expressed neither a high nor a low preference for maintaining strict classroom discipline and order, while non-Native students indicated a low preference, and Cree, Dene and Metis students expressed a slightly low preference, the result would suggest that: non-Native teachers had a more positive reaction to this scale than did non-Native students and had a similar preference to that of Cree, Dene and Metis students. It could be interpreted that the instructional style of non-Native teachers on this scale was incongruent with non-Native students and congruent with Cree, Dene and Metis students. On the other hand, Native teachers (CM=16.24, RM=13.53) expressed a slightly low preference for this scale which was similar to all of students and did not differ significantly.

(2) Learning/Instructional Content

In the category of Learning/Instructional Content, all four scales showed significant differences among the means of the cultural groups of teachers and students.

On the Numeric scale, there were significant differences among the means of the groups ($F=2.21$, $p<.05$). The SNK tests revealed significant differences between the mean scores of non-Native teachers (CM=17.14, RM=14.28) and Dene students (M=15.03). Since non-Native teachers expressed a low preference for teaching about numbers and logic, and Dene students showed neither a high nor a low preference, this result would indicate that non-Native teachers had a lower preference for this scale than did Dene students. It could be interpreted that the instructional style of non-Native teachers on this scale was incongruent

with Dene students. On the other hand, Native teachers (CM=16.96, RM=14.13) also showed a low preference for this scale but one-way ANOVA did not indicate significant differences from student preferences.

On the Qualitative scale, there were significant differences among the means of the groups ($F=3.26$, $p<.01$). The SNK tests revealed significant differences between the mean scors for non-Native teachers (CM=14.10, RM=11.75)) and Cree students (M=15.95). Since non-Native teachers showed a slightly high preference for teaching about words and language, and Cree students expressed a slightly low preference, this result would indicate that non-Native teachers had a higher preference for this scale than did Cree students. Native teachers (CM=13.44, RM=11.20) also showed a slightly high preference for this scale but one-way ANOVA did not indicate significant differences from student preferences.

On the scale of Inanimate, significant differences were found among the means of the groups ($F=15.47$, $p<.001$). The SNK tests indicated significant differences among the mean scores for Native (CM=16.48, RM=13.73) and non-Native (CM=16.50, RM=13.75) teachers, and Cree (M=11.90), non-Native (M=12.50), Metis (M=12.72) and Dene (M=13.28) students. Since both teacher groups expressed a slightly low preference for getting students to work with things, and all students showed high to very high preferences for this scale, the result would indicate that both groups of teachers had much lower preferences than did any groups of students. Hence, it would be concluded that the instructional styles of both groups of teachers on this scale were incongruent with all the groups of students.

On the People scale significant differences were found among the groups ($F=14.39$, $p<.001$). The SNK tests indicated significant differences among the mean scores of non-Native (CM=12.36, RM=10.30) and Native (CM=13.12, RM=10.93)) teachers, and non-Native (M=15.53), Cree (M=15.88), Metis (M=15.91) and Dene (M=16.94) students. Since both teacher groups expressed high preferences for letting students learn about working with people, and all students showed slightly high to high preferences, this result would indicate that both groups of teachers had higher preferences for this scale than did all the groups of students. Therefore, the instructional styles of both Native and non-Native teachers on this scale were incongruent with the learning styles of all the groups of students.

(3) Learning/Instructional Mode

In the category of Learning/Instructional Mode, three scales showed significant differences among the means of cultural groups. The Lecturing/Listening scale on whch significant differences were found within student groups was excluded from the further analyses.

On the Lecturing/Listening scale, no significant differences were found between the means of students and teachers. Both groups of teachers expressed slightly low to low preferences for lecturing, and all students also stated slightly low to low preferences for listening. Therefore, instructional styles of Native and non-Native teachers on this scale appeared to be congruent with learning styles of all student groups.

On the Reading scale, there were significant differences among the means of the groups ($F=8.45$, $p<.001$). The SNK tests revealed significant differences among the mean scores for Native ($\underline{CM}=14.88$, $\underline{RM}=12.40$), non-Native ($\underline{CM}=16.13$, $\underline{RM}=13.44$) teachers and non-Native students ($\underline{M}=18.26$). On the basis of mean scores, Native teachers expressed neither a high nor a low preference for teaching through written materials, and non-Native teachers expressed a slightly low preference, while non-Native students showed a very low preference. Hence, this result would indicate that Native and non-Native teachers had lower preferences than non-Native students for this learning mode. It could be interpreted that the instructional styles of both groups of teachers were incongruent with the learning style of non-Native students. Student groups of Cree, Dene and Metis were closer to both groups of teachers in their preferences for the Reading scale.

On the Iconics scale, there were significant differences among the means of the groups ($F=7.65$, $p<.001$). The SNK tests revealed significant differences between the mean scores for non-Native teachers ($\underline{CM}=13.59$, $\underline{RM}=11.33$) and non-Native students ($\underline{M}=11.58$). Since non-Native teachers expressed a slightly high preference for teaching by visual materials, and non-Native students showed a very high preference, this result would indicate that, in a general trend of higher preference, non-Native teachers had a less preference for this scale than did non-Native students. Native teachers ($\underline{CM}=14.16$, $\underline{RM}=11.80$) also expressed a slightly high preference, but one-way ANOVA did not indicate any significant differences from any student group preferences.

On the Direct Experience scale, no significant differences were found in the mean scores between students and teachers. Hence, it would suggest that there were no differences between instructional style preferences of teachers and learning style preferences of students on the Direct Experience scale.

4.9.2 Congruence Between Learning Styles of Students and Instructional Styles of Teachers

The results of one-way ANOVA for Cree, Dene, Metis and non-Native students, and Native and non-Native teachers together on the 16 learning/instructional style scales yielded significant differences on 14 scales out of 16 scales. However, because two of the 14 scales showed significant differences within the student cultural groups rather than between students and teachers, these two scales were excluded from further analysis. The results of the Newman-Keuls Comparisons were summarized separately: differences between Native teachers and the four cultural groups of students (see Table 92), and differences between non-Native teachers and the four cultural groups of students (see Table 93).

On the basis of the Newman-Keuls Comparisons, significant differences in learning/instructional style between Native teachers and Cree, Dene, Metis and non-Native students appeared in 10 cases out of a possible combinations of 64 cases, or in 15.6 percent of cases (see Table 92), while non-Native teachers and the same cultural groups of students showed incongruency in 24 cases out of 64, or 37.5 percent (see Table 93). These results were also considered as a congruency rate of

84.4 percent (54 matched cases) for Native teachers, and 62.5 percent (40 matched cases) for non-Native teachers. Although both Native and non-Native teachers were congruent on more than 50 percent of all components, it was found that Native teachers were congruent with all students at a higher percentage and on a greater number of matching combinations than was true for non-Native teachers.

Table 92

Differences between Instructional Style Preferences of Native Teachers and Learning Style Preferences of Cree, Dene, Metis and Non-Native Students According to Newman-Keuls Comparisons

Scale	Cree	Dene	Metis	Non-Native
(1) Conditions				
Peer				
Organization				
Goal Setting				
Competition				
Instructor				
Detail				
Independence			X	
Authority				
(2) Content				
Numeric				
Qualitative				
Inanimate	X	X	X	X
People	X	X	X	X
(3) Mode				
Lecturing				
Reading				X
Iconics				
Direct Experience				
Total Difference	2	2	3	3

Note. X = Significantly different from Native teachers.

Table 93

Differences between Instructional Style Preferences of Non-Native Teachers and Learning Style Preferences of Cree, Dene, Metis and Non-Native Students According to Newman-Keuls Comparisons

Scale	Cree	Dene	Metis	Non-Native
(1) Conditions				
Peer			X	X
Organization	X	X	X	X
Goal Setting				
Competition		X		
Instructor				
Detail	X	X	X	X
Independence				
Authority				X
(2) Content				
Numeric		X		
Qualitative	X			
Inanimate	X	X	X	X
People	X	X	X	X
(3) Mode				
Lecturing				
Reading				X
Iconics				X
Direct Experience				
Total Difference	5	6	5	8

Note. X = Significantly different from non-Native teachers.

CHAPTER 5

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter provides a general overview of the study, as well as a summary of findings related to each hypothesis. Conclusions are reported, and recommendations are made for Saskatchewan schools, including the situation of non-Native students attending school in Native communities. Future research directions are suggested.

5.1 Study Overview

The purpose of this study was to measure the congruence between the learning styles of Cree, Dene, Metis and non-Native students, and the instructional styles of Native and non-Native teachers in Northern Saskatchewan schools. The study also identified differences and similarities in learning and instructional styles among the groups classified by culture, sex and age. Since few studies are available in the research area of learning/instructional style of Native students and teachers, this research provides additional information that can be useful to educators and administrators in Native education.

The data for this study were collected by the administration of Canfield's Learning Styles Inventory to a sample of students in six Northern Saskatchewan schools, and Canfield's Instructional Styles Inventory to a sample of teachers from the same schools. The student and teacher inventories were comparable and were designed to produce

individual learning and instructional style profiles which consisted of 16 components in three categories: Learning Conditions, Learning Content and Learning Mode. In addition, the inventories were designed to match each other, thereby permitting a comparison of differences and similarities between the 16 learning style scales and the 16 instructional style scales. The inventories also permitted prediction of levels of performance of students and perceived responsibility of teachers for the learning process.

The samples of students and teachers were from six schools located in remote Native communities wthin the Northern Saskatchewan Administrative Zone. The total sample of 464 consisted of 385 students and 79 teachers. The student sample was comprised of 81 Cree, 65 Dene, 134 Metis and 105 non-Native students, while the teacher sample consisted of 15 Native teachers and 64 non-Native teachers.

The dependent variables investigated in the study were the 16 learning/instructional style scales, predicted levels of performance of students, and perceived responsibility of teachers for the students' learning process. The independent variables were culture, sex and age. Based on the independent variables, the student and teacher samples were classified and analyzed in relation to nine hypotheses.

The nine hypothese posed in the study were tested by an examination of mean scores on 16 inventory scales and by using one-way ANOVA with accompanying Newman-Kuels comparisons between ordered means. The significance level was set at .05. Discriminant analysis was used to validate the findings found by the one-way ANOVA and to identify overall group differences. Findings from the analyses were reported,

conclusions were reached on the basis of results, and recommendations were made for Native education and for further research.

5.2 Summary of Findings Related to the Hypotheses

Research findings are summarized on the basis of the rejection or acceptance of the null and research hypotheses.

5.2.1 Differences Among the Learning Styles of Cree, Dene, Metis and non-Native Students: Hypothesis One

Research studies have indicated that Native students process information in a manner different from that of non-Native students (Goodenough, 1926; Telford, 1932; Berry 1966 & 1971; Bland, 1975; Downing, 1977; Wyatt, 1978; Koenig, 1981; Kaulback, 1984; Pepper, 1985). These studies, however, often neglected to investigate the differences among Native people. Therefore, in this study it was hypothesized that there would be differences found in the learning styles of the four cultural groups: Cree, Dene, Metis and non-Native students.

As shown in Table 94, the one-way ANOVA for Cree, Dene, Metis and non-Native students without consideration of age yielded significant differences on seven scales. Moreover, since the student sample classified by culture was contaminated by student age, further analyses were conducted by a series of one-way ANOVA at each age level. The results showed significant differences for: five scales at age 13; two scales at age 14; three scales at age 15; two scales at age 16; and one scale at ages 17-19. Hence, the hypothesis of no difference was

Table 94

Differences Among the Learning Style Preferences of Cree, Dene, Metis and Non-Native Students Assessed by One-Way ANOVA and Confirmed by Discriminant Analysis

Scale	ANOVA (Cult.)	ANOVA (Cult. at Each Age) Student Ages						Dis. Analysis Function	
		12	13	14	15	16	17-19	One	Two
(1) Conditions									
Peer									
Organization			X						
Goal Setting			X						
Competition	X		X	X					
Instructor	X							C	C
Detail									C
Independence					X				
Authority	X			X				C	C
(2) Content									
Numeric							X	C	C
Qualitative						X			
Inanimate									C
People									
(3) Mode									
Listening	X							C	
Reading	X		X		X			C	
Iconics	X		X		X			C	
Direct Experience	X					X		C	
Total Difference	7	0	5	2	3	2	1	7	5

Note. X = Significant difference; C = Confirmed.

rejected for seven learning style scales without consideration of age, and the research hypothesis was accepted for the same scales. Furthermore, by one-way ANOVA on the basis of culture at each age level, the null hypothesis was rejected for five scales at age 13, two scales at age 14, three scales at age 15, two scales at age 16, and one scale

at ages 17-19; the research hypothesis was accepted for the same scales at every age level.

Based on results of both one-way ANOVA with and without consideration of age, the analyses yielded ten important findings (see Table 94 for summary, Tables 8 and 9 for overall cultural differences without consideration of age, and Tables 10-41 for cultural differences at each age level) concerning cultural differences in the learning styles of Cree, Dene, Metis and non-Native students. Explanations in brackets indicate the ranges of the mean scores.

1. At the age of 13, non-Native students (slightly high preference) favored course work organized logically, clearly and sequentially more than did the Cree (slightly low preference) and Dene (low preference) students.

2. At the age of 13, non-Native students (low preference) showed a lower preference for setting their own learning goals than did Cree (slightly high preference) and Metis (neither a high nor a low preference) students.

3. Without consideration of age, and at the ages of 13 and 14, Dene students (slightly low to slightly high) showed a much less negative reaction to competitive learning situations than Cree (low preference), Metis (low to very low preference) and non-Native (low preference).

4. At the age of 15, Metis students (low preference) showed a lower preference for learning alone and independently than did the Dene students (slightly high preference).

5. Without consideration of age and at the age of 15, non-Native students (low preference) showed a much lower preference for strict

classroom discipline than Cree (neither a high nor a low preference), Dene (slightly low preference) and Metis (neither a high nor a low preference).

6. At the ages of 17-19 with non-Native students removed, Metis students (very low preference) showed a much lower preference for learning about numbers and logic than did Dene (neither a high nor a low preference) and Cree (neither a high nor a low preference) students.

7. At age 16 with non-Native students removed, Dene students (high preference) showed much higher preference for learning about words and language (e.g., writing, edition and talking) than did Metis (low preference) and Cree (a low preference) students.

8. Without consideration of age, at the age of 12 with Dene students removed, and the age of 14, non-Native students (low to very low preference) had a much lower preference for learning through written materials (e.g., reading texts and pamphlets) than did Dene students (neither a high nor a low preference).

9. Without consideration of age and at the age of 12 with Dene students removed, and the age of 14, non-Native students (very high preference) favored learning through visual materials more than did Dene students (neither a high nor a low preference).

10. Without consideration of age and at the age of 16, with non-Native students removed, Cree (very high to high preference) and non-Native (high preference) students indicated a higher preference for learning through direct experience than did Dene students (neither a high nor a low preference).

Discriminant analysis (see Table 94 for summary and Table 44 for detail) was used to confirm the significant differences found by the use of one-way ANOVA, and to identify overall learning style differences among the cultural groups. Six scales out of the seven which had shown significant differences by one-way ANOVA without consideration of age were confirmed by discriminant analysis. In addition, six scales out of ten which had shown significant differences by the one-way ANOVA based on culture at each age level were confirmed by discriminant analysis. The overall cultural differences in the learning styles of Cree, Dene, Metis and non-Native students (see Figure 4) were identified on the basis of two canonical discriminant functions, indicating that Cree and Metis students favored similar learning styles, while Dene and Non-Native students differed most strongly from each other. Cree and Metis students were placed between Dene and non-Native students.

5.2.2 Differences Between the Learning Styles of Male and Female Students: Hypothesis Two

Canfield (1980) reported differences in the learning styles of male and female community college students. In order to test for sex differences in this study it was hypothesized that there would be differences found in the learning styles of male and female students.

As shown in Table 95, the results of one-way ANOVA showed significant differences between male and female students on the mean scores of 12 learning style scales. Therefore, the hypothesis of no difference was rejected for 12 scales of learning style and the research

hypothesis was accepted; the null hypothesis was accepted for four scales of learning style and the research hypothsis was rejected.

Table 95

Differences Between Learning Style Preferences of Male and Female Students Assessed by One-Way ANOVA and Confirmed by Discriminant Analysis

Scale	ANOVA (Sex)	Dis. Analysis (Function One)
(1) Conditions		
Peer	X	
Organization		
Goal Setting	X	
Competition		
Instructor	X	C
Detail	X	
Independence	X	C
Authority	X	C
(2) Content		
Numeric	X	
Qualitative	X	C
Inanimate	X	C
People	X	C
(3) Mode		
Listening		
Reading		
Iconics		
Direct	X	
Experience	X	
Total Difference	12	6

Note. X = Significantly different; C = Confirmed.

There were 12 important differences (see Table 95 for summary and Table 46 for detail) related to the hypothesis concerning the learning styles of male and female students:

1. Female students (high preference) had a higher preference for learning in teams and keeping good relationships with other students than did male students (high preference).

2. Female students (slightly low preference) expressed a lower preference for setting their own goals than did male students (neither a high nor a low preference).

3. Male students (high preference) were more interested in knowing the instructor personally than were female students (slightly high preference).

4. Female students (slightly high preference) favored receiving detailed information concerning assignments, requirements and rules, more than did male students (neither a high nor a low preference).

5. Female students (low preference) felt more negatively toward learning alone and independently than did male students (slightly low preference).

6. Male students (low preference) were more opposed to strict classroom discipline than were female students (neither a high nor a low preference).

7. Female students (low preference) expressed a stronger dislike for learning about numbers and logic than did male students (slightly low preference).

8. Male students (slightly low preference) were more opposed to learning about words and language than were female students (slightly high preference).

9. Male students (very high preference) felt much more positive toward learning about inanimate objects than did female students (slightly high preference).

10. Male students (low preference) disliked learning about working with people more than did female students (neither a high nor a low preference).

11. Male students (high preference) had a greater preference for learning through visual materials than did female students (high preference).

12. Female students (high preference) indicated a higher preference for learning by direct experience than did male students (slightly high preference).

Discriminant analysis (see Table 95 and Table 49 for detail) was used to validate findings of the one-way ANOVA and to identify the overall difference between male and female students. The six scales which showed significant differences at the .001 level by one-way ANOVA were confirmed by discriminant analysis. The overall difference in learning styles between male and female students (see Figure 5) was identified on the basis of discriminant analysis function one, indicating that male and female students differed less in learning style than did Dene and non-Native students (see Figure 4). However, the difference between male and female was greater than that found among all other comparisons of cultural groups of students.

5.2.3 Differences Among the Three Age Groups of Students in Each Cultural Groups: Hypothesis Three

Canfield (1980) had found significant differences between community college students below and above 25 years of age. In order to test for age differences in this study, the students were classified into three age groups. It was hypothesized that there would be differences found in the learning styles of students on the basis of age.

As shown in Table 96, the results of one-way ANOVA indicated significant differences on: five scales among three age groups of Dene students; and three scales among three age groups of non-Native students. Therefore, the hypothesis of no difference was accepted for all scales among Cree and Metis students and the research hypothesis was rejected. The null hypothesis was rejected for five scales among Dene students and for three scales among non-Native students, and the null hypothesis was accepted for 11 scales among Dene students and rejected for 13 scales among non-Native students.

There were nine important findings (see Table 96 for summary and Tables 51-58 for detail) related to the hypothesis concerning differences in the learning styles of three age groups of students:

1. There were no age differences in the learning styles of Cree and Metis students, while Dene and non-Native students showed age differences on some scales of learning style.

2. Among Dene students, those from 16-19 years of age (slightly high preference) had a greater preference for having course work organized

logically, clearly and sequentially than did in those from 12 to 14 years old (slightly low preference).

Table 96

Differences in Learning Style Preferences Among Three Age Groups of Students in Each Cultural Group Assessed by One-Way ANOVA and Confirmed by Discriminant Analysis

Scale	ANOVA (Age in Each Cultural Group) Student Culture				Discriminant Analysis (Function One)
	Cree	Dene	Metis	Non-Native	
(1) Conditions					
Peer					
Organization		X			C
Goal Setting					
Competition					
Instructor					C
Detail		X			
Independence		X			
Authority					C
(2) Content					
Numeric					
Qualitative		X			
Inanimate					
People		X			
(3) Mode					
Listening					C
Reading				X	C
Iconics				X	C
Direct Experience				X	C
Total Difference	0	5	0	3	7

Note. X = Significantly different; C = Confirmed.

3. Among Dene students, the 12-14 year-old students (high preference) showed a greater preference for getting detailed information than did the 15 year-old students (slightly low preference).

4. Among Dene students, the 15 year-old students (slightly high preference) had a more positive response to learning independently than did the 12-14 year-olds (low preference) and 16-19 year-olds (low preference).

5. Among Dene students, the 16-19 year-old students (high preference) had a greater preference for learning about words and language than did the 12-14 year-olds (slightly low preference) and 15 year-olds (neither a high nor a low preference).

6. Among Dene students, the 12-14 year-old students (slightly low preference) had a less negative response to learning about working with people than did the 16-19 year-old students (low preference).

7. Among non-Native students, the 15-16 year-old students (neither a high nor a low preference) had a less negative response to learning through written materials than did the 12-13 year-olds (low preference) and 14 year-olds (low preference).

8. Among non-Native students, the 12-13 year-old (very high preference) and 14 year-old (very high preference) students had a greater preference for the visual materials than did the 15-16 year-olds(slightly high preference).

9. Among non-Native students, the 12-14 year-old (high preference) and 14 year-old (high preference) students had a greater preference for learning by direct experience than did the 15-16 year-old students (neither a high nor a low preference).

Discriminant analysis (see Table 96 for summary and Table 61 for detail) was used to validate the findings of one-way ANOVA and to identify overall age differences. Among Dene students, only one scale of learning style out of five which showed significant differences by one-way ANOVA was confirmed by discriminant analysis. In contrast, all the three scales of learning style among non-Native students which were found to show significant differences by one-way ANOVA were confirmed by discriminant analysis. The overall differences in learning styles of the three age groups of students (see Figure 6) were identified on the basis of two canonical discriminant functions, indicating that the differences among the three age groups were much smaller than the difference between Dene and non-Native students (see Figure 4). Likewise, the differences among age groups were smaller than that between male and female students (see Figure 5).

5.2.4 Culture, Sex and Age Differences in Predicted Levels of Performance: Hypothesis Four

Reports from the Saskatchewan Department of Education (Minister's Advisory Committee on Native Curriculum Riview, 1984; Minister's Advisory Committee on Curriculum and Instructional Rivew, 1984; Indian and Metis Education Consultations, 1985) have pointed out a large age/grade disparity and a high dropout rate among Native students. These factors may in part be related to the level of academic performance expected by Native students. In order to assess the levels of performance which students held for themselves, it was hypothesized

that there would be differences found in predicted levels of performance of students on the basis of culture, sex and age.

The one-way ANOVA conducted on predicted levels of performance based on culture, sex and age, found significant differences among Cree, Metis, and non-Native students at ages 12-14. Hence, the hypothesis of no difference was rejected for the cultural groups of students at ages 12-14, and the research hypothesis was accepted. No significant differences were found by one-way ANOVA conducted on the basis of culture at ages 15 and 16-19. Therefore, the null hypothesis was accepted among those students, and the research hypothsis was rejected. No significant differences were found among students classified on the basis of sex and age. Therefore, the null hypothesis was accepted for every age group and for male and female students, and the research hypothesis was rejected among those students. In summary, the null hypothesis was rejected for only the cultural groups of students at ages 12-14, and accepted for the cultural groups at ages 15 and 16-19, for male and female students, and for three age groups in every cultural groups. The research hypothesis was accepted for the cultural groups of students at ages 12-14, and rejected for all cultural groups at ages 15 and 16-19, for male and female students, and for age groups of students.

5.2.5 Differences Between the Instructional Style of Native and Non-Native Teachers: Hypothesis Five

The necessity to hire Native teachers in Native schools has been discussed in the report of Indian Control of Indian Education (Native

Indian Brotherhood, 1972) and recently by the Saskatchewan Human Rights Commission (1985). To examine differences and similarities in instructional styles between Native and non-Native teachers, it was hypothesized that there would be differences found between the instructional styles of Native and non-Native teachers.

As shown in Table 97, the results of one-way ANOVA for Native and non-Native teachers yielded significant differences on two scales of instructional style. Hence, the null hypothesis was rejected for two scales of instructional style and accepted for 14 scales. The research hypothesis was accepted for two scales and rejected for 14 scales.

Based on results of one-way ANOVA, findings of the hypothesis (see Table 97 for summary and Table 67 for detail) were summarized into three points:

1. There were significant differences found in mean scores on two of the 16 scales between the instructional styles of Native and non-Native teachers.

2. Non-Native teachers (very high preference) expressed a greater preference for organizing course work logically, clearly and sequentially than did Native teachers (slightly high preference).

3. Non-Native teachers (low preference) reacted less positively to encouraging students to work alone and independently than did Native teachers (neither a high nor a low preference).

Table 97

Differences Between Instructional Style Preferences of Native and non-Native Teachers Assessed by One-Way ANOVA and Confirmed by Discriminant Analysis

Scale	ANOVA (Cult.)	Dis. Analysis (Function One)
(1) Conditions		
Peer		
Organization	X	C
Goal Setting		
Competition		
Instructor		
Detail		
Independence	X	C
Authority		C
(2) Content		
Numeric		
Qualitative		
Inanimate		
People		
(3) Mode		
Lecturing		
Reading		
Iconics		
Direct Experience		
Total Difference	2	3

Note. X = Significantly different; C = Confirmed.

Discriminant analysis (see Table 97 for summary and Table 70 for detail) was used to validate the results of one-way ANOVA and to identify overall differences between Native and non-Native teachers. The findings of significant differences in two learning style scales were confirmed by discriminant analysis. The overall differences in the instructional style of Native and non-Native teachers (see Figure 7)

were identified, indicating that the two groups were found to differ less strongly on the basis of culture than they did on the basis of sex.

5.2.6 Differences Between the Instructional Style of Male and Female Teachers: Hypothesis Six

To examine differences in instructional style between male and female teachers, it was hypothesized that there would be differences found in the instructional styles of teachers on the basis of sex.

As shown in Table 98, the results of one-way ANOVA for male and female teachers at three age levels showed significant differences for: four out of 16 learning style scales at ages 20-29; two scales at ages 30-39; and one scale at ages 40+. Hence, the null hypothesis was rejected for four scales of instructional style and accepted for 12 scales at ages 20-29; rejected for three scales and accepted for 13 scales at ages 30-39; and rejected for one scale and accepted for 15 scales at ages 40+. The research hypothesis was accepted for four scales of instructional style and rejected for 12 scales at ages 20-29; accepted for three scales and rejected for 13 scales at ages 30-39; and accepted for one scale and rejected for 15 scales at ages 40+.

Based on the results of the one-way ANOVA, findings related to the hypothesis (see Table 98 for summary and Tables 72-74 for detail) are summarized into five points:

1. Differences in instructional style between male and female teachers appeared to decrease as the ages of teachers increased.

2. Male teachers (slightly high to neither a high nor a low preference) had a slightly higher positive response to letting students

work with things than did female teachers (very low preference) at all ages.

Table 98

Differences in Instructional Style Preferences Between Male and Female Teachers at Each Age Level Assessed by One-Way ANOVA and Confirmed by Discriminant Analysis

Scale	ANOVA (Sex at Each Age Level) Teachers Age			Discriminant Analysis (Function One)
	20-29	30-39	40+	
(1) Conditions				
Peer				
Organization				
Goal Setting				
Competition				
Instructor				C
Detail				
Independence				C
Authority				
(2) Content				
Numeric				
Qualitative	X	X		C
Inanimate	X	X	X	C
People	X			C
(3) Mode				
Listening				
Reading				
Iconics				
Direct Experience	X			
Total Difference	4	2	1	5

Note. X = Significantly different; C = Confirmed.

3. At ages 20-29 and 30-39, female teachers (very high to high preference) expressed a greater preference for teaching about words and

language than did male teachers (neither a high nor a low, to slightly low preference).

4. At ages 20-29, female teachers (very high preference) indicated a greater preference for letting students learn about working with people than did male teachers (neither a high nor a low preference).

5. At ages 20-29, male teachers (very high preference) more strongly favored encouraging students to learn by direct experience than did female teachers (slightly high preference).

Discriminant analysis (see Table 98 for summary and Table 77 for detail) was used to confirm the results of one-way ANOVA and to identify overall learning style differences between male and female teachers. The three scales which were found to differ significantly by the one-way ANOVA were confirmed by discriminant analysis. Overall differences in the instructional style of male and female teachers (see Figure 8) were identified on the basis of canonical discriminant function one. Male and female teachers showed a relatively high level of instructional style differenece in comparison to the difference between teachers on either the basis of culture (see Figure 7) or age (see Figure 9).

5.2.7 Differences Among the Instructional Styles of the Three Age Groups of Teachers: Hypothesis Seven

To examine the differences and similarities in instructional style among different age groups, the teacher sample was classified into three age groups, and it was hypothesized that <u>there would be differences found in the instructional styles of teachers on the basis of age</u>.

As shown in Table 99, one-way ANOVA for the three age groups of male and female teachers found that the scores of the three age groups

Table 99

Differences Among Instructional Style Preferences of Three Age Groups of Teachers Assessed by One-Way ANOVA and Confirmed by Discriminant Analysis

Scale	ANOVA (Age in Male and Female)		Discriminant Analysis	
	Sex		Function	
	Male	Female	One	Two
(1) Conditions				
Peer				C
Organization			C	
Goal Setting				
Competition				C
Instructor				C
Detail	X		C	C
Independence			C	
Authority			C	
(2) Content				
Numeric				
Qualitative				
Inanimate			C	
People				
(3) Mode				
Listening				
Reading				C
Iconics	X		C	
Direct Experience	X			C
Total Difference	3	0	6	6

Note. X = Significantly different; C = Confirmed.

of male teachers differed significantly from each other on three scales. No significant differences were found among the instructional styles of

the three age groups of female teachers. Hence, the null hypothesis on the basis of age was rejected for three scales of instructional style among the male teachers and accepted for 13 scales; and the research hypothesis was accepted for three scales and rejected for 13 scales. For female teachers, the null hypothesis was accepted for all the scales; and the research hypothesis was rejected for all the scales.

Based on the results of one-way ANOVA, findings related to the hypothesis (see Table 99 for summary and Table 79-82) were summarized into four points:

1. There were no significant differences found among the three age groups of female teachers in instructional style.

2. The 40^{+} year-old male teachers (low preference) reacted more negatively to providing specific information on assignments, requirements and rules more than did the 30-39 year-old male teachers (neither a high nor a low preference).

3. The 20-29 year-old male teachers (slightly low preference) expressed lower preference for teaching by using visual materials than did the 30-39 year-olds (slightly high preference) and 40^{+} year-olds (slightly high preference).

4. The 20-29 year-old male teachers (very high preference) indicated a greater preference for getting students to learn by direct experience than did the 30-39 year olds (slightly high preference) and the 40^{+} year-olds (slightly high preference).

Discriminant analysis (see Table 99 for summary and Table 85 for detail) was used to validate the findings from the one-way ANOVA, and to identify overall differences among the three age groups of teachers.

The three scales which showed significant differences among male teachers by one-way ANOVA were confirmed by discriminant analysis. Overall differences in the instructional style of the three age groups of teachers (see Figure 9) were identified on the basis of two canonical discriminant functions. Differences in instructional style on the basis of the age of teachers were relatively smaller than differences on the basis of sex (see Figure 8) but similar to differences on the basis of culture (see Figure 7).

5.2.8 Culture, Sex and Age Differences in Perceived Responsibility of Teachers for the Students' Learning Process: Hypothesis Eight

Perceived responsibility is interpreted as the extent of a teacher's feeling that changes in teaching can create differences in learning. Therefore, differences in levels of perceived responsibility may influence the students' learning. To examine the differences in perceived responsibility of teachers for the students' learning process on the basis of independent variables, it was hypothesized that there would be differences found in perceived responsiblity of teachers for the students' learning process on the basis of culture, sex and age.

The results of one-way ANOVA on the basis of culture, sex and age indicated no significant differences in the scores of perceived responsibility. Consequently, the null hypothesis was accepted for culture, sex and age and the research hypothesis was rejected. Teachers as a whole appeared to share the same perceptions about teachers' responsibility for the students learning process.

5.2.9 Congruence Between the Learning Styles of Students and the Instructional Styles of Teachers: Hypothesis Nine

Pepper (1985) stated that significant academic gains are expected when instructional materials are matched correctly to the students' identified learning style. Therefore, it was hypothesized that congruence would be more likely to be found between learning styles of Cree, Dene, Metis and non-Native students and the instructional style of Native teachers, than it would be between learning styles of Cree, Dene, Metis and non-Native students and the instructional style of non-Native teachers.

The results of one-way ANOVA for Cree, Dene, Metis and non-Native students, and Native and non-Native teachers together on the 16 learning/instructional style scales yielded significant differences on 14 out of 16 scales. However, because two of the 14 scales showed significant differences within the student cultural groups rather than between students and teachers, these two scales were excluded from further analysis. The results of the Newman-Keuls comparisons on the remaining 14 scales were summarized separately: differences between Native teachers and the four cultural groups of students (see Table 92), and differences between non-Native teachers and the four cultural groups of students (see Table 93). Significant differences in learning/instructional style identified by the Newman-Keuls comparisons between Native teachers and Cree, Dene, Metis and non-Native students appeared in 10 cases out of 64 possible combinations of style component and cultural group, or 15.6 percent of the total. In 54 cases out of

64, or 84.4 percent, congruence was found. Non-Native teachers and the same cultural groups of students showed 24 mismatched cases out of 64, or 37.5 percent of cases of incongruence and 40 matched cases, or 62.5 percent of instances of congruence between teachers and student groups. Although both Native and non-Native teachers were congruent on more than 50 percent of all instructional/learning components with all student groups, it was found that Native teachers were congruent with all student groups at a higher percentage and on a greater number of components than was true for non-Native teachers. Therefore, the null hypothesis was rejected and the research hypothesis was accepted.

Based on the results of one-way ANOVA (see Tables 90 and 91) and the Newman-Keuls comparisons (see Tables 92 and 93), findings of the hypothesis nine were summarized in the three categories:

(1) Congruence Between Instructional Style of Native Teachers and Learning Styles of Cree, Dene, Metis and Non-Native Students

1. Native teachers expressed neither a high nor a low preference for encouraging students to work alone and independently. This instructional style of Native teachers was incongruent with the learning style of Metis students who stated a low preference for learning alone and independently. Native teachers were congruent with other student groups on this scale.

2. Native teachers had a slightly low preference for teaching by letting students work with things. This instructional style of Native teachers was incongruent with all student groups who had high to very

high preferences for learning about how to work with things (building, designing and operating).

3. Native teachers had a high preference for letting students learn about working with people. This instructional style of Native teachers was incongruent with all student groups who had slightly low to low preferences for learning about working with people.

4. Native teachers had neither a high nor a low preference for teaching by examining written materials. This instructional style of Native teachers was incongruent with the learning style of non-Native students who showed a very low preference for learning through written materials. Native Teachers were congruent with other student groups on this component.

5. On 12 of the 16 scales, the instructional style of Native teachers showed congruence with the learning styles of all cultural groups of students.

(2) Congruence Between Instructional Style of Non-Native Teachers and Learning Styles of Cree, Dene, Metis and Non-Native Students

1. Non-Native teachers expressed a slightly high preference for letting the students study in teams. This instructional style of non-Native teachers was incongruent with the learning styles of Metis and non-Native students who showed a high preference for learning in teams and maintaining good relationships with other students. Non-Native teachers were congruent with Cree and Dene on this scale.

2. Non-Native teachers stated a very high preference for organizing course work logically, clearly and sequentially. This instructional

style of non-Native teachers was incongruent with the learning styles of all student groups who showed neither high nor low, to slightly high preferences for having course work organized logically, clearly and sequentially.

3. Non-Native teachers stated a very low preference for getting students to compete among themselves. This instructional style of non-Native teachers was incongruent with the learning styles of Dene students who showed a slightly low preference for competitive learning conditions. Non-Native teachers were congruent with Cree, Metis and non-Native students on this component.

4. Non-Native teachers indicated a slightly low preference for providing specific information on assignments, requirements and rules. This instructional style of non-Native teachers was incongruent with the learning styles of all student groups who showed slightly high preferences for having detailed information on assignments, requirements and rules.

5. Non-Native teachers stated neither a high nor a low preference for maintaining strict classroom discipline and order. This instructional style of non-Native teachers was incongruent with the learning styles of non-Native students who showed a low preference for strict classroom discipline. Non-Native teachers were congruent with Cree, Dene amd Meits students on this scale.

6. Non-Native teachers expressed a low preference for teaching about numbers and logic. This instructional style of non-Native teachers was incongruent with the learning styles of Dene students who showed neither a high nor a low preference for learning about numbers and logic.

Non-Native teachers were congruent with Cree, Metis and non-Native students on this component.

7. Non-Native teachers indicated a slightly high preference for teaching about words and language. This instructional style of non-Native teachers was incongruent with the learning styles of Cree students who showed a slightly low preference for learning about words and language. Non-Native teachers were congruent with Dene, Metis and non-Native students on this scale.

8. Non-Native teachers stated a slightly low preference for letting students work with things. This instructional style of non-Native teachers was incongruent with the learning styles of all student groups who showed high to very high preferences for learning by working with things.

9. Non-Native teachers expressed a high preference for letting students learn about working with people. This instructional style of non-Native teachers was incongruent with the learning styles of all student groups who showed slightly low to low preferences for learning about working with people.

10. Non-Native teachers stated a slightly low preference for teaching by examining written materials. This instructional style of non-Native teachers was incongruent with the learning styles of non-Native students who showed a very low preference for learning through written materials. Non-Native teachers were congruent with Cree, Dene and Metis students on this scale.

11. Non-Native teachers expressed a slightly high preference for showing visual materials. This instructional style of non-Native

teachers was incongruent with the learning styles of non-Native students who showed a very high preference for learning through visual materials such as movies, slides, pictures and graphs. Non-Native teachers were congruent with Cree, Dene, and Metis students on this component.

12. On 5 of the 16 scales, the instructional style of non-Native teachers showed congruence with the learning styles of all cultural groups of students. On the remaining 11 scales, they were incongruent with one or the other of the student groups.

(3) Differences in Congruence Between the Instructional Styles of Native and Non-Native Teachers and the Learning Styles of Cree, Dene, Metis and Non-Native Students

1. Native teachers were congruent with all student groups on a higher percentage, and on a greater number of learning/instructional components than was true for non-Native teachers.

2. On the Inanimate and People scales, the instructional styles of both Native and non-Native teachers were incongruent with the learning styles of all student groups. The instructional styles of both groups of teachers matched closely.

3. On the Organization scale, the instructional style of non-Native teachers was incongruent with the learning styles of all student groups, while the instructional style of Native teachers was congruent.

4. On the Independence scale, the instructional style of Native teachers was incongruent with the learning style of Metis students whose learning style was congruent with the instructional style of non-Native teachers.

5. On the Reading scale, the instructional styles of both Native and non-Native teachers were incongruent with the learning style of non-Native students.

6. On the Iconics scale, the instructional styles of both Native and non-Native teachers were incongruent with the learning style of non-Native students.

7. On the Goal Setting, Instructor, Lecturing/Listening and Direct Experience scales, the instructional styles of both Native and non-Native teachers were congruent with the learning styles of all cultural groups of students.

5.3 Conclusions and Discussion

The findings in relation to the nine hypothses tested in the present study are discussed in this section under five headings: learning style of students, student academic performance, instructional style of teachers, teacher responsibility for student learning, and congruence between learning and instructional styles of students and teachers.

5.3.1 Learning Style of Students

(1) Cultural Differences

The present study concluded that on the basis of cultural groups, the greatest difference in learning style was between the Dene and non-Native students. The Cree and Metis were similar to each other and fell midway between Dene and non-Native students. This finding suggests

that learning style differences exist among groups of Native students (Cree, Dene and Metis), as well as between Native and non-Native students. These findings confirm the results of other studies (Berry, 1966, & 1971; Bland,1975; Steward, 1971; Koenig, 1981; Kaulback, 1984) in which it was found that Native children process information in ways which differ from those of non-Native children. Furthermore, Koenig (1981) found differences in cognitive style among different groups of Native people, as well as between Native and non-Native people.

Students of Cree, Dene, Metis and non-Native backgrounds differed with respect to certain components of learning style.

Cree students in this study preferred to learn by direct experience which differed significantly from Dene students.

Dene students expressed a high preference for learning about words and language which differed significantly from Cree and Metis students who showed a low preference. Unlike Cree, Metis and non-Native students who showed a low preference, Dene students did not reject competitive learning situations.

Metis students expressed a low preference for learning independently and alone which differed significantly from Dene students who stated a slightly high preference. Older Metis students (ages 17-19) strongly disliked learning about numbers and logic, while Dene and Cree students expressed acceptable responses to mathematical learning contents.

Non-Native students favored course work organized logically, clearly and sequentially more than did Cree and Dene students who disliked this type of course work. In the general trend of high

preference for visual materials, non-Native students especially preferred to learn by viewing movies, slides, pictures and graphs. However, non-Native students disliked having strict classroom discipline, while Cree, Dene and Metis students did not have a strong dislike for classroom discipline. Non-Native students also expressed a low preference for setting their own learning goals which differed significantly from Cree and Dene students who showed a slightly low preference.

Dene students were different from other Native groups of Cree and Metis in giving a somewhat positive response to competitive learning situations. This preference of Dene students contradicted to previous statements concerning Native people (Chilcott, 1985; Pepper, 1985; Burnaby 1984; Bryde 1971), which described them as group-oriented and anti-competitive. In addition, unlike Cree and Metis students, Dene students preferred learning about words and language. These differences in learning style preferences could be evidence of cultural diversity among various Indian tribal-lingustic groups.

In this study, differences in learning style preferences also appeared between Native and non-Native students in some components. Although every Native student group (Cree, Dene and Metis) as well as non-Native students expressed, more or less, high preferences for learning by visual materials, non-Native students stated a much higher preference than did any Native student group. This finding was in contrast to some earlier studies which found that Native students preferred to learn by visual materials (Kaulback, 1984). Non-Native students also expressed reaction against having strict classroom

discipline, while Native students were less opposed to this learning situation. This may suggest that non-Native students are likely to enjoy more freedom in a classroom than is true for Native students.

(2) Sex Difference

Although culture was found to relate to some differences in learning style, sex appeared to be an even stronger variable influencing student learning style preference. Sex differences were found on 12 of 16 learning style scales, confirming Canfield's 1980 study which reported sex differences among community college students.

In general, female students differed from male students in preferring good relationships with students, clearly presented and organized materials, learning about working with people and direct experience. Male students differed from female students in expressing a preference for knowing the instructor personally and for learning by working with things. The results of Canfield's study (1980) also found differences between male and female community college students on preference for learning about things and learning about working with people. These two scales of learning style seemingly are strong characteristics which distingush male and female student learning style preferences. Namely, male students tend to prefer working with things, while female students prefer to learn about working with people.

(3) Age Differences

Canfield (1980) found age differences among student learning style preferences. The present study likewise found that three age groups of

Dene and non-Native students differed on learning style components. However, the three age groups of Cree and Metis students did not differ. As in Canfield's work, this study concluded that age did influence learning style preference, but it was a weaker factor than sex.

Among Dene students, younger students preferred to get specific information on assignments and requirements, while older students liked course work to be organized logically, clearly and sequentially, and also preferred to learn about words and language. Among non-Native students, younger students expressed a higher preference for learning by visual materials and direct experience than did older students, while older students responded less negatively to learning through written materials.

Since Cree and Metis students did not reveal any age differences from ages 12 to 19, they were likely to share the same type of preferences in learning style throughout those ages. On the other hand, among Dene and non-Native students, older students tended to prefer to learn through written materials.

(4) Overview

Conclusions of this study concerning the relative importance of culture, sex and age as factors influencing learning style, were that sex influenced student preferred learning style to a greater degree than did cultural background by itself. Age was of second importance. This conclusion emphaseized the necessity to consider all factors in the design of program and processes for Native education. The assumptions that all Native students prefer to learn in a particular way, and that

cultural background can be considered in isolation from age and sex were not supported in this study.

5.3.2 Student Academic Performance

When students in this study were asked to predict their expected level of academic performance, cultural background was found to relate to differences at only one age level. Findings lead to the conclusion that among students of 12-14 years, the cultural groups differed: Cree and Metis students held the lowest expectations for their own performance; Dene students expected greater academic success than Cree and Metis students; and non-Native students expressed highest expectations . No differences were found among groups of other age levels, nor between male and female students. This finding may suggest that Cree, Metis, and to a lesser extent, Dene students in their early teenage years are more at risk and less likely to succeed academically than non-Native students of the same ages. Older students of all groups did not differ in their expectation of academic performance.

Reports from the Saskatchewan Department of Education (Minister's Advisory Committee on Native Curriculum Riview, 1984; Minister's Advisory Committee on Curriculum and Instructional Review, 1984) as well as school drop-out studies in Saskatchewan urban centers (Koenig, 1984; Department of Education, 1985) have pointed out a large age/grade disparity and high drop-out rate among Native students. Those who dropped-out tended to do so in their early teenage years, a period which this study found to be one of low self-expectations of academic performance.

5.3.3 Instructional Style of Teachers

(1) Cultural Differences

This study concluded that, except for two components, there were no differences in the instructional style preferences of Native and non-Native teachers. The points of difference indicated that non-Native teachers more strongly preferred to teach from logically and clearly organized materials than did Native teachers. Native teachers were more likely to encourage students to work independently than was true of non-Native teachers. No other differences were found between cultural groups when age and sex were disregarded. These results may reflect a social and functional role shared by both Native and non-Native teachers, rather than cultural differences.

(2) Sex Difference

Male and female teachers were found to prefer, to a modest degree, different approaches to teaching at only certain age levels. This finding to some extend supported Canfield's 1979 research. He established teacher norms of instructional style separately for male and female teachers because he found significant sex differences. Furthermore, this study found that differences in instructional style between male and female teachers appeared to decrease as the ages of teachers increased.

Male teachers at all ages preferred to let students work with things more than did female teachers. However, this was the only one out of 16 scales which showed sex differences at all ages. At ages

20-39, female teachers strongly preferred teaching about words and language, while male teachers showed a negative reaction. At ages 20-29, female teachers expressed a very high preference for letting students learn about working with people. Male teachers of ages 20-29 stated a very high preference for encouraging students to learn by direct experience.

(3) Age Differences

In this study, age differences were found only among male teachers. This result may indicate that female teachers at all age seemingly have a common set of preferences of instructional style. Among male teachers, three out of 16 scales indicated differences among age groups. Younger male teachers (20-29 years old) expressed a very high preference for letting students learn by direct experiecne, while male teachers of 30-39 years old, and older male teachers (40 years or over) preferred to use visual materials. Older male teachers also disliked providing detailed information to students more than did the 30-39 year group.

(4) Overview

This study showed that culture, sex and age related to differences in instructional style of teachers in patterns similar to the ways in which these variables influenced learning style among students. Among teachers, sex was found to be the most important variable followed by culture and age, both of which were of similar degree of importance. Cultural background as an isolated variable was relatively unimportant in relation to either learning or instructional style. It is suggested

that this finding is of importance for any future cross-cultural research in the area of learning and instructional styles as well as for training and in-servise programs for teachers.

5.3.4 Perceived Responsibility for Student Learning

Canfield (1980) explained that perceived responsibility for the students' learning process measures the extent to which teachers express "a conviction that, by varying or adapting instructional procedures, changes in learning can or will occur" (p.6). Furthermore, perceived responsibility is interpreted as the extent of a teachers' feeling that changes in teaching can create differences in learning. The present study revealed no differences among teachers classified by culture, sex and age, in the levels of perceived responsibility that they felt for changing their teaching strategies in order to enhance student learning. The teacher group as a whole appeared to share similar perceptions about their responsibility for student learning.

5.3.5 Congruence Between Learning and Instructional Styles

The major question posed in this study was to assess whether preferred instructional styles of Native and non-Native teachers were congruent or incongruent with the preferred learning styles of Cree, Dene, Metis and non-Native students. It also investigated whether the likehood of congruence differed between Native and non-Native teachers in relation to the different cultural groups of students.

Neither group of teachers was congruent with all components of learning style preferences of any student group, but both Native and

non-Native teachers were congruent on more than 50 percent of all components. There was strong evidence in the study however that Native teachers were congruent with all student groups on a greater number of components than was true for non-Native teachers. Native teachers were congruent with all student groups in 54 (84.4%) matched combinations of cultural student groups and learning/instructional components. The congruency rate for non-Native teachers was 40 out of 64 instances or 62.5 percent.

Native teachers showed incongruence with some groups of students on four out of 16 scales. Native teachers were incongruent with Metis students in favoring a teaching approach of letting students study independently. Native teachers expressed neither a high nor a low preference for this learning condition, while Metis students disliked studying independently. Native teachers were also incongruent with non-Native students in preferring a teaching approach of using written materials. Native teachers stated neither a high nor a low preference, while non-Native students expressed a very low preference. Native teachers were incongruent with all student groups in expressing a high preference for letting students learn about working with people, while all student groups, more or less, disliked this learning content. On the other hand, all student groups expressed high to very high preferences for learning about working with things, but Native teachers stated a slightly low preference for teaching this material. In sum, Native teachers were incongruent with one student group on the scales of Independence and Iconics, and with all four student groups on the scales of Inanimate and People.

Non-Native teachers showed incongruence in 10 out of 16 scales. They were incongruent with all student groups on four scales; Organization, Detail, Inanimate and People. On the Inanimate and People scales, non-Native teachers preferred teaching about people rather than things while student preference were exact opposites. Non-Native teachers expressed a very high preference for Organization, while all student groups stated neither high nor low to slightly high preferences. On the People scale, non-Native teachers showed a high preference, while all student groups stated a slightly low preference. On the Peer scale, non-Native teachers expressed a slightly high preference for letting the students study in teams, while Metis and non-Native students showed a high preference for learning in tearms. On the remaining five scales, non-Native teachers were incongruent with non-Native students on Authority, with Dene on Numeric, with Cree on Qualitative, and with non-Native on Reading and Iconics.

Overall, Native teachers were found to be congruent with all student groups on a greater number of learning/instructional components and learning/instructional style scales than were non-Native teachers. Social and economic environment as well as culture affecting all students paticipating in this study might also have influenced Native teachers during their pre-school and school years and therefore may have influenced their instructional styles. Non-Native teachers tended to have come from outside of Northern Saskatchewan and grew up in a different social and cultural milieu. Findings from this study suggest that if significant academic gains are made when instructional style is matched correctly with students' identified learning style (Downing,

1977; Wyatt, 1978; Dunn, 1983; Pepper, 1985), then Native teachers may have the potential to lead students in Northern Saskatchewan to a higher academic success.

5.4 Recommendations for Education in Native Schools

Ignoring other possible factors affecting learning/instructional style, the following recommendations were drawn from the findings.

Recommendation 1: Teachers should be aware that not all Native students have the same preferences in learning style.

Since this study found differences in learning style among Cree, Dene, Metis and non-Native students attending Northern Saskatchewan schools, it is important that teachers realize that not all Native students, regardless of tribal culture, share the same preferences of learning style, and thereby adjust their teaching strategies to meet different needs.

Recommendation 2: Curriculum designers of Native education programs need to understand the unique preferences of student learning styles in order to provide adequate teaching/learning materials.

Since this study found unique differences in preferences of learning style among students with different cultural backgrounds, it is recommended to the curriculum designers for Native schools that differences in preferences of learning style be taken into consideration in designing teaching/learning materials.

Recommendation 3: Teachers should utilize the knowledge of student learning style differences between male and female students to maximize their learning.

Since this study as well as Canfield's studies found differences in learning style between male and female students, it is recommended that teachers understand these differences and vary teaching approaches in order to maximize learning of both groups of students.

Recommendation 4: School Boards should initiate further research on learning style of students in a cross-section of culture, sex and age groups of students.

Since this study found that sex appeared to be a strong factor influencing student learning style, and age differences were also found among Dene and non-Native students but not among Cree and Metis students, it is recommended that further research on learning style be conducted of students classified by cultural background, sex and age.

Recommendation 5: College of education teacher training programs need to consider teaching a greater variety of teaching approaches on the basis of student preferences of learning style.

Since some unique characteristics of learning style preferences appeared on the basis of culture, sex and age in this study, it is recommended that College of Education teacher training programs should provide more variety in teaching approaches for college students who themselves may have different learning preferences.

Recommendation 6: School Boards should consider characteristics of instructional style preferences when hiring teachers.

Since this study found that teachers have some unique preferences of instructional style, school boards must consider differences in instructional style who hiring teachers in order to meet needs of students who may have a variety of learning style preferences.

Recommendation 7: Counselling must be provided to support students at younger ages at school to encourage them to achieve higher academic performance.

Since this study found that Cree and Metis students of 12 to 14 years of age expected their academic performance to be lower than did non-Native students at the same ages, it is recommended that adequate counselling must be provided for Cree and Metis students of this age group to help them gain self-confidence towards academic performance.

Recommendation 8: Teachers should appreciate their own differences in preferences of instructional style as useful characteristics and make more use of their preferred instructional approches, providing they match the learning style preferences of their students.

Since this study found that teachers, to some degree, differed in their preferences of instructional style when classified by culture, sex and age, it is recommended that teachers better understand their own instructional preferences and utilize these abilities to provide a variety of teaching strategies.

Recommendation 9: Teachers need to understand the components of learning/instructional style which are congruent between themselves and their students and use these approaches frequently as a teaching approach.

Since some highly congruent components of learning/instructional style were found in this study, it is recommended that teachers make more use of these components to stimulate student learning.

Recommendation 10: Teachers and school officials should investigate the incongruent components of learning/instructional style in their

classrooms and make necessary changes to facilitate more efficient teaching approaches.

Since some incongruent components of learning/instructional style were found in this study, it is recommended that teachers and officials assess teaching and learning approaches to identify the incongruent components in order to facilitate more efficient teaching.

5.5 Suggestions for Further Study

Given the seriousness of the educational situation of the Native people of Canada and the lack of information available about learning and teaching preferences, much more research is required to answer questions of learning and teaching styles which this study was unable to address. Since the studies on learning/instructional style have indicated the importance of matching learning style with instructional style to gain academic success, further research should be conducted to offer more precise information about the matching of learning and instructional style.

Following this study, there is a need for such specific studies as:

1. A study of learning/instructional style using Canfield's Learning and Instructional Styles Inventories, and other assessment forms together in order to confirm the accuracy and consistency of the assessment forms.

2. A comparative study among Native people in order to identify in more detail differences and similarities of learning/instructional preferences of Native people of different backgrounds.

3. A study to design and test new assessment instruments which can measure each learning/instructional component independently.

4. A study of those subjects who were incorrectly classified by discriminant analysis in this study to find why they were not classified correctly according to culture, sex and age groups.

5. A study of learning/instructional style using interviews administered in the first language of all subjects.

6. A more detailed study of learning/instructional style differences between male and female students, and male and female teachers to identify specific differences and similarities which this study could not answer.

7. A study of differences in instructional style between Native and non-Native teachers on the Independence and Organization scales and related areas, which this study found to be components of significant differences.

8. A study of students' expectation for their academic performance in relation to drop-out and age/grade disparity.

9. A more comprehensive study of congruence between learning style of students and instuctional style of teachers to provide more detailed information which this study could not provide.

10. A comparative study of learning and instructional styles within a sample of teachers or teachers in training to find differences and similarities among the same respondents.

11. A study which would repeat the present study with different independent variables to classify the sample, such as urban and rural,

monolingual and multilingual, socio-economic background, educational background, degree of acculturation.

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APPENDICES

APPENDIX A

LETTERS
FOR RESEARCH PERMISSION

Nov. 5th, 1985

Mr. Eli Fleury
Dirctor of Education
Northern Lights School Division #113
101-15th Street West
prince Albert
Asakatchewan
S7V 5E9

Dear Mr. Fleury

Re: Request; Permission for Research

I would like to request permission from the Northern Lights School Committee to execute the research in Division #113 as described herein.

1. Research

The study will investigate the levels of congruency between the learning styles of Cree, Dene, Metis and non-Native students and the instructional styles of Native and non-Native teachers in selected Northern Saskatchewan schools.

2. Purpose

The study will describe the degree of congruence between the learning and instructional styles. The results of the proposed study will contribute to provide information for; (1) designing taeaching and learning programs which may aid teachers in being more 'tuned-in' to the preferred learning styles of Native students, and (2) identifying

efficient instructional styles to facilitate the learning potential of Native students.

3. Report of the Study

The study will be written as a Master thesis under Indian and Northern Education Program, University of Saskachewan. The copy of the thesis will be distributed to the school board of Northern Lights School Division #113, the schools participated in the research and other interested parties.

Thank you for your consideration of my research.

Yours Truly,

Katsuo Tamaoka,

M. Ed. (Comparative Ed.)
Graduate Student (M. Ed. for Indian and Northern Ed.)
College of Graduate Studies and Research
University of Saskatchewan

NORTHERN LIGHTS SCHOOL DIVISION No. 113

101 - 15th Street East Prince Albert, Saskatchewan S6V 1G1 Telephone: 922-1100

November 25, 1985

Mr. Katsuo Tamaoka
Room 3105
Indian & Northern Education Branch
College of Education
University of Saskatchewan
SASKATOON, SK
S7N 0W0

Dear Mr. Tamaoka:

I am pleased to inform you that the Northern Lights School Board passed the following motion at its November meeting:

> "....that the request from Katsuo Tamaoka to visit our classrooms, as per attached letter, be approved subject to direction from the Chief Executive Officer."

Please contact me at 922-1100 to arrange a meeting to discuss a schedule for your proposal.

Yours truly,

Elie C. Fleury
Director of Education

irk

Saskatchewan

Saskatchewan
Education Branch
Box 5000
La Ronge, Canada
S0J 1L0

.1986 02 10

Mr. Katsuo Tamaoka
Room 3105
Indian and Northern
Education Program
Education Building
University of Saskatchewan
SASKATOON, Saskatchewan
S7N 0W0

Dear Mr. Tamaoka:

RE: Permission to Conduct Research in Rossignol School, Ile a la Crosse, Saskatchewan

The Board of Education of the Ile a la Crosse School Division would be pleased to assist you in your research by approving your request to carry out testing and interview procedures in the school. Please contact the principal, Russel Lahti at 833-2010 to finalize your plans.

Sincerely,

D. Thomson

David Thomson,
Acting Superintendent

DT:jn
c.c. Colin MacColl
Russel Lahti

APPENDIX B

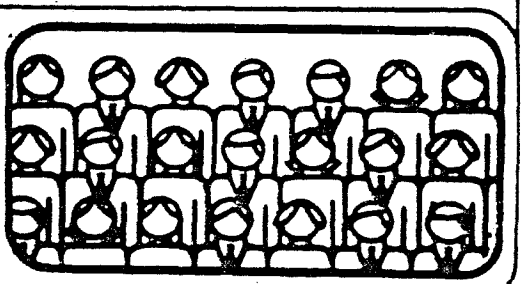
INVENTORY BOOKLETS

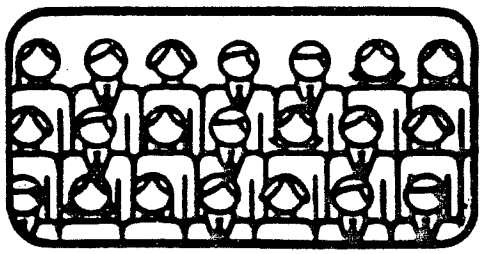
1. THE CANFIELD LEARNING STYLES INVENTOR: FORM E
2. THE CANFIELD LEARNING STYLES INVENTORY: FORM S-A
3. THE CANFIELD INSTRUCTIONAL STYLES INVENTORY

Canfield
Learning Styles Inventory
Form E

Wynelle Knight, M.Ed.
Albert A. Canfield, Ph.D.

humanics media
MAXIMIZING THE LEARNING EXPERIENCE





instructions

We would like to know how you like to study and learn. This is not a test. There are no "right" or "wrong" answers.

Below is a "sample" question that shows you how to mark your preferences.

example

Look at the 4 colors below. Which color do you like the best? Second best? Third best? Least?

a. Yellow
b. Red
c. Blue
d. Green

answer sheet example

a. 4 (Least Liked)

b. 3 (Third Most Liked)

c. 1 (Best Liked)

d. 2 (Second Most Liked)

For each of the 30 items in the Inventory, mark your answers on the separate answer sheet. Please do not put marks on this booklet. Please indicate what you really prefer from first through fourth for each item. If you don't put a number in each blank, your answers can't be used. If you are not sure how to mark your answers, ask for help.

1 **Remember your favorite classes. Why did you like them? Which reason is your first choice? Second? Third? Last? Rank the classes 1, 2, 3, and 4.**

a. I enjoyed the other students. We shared our ideas and feelings with each other.
b. The course was well planned. Each idea followed in order.
c. I decided my goals. The teacher let me study what was most interesting to me.
d. I knew how I compared to other students. Each student was graded fairly.

2. **What kind of teacher do you like? Rank them 1 (first), 2, 3, and 4 (least).**

a. Teachers who are pleasant and friendly. Teachers who are interested in me.
b. Teachers who give clear assignments about homework. Teachers who give clear assignments.
c. Teachers who let me decide what to study. Teachers who let me decide how to do things.
d. Teachers who set high goals in class. Teachers who make me work to reach those goals.

3. **Which courses do you usually like? Rank your first choice, second choice, third choice, and last choice.**

a. Math and science.
b. Reading and writing.
c. Crafts and shop courses.
d. Psychology and interviewing.

4. **How do you learn? Decide which way you learn best. Rank them from 1 (best) to 4 (least).**

a. Listening to other people talk about something.
b. Reading what other people have written about something.
c. Seeing pictures, movies, drawings, etc.
d. Working with it myself. Doing it myself.

5. **When you turn in a paper, what grade do you usually think you'll get? Rank all four from the first (most likely) to the last (least likely).**

a. Excellent or outstanding.
b. Good or above average.
c. Average to satisfactory.
d. Below average.

6. **What would help your school experience? Rank all four from the first (most help) to the last (least helpful).**

a. More group activities. More chances to meet and know other students.
b. More class outlines. More explanation of what the course is all about.
c. More opportunity to set my own goals. More opportunity to think for myself.
d. More information to help me see how I compare to other students.

7. Which kind of teachers are the worst? Rank the worst kind (1), second worst (2), etc.
- a. Teachers who are only interested in the subject. They are not interested in students.
- b. The teachers who are not clear in explaining assignments. I never know what I'm supposed to be doing.
- c. The teachers who never let me do things on my own. They never let me make my own decisions.
- d. The teachers who are too easy when the students are noisy. The students don't listen because the teacher lets them do whatever they want to do.

8. Which do you enjoy the most. Rank 1 (most enjoy) through 4 (least enjoy).
- a. Figuring out the prices of things.
- b. Writing a letter or a report.
- c. Building or repairing something.
- d. Talking with a stranger.

9. Classes usually have different activities. Read the following. Which do you prefer? Rank them 1 to 4.
- a. Lecture, question and answer sessions.
- b. Reading the textbook or other assignments.
- c. Movies, slides, charts, pictures, etc.
- d. Experimenting or doing projects in the lab.

10. Imagine you just got your grade for a class. You thought the class was easy. However, you got the lowest grade in the class. How do you feel? Rank 1 (would most probably feel this way) to 4 (would least likely feel this way).
- a. Somebody made a mistake.
- b. Surprised because this doesn't happen very often.
- c. A little surprised, but this happens sometimes.
- d. It wouldn't surprise me at all.

11. In most courses students are evaluated and given grades. How do you feel about grades? Rank these items from most like how you feel (1) to least like how you feel (4).
- a. Sometimes grades make students jealous. They cause hard feelings.
- b. Sometimes teachers give tests that have unfair questions. The questions aren't related to the textbook or what was covered in class.
- c. Sometimes grades or tests are not helpful to me. They don't help me decide how I'm doing. They don't help me see what I should study the most.
- d. Sometimes grades don't really show who is doing well and who isn't.

12. Read each item. Which method helps you learn the best? Rank 1 to 4.
- a. Getting to know the teacher; getting a chance to visit and talk with the teacher.
- b. Knowing exactly what to do for the course; knowing exactly what is expected.
- c. Getting a chance to make my own decisions; getting to plan my own work.
- d. Having a teacher who will tell me how and what to study.

13. Imagine that a course requires you to visit a home for the elderly. What would you most like to do? Rank 1 to 4.
- a. Help them figure their taxes.
- b. Write a letter for them or read to them.
- c. Help fix something for them.
- d. Sit and visit with them about their feelings.

14. You want to learn about new or different jobs. Which way would you like to learn about these jobs? Rank 1 to 4.
- a. Have someone tell me about it.
- b. Read a book or a paper that explains it.
- c. Watch a demonstration in class.
- d. Try to do the job myself.

15. Imagine that you just turned in a paper to a teacher. What will your grade probably be? Rank 1 (most probable) to 4 (least probable).
- a. Excellent.
- b. Good or above average.
- c. Average.
- d. Below average.

16. What is your responsibility as a student? Rank 1 to 4.
- a. Cooperate with other students and help them if I can.
- b. Ask the teacher questions if the class is confusing.
- c. Make my own decisions about what I can do.
- d. Compare myself with other students and compete with them.

17. If someone wants to be a teacher, what do you think is most important for them to learn? Rank from 1 (most important) to 4 (least important).
- a. How to get along with students. How to have good relationships with them.
- b. How to tell students about requirements, rules, grading, etc.
- c. How to let students work and learn on their own.
- d. How to keep order in the classroom. How to make the students do the work.

18. Which class would you like the most, next most, etc? Rank 1 to 4.
- a. Math and logic.
- b. Writing short stories.
- c. Learning how to use a machine to make something.
- d. Why people do what they do.

19. Imagine that you want to learn about a new kind of plastic. How would you like to learn about it? Rank from 1 to 4.
- a. Hearing a lecture about it.
- b. Reading a book about it.
- c. Watching a movie or see slides about it.
- d. Experimenting with it.

20. How will your grades compare with other students? Which is most probable (1)? Second most? Third most? Fourth most? Rank 1 to 4.
- a. In the top 10%.
- b. In the top 25 or 33%.
- c. In the middle 50%.
- d. In the bottom 25%.

21. Remember the classes you disliked. Why did you dislike them? Rank the answers 1 to 4.

a. Students argued and fought too much in class.
b. The class was not organized. I didn't know what was coming next.
c. I was not allowed to do the things I wanted to do.
d. No matter how well or poorly anyone did, the teacher just accepted it.

22. Remember the teachers who helped you the most. Rank the responses from 1 (they were most like this) through 4 (they were least like this).

a. They liked students. They really wanted to help and understand the students.
b. They made it very clear as to just what you were to do. They didn't make you guess what they wanted.
c. They let students work on their own. They thought of each person as an individual.
d. They controlled their classrooms. They required everyone to behave and think and study in class.

23. If you were a club member, what would you like to do? Rank 1 (most) to 4 (least).

a. Keeping records on money, bills, etc.
b. Writing what happened at meetings; writing letters.
c. Setting up the room and keeping equipment in order.
d. Meeting new members and helping everyone get acquainted.

24. If you took a class on how to keep the environment clean, how would you like to learn about it? Rank 1 through 4.

a. Hear a lecture about it.
b. Read about it.
c. Watch TV, films, etc.
d. Go on a field trip.

25. How have you done in school? How well do these describe you. Rank from 1 (most like what I've done) through 4 (least like me).

a. I've been at the top or near the top of my classes.
b. I've done better than average.
c. I've been near the middle of my class.
d. I've been in the lower part of my classes.

26. Read each item. How important are these ideas for a class? Rank from 1 to 4.

a. I have a chance to make friends; the students help one another.
b. The ideas or topics are in order; they follow each other in an understandable way.
c. I can decide how and what I want to study; I have some choices in how much study I will do on various topics.
d. The grades are fair and really show which students did best.

27. What kinds of things do you dislike about a class? Rank the most disliked (1), second most disliked (2), etc. through least disliked (4).

a. The teacher was unfriendly, angry, or impolite.
b. I couldn't understand what I was supposed to do.
c. I couldn't do things the way they were best for me.
d. The teacher couldn't control the class.

28. Which are you most interested in for a job? Rank 1 to 4.

a. Math, accounting, engineering.
b. Writing, speaking, language.
c. Building, designing, or fixing things.
d. Selling, teaching, interviewing.

29. What do you MOST LIKE to do in a class? Rank from 1 to 4.

a. The teacher lectures and then answers questions.
b. I read about the subject.
c. I watch movies, look at pictures, drawings, etc.
d. I can experiment and try to use the material myself.

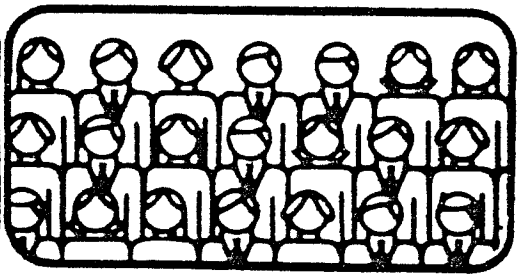
30. Imagine that you just finished a very difficult course. You received the highest grade in the class. What would you likely think? Rank from 1 (most likely) through 4 (least likely).

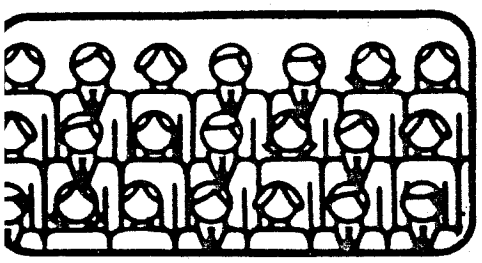
a. I expect to do well. I would not be surprised.
b. I'd be surprised, but it could happen.
c. I feel like I guessed the right answers, I was lucky.
d. I'd think that someone made a mistake with my grade.

Canfield Learning Styles Inventory Form S-A

Albert A. Canfield, Ph.D.

humanics media
MAXIMIZING THE LEARNING EXPERIENCE





This inventory gives you an opportunity to describe how you learn best. There are no right or wrong answers. You are to read each of the 30 items, and rank the responses according to how well they describe your reactions or feelings. The example below illustrates how the items are presented. Examine it carefully to be sure you understand how you are to mark your answers.

example

32. Rank the following colors in the order in which you generally prefer them.

a. Yellow
b. Red
c. Blue
d. Green

answer sheet example

a. 4 (least preferred)
b. 3 (third)
c. 1 (most preferred)
d. 2 (second)

You must write a number in each blank on your answer sheet to indicate how well each response expresses how you feel. All four responses must be ranked (from 1 to 4) for each item.

Note that the items are numbered from the top to the bottom on the pages of this booklet and on your answer sheet.

If you are sure that you know what you are to do, begin. If you have a question, ask for assistance before starting.

1. Rank the following items in terms of how well they describe the classes you've liked most. (1 for the most descriptive statement, 2 for the second most, etc.)

a. I enjoyed the other students and we shared our ideas and feelings with each other.
b. The course was well organized and the topics followed one another in a meaningful sequence.
c. I more or less set my own goals and studied the things of most interest to me.
d. I knew how my work compared with others and the best work was fairly recognized.

2. Number the following descriptions of teachers from 1 to 4 in the order in which you normally prefer them. (1 for most preferred, etc.).

a. Teachers who are pleasant, friendly, and who take a personal interest in me.
b. Teachers who provide specific and clear information about assignments and requirements.
c. Teachers who give me the opportunity to decide what I want to study and how I want to do things.
d. Teachers who impose high standards and make me do the work necessary to accomplish them.

3. Rank the following courses in terms of their general appeal to you.

a. Mathematics and physical science.
b. Language and literature.
c. Household and craft repair skills.
d. Interviewing and counseling.

4. Rank the following in terms of their general value to you as ways to learn.

a. Listening to others talk about a subject.
b. Reading what others have written about it.
c. Seeing pictures, graphs, movies, etc.
d. Handling or working with something tangible.

5. Rank the following grades to indicate how likely you are to receive them on a paper or a report.

a. Excellent or outstanding.
b. Good or above average.
c. Satisfactory or about average.
d. Unsatisfactory.

6. Rank the following in the order in which they would be most helpful for improving your school experience in general.

a. There were more group activities and opportunities to get to know other students well.
b. There were more class outlines and clearer statements about what the classes were all about.
c. There were more opportunities to think through my capabilities and set goals for my own performance.
d. There was more objective and frequent information on how my performance compares with others.

- **Rank the following in terms of how accurately they describe the worst teachers you've known.**
  a. They were more interested in the subject matter than in the students.
  b. They were vague about assignments and I was never sure what was expected of me.
  c. They were too restrictive in letting me do things on my own, coming to my own conclusions, etc.
  d. They were too easy and the students lost respect for them.

- **Rank the following in the order in which you enjoy doing them.**
  a. Figuring out how things differ in cost.
  b. Writing a report or a letter.
  c. Building or repairing something.
  d. Carrying on a conversation with a stranger.

- **Classes typically involve the following kinds of teaching activities. Rank them in the order in which you generally prefer them as ways to learn.**
  a. Lectures, audio tapes, and question-answer sessions.
  b. Textbook assignments and other readings.
  c. Movies, slides, graphs, charts, etc.
  d. Experiments or projects in the laboratory.

0. **Imagine that you have just received your grade on the final examination in a course you felt was pretty easy and that you got the lowest grade in the class. Rank the following as to how you'd most likely feel.**
  a. Somebody made a mistake in grading the papers.
  b. I'd be quite surprised, because that doesn't happen very often.
  c. It would surprise me a little, but that sometimes happens.
  d. It wouldn't surprise me very much at all.

1. **In most courses, student performance is evaluated on some basis. Rank the following in terms of how you feel about such evaluations.**
  a. They sometimes create jealousies and hard feelings among the students.
  b. Sometimes they are unrelated to the supposed content and purposes of the course.
  c. They sometimes aren't very helpful in evaluating my progress or in helping me focus my study activities.
  d. Sometimes they don't really distinguish between those who are doing well and those not doing so well.

2. **Rank the following in terms of their value to you in learning.**
  a. Having a chance to visit informally and develop an effective relationship with the teacher.
  b. Having specifics on what courses include and what they require.
  c. Having the chance to adopt my own approach and to make some contribution of my own.
  d. Having scholarly teachers explain the material and direct my study in the most meaningful and useful direction.

13. **If you were in a course that required everyone to visit a home for the elderly, and you could do any of the following, rank them in the order of their interest to you.**
  a. Help them compute their income taxes or balance their checkbooks.
  b. Write a letter or read to them.
  c. Help repair or replace something for them.
  d. Sit and visit with them about their feelings.

14. **How do the following appeal to you as ways to find out about new occupations or types of work?**
  a. Have someone in the field tell me about it.
  b. Read a recent study explaining it.
  c. Watch a classroom demonstration of the work.
  d. Trying to do the work itself.

15. **Imagine that you have just turned in a paper to an instructor. Place a 1 by the letter of the response that describes how you think it would be most likely evaluated, a 2 by the second most likely, etc.**
  a. Excellent
  b. Above average
  c. Average
  d. Below average

16. **As a student, I feel it is my responsibility to:**
  a. Cooperate with the other students and help them when I can.
  b. Ask the teacher questions when the course is confusing or when the purpose isn't clear.
  c. Make my own decisions as to what I can accomplish.
  d. Assess the ability of the other students and work accordingly.

17. **Consider the following topics for teacher training and rank them in the order in which you think they would generally be most helpful to teachers.**
  a. How to get along with students and maintain good relationships with them.
  b. How to inform students of requirements, rules, the basis for grades, etc.
  c. How to utilize independent study techniques so students can work more or less on their own.
  d. How to maintain classroom discipline and get students to do the assigned work.

18. **Rank the following classes in the order in which they appeal to you.**
  a. Formal logic and mathematics.
  b. Developing the plot and writing short stories.
  c. Operating a machine to make something.
  d. Human behavior and the "helping" occupations.

19. **Rank the following in the order in which you would typically like to learn about the properties of a new plastic.**
  a. Hearing a lecture.
  b. Reading a book or text.
  c. Viewing a movie or slides.
  d. Experimenting with a small sample.

. **Assume you are going to be in school next year, and rank the following evaluations in the order in which you think you'd receive them.**
a. In the top 10% or so.
b. In the top 25 or 33 percent.
c. In the middle 50 percent.
d. In the bottom 25 or 33 percent.

. **Rank the following in terms of how accurately they describe the classes you have DISLIKED.**
a. There was a lot of arguing, bickering, or fighting among the students.
b. The class was disorganized and I couldn't tell what topic was coming next.
c. There was no opportunity for me to pursue my own special interests or branch off on anything.
d. No matter how well or how much anyone did, the teacher just accepted it.

. **Rank the following in the order in which you feel they describe your most effective teachers.**
a. They like students and have a sincere desire to understand and help them.
b. They leave no confusion about what is to be done and how it is to be done.
c. They consider each person as an individual and let each student work to his abilities and interests.
d. They control their classrooms and require everyone to meet some minimum requirements.

. **Club members are generally required to help in some way, rank the following in order of your preference for doing them.**
a. Keeping the books on income, expenses, and finances.
b. Keeping the minutes of the meetings and doing the correspondence.
c. Setting up the room and keeping club equipment in order.
d. Greeting newcomers and helping everyone feel welcome.

. **Suppose you were taking a course in Ecology. Rank the following in terms of how you'd like to study the topic.**
a. Hear speeches by qualified people.
b. Read reports and studies.
c. Watch movies, TV, films, etc.
d. Take field trips.

. **Rank the following in terms of how well they describe your feelings about your school performance.**
a. I've been at or near the top of my class.
b. I've been better than average.
c. I've been near the middle.
d. I've been in the lower half.

26. Rank the following in their importance to you in the way classes are handled.
a. There is an opportunity to develop friends and the students support one another.
b. The class sessions are logically related to each other and the topics follow an understandable and meaningful sequence.
c. Based upon the topic and my abilities, I can determine what areas I'll pursue.
d. Student's grades and the evaluation of their performance give fair recognition and credit to those doing the best.

27. Rank the following in terms of how likely they would be as a reason for you to dislike a class.
a. The teacher was hostile, easily angered, or inconsiderate.
b. There were vague standards and vague or frequently changing requirements.
c. There was too little opportunity to determine my own activities.
d. The teacher lacked the ability to direct and control the class.

28. Rank the following in terms of their interest to you as a general field of work.
a. Mathematics, engineering, accounting.
b. Language, writing, speaking.
c. Building, installing, operating equipment.
d. Interviewing, selling, teaching.

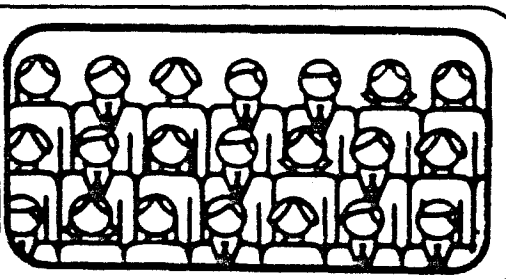
29. Rank the following class activities in the order in which they normally appeal to you.
a. The teacher lectures and answers questions.
b. I can read about the topic in a text or some outside reading.
c. Pictures, movies, graphs, displays, etc. are used.
d. I can experiment with or actually use the material.

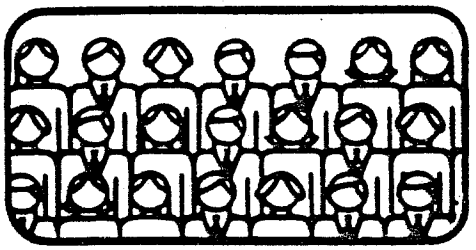
30. Imagine that you've just received the results of a final examination in a very difficult course and your grade was the highest in the class. Rank the following in terms of how you would most likely feel.
a. I'd have expected to do well so it wouldn't surprise me.
b. I'd be surprised, but it could happen.
c. I'd feel like I had lucked out and guessed a lot of the correct answers.
d. I'd probably think that someone had made a mistake in grading the test.

Canfield
Instructional Styles Inventory

Albert A. Canfield, Ph.D.
Judith S. Canfield, Ed.D.

humanics media
MAXIMIZING THE LEARNING EXPERIENCE





instructions

This inventory gives you an opportunity to describe how you feel about various aspects of the instructor's job. There are no right or wrong answers, so be as honest with yourself as you can. Read each of the 25 items, and rank the four responses according to how well they describe your personal reactions or feelings. The example below shows how the items are presented and how you are to mark your responses. Examine the item carefully to be sure you understand how your answers are to be marked on the answer sheet.

example item

35. Rank the following colors in the order in which you typically prefer them.

a. Yellow
b. Green
c. Red
d. Blue

example answer sheet

a. 1 (Most preferred)
b. 4 (Least preferred)
c. 3 (Third most preferred)
d. 2 (Second most preferred)

It is most important that you write numbers in the blank spaces on the answer sheet to indicate the order of your preferences.

All four of the responses must be ranked (from 1 to 4) for each item. Leave no spaces or items blank.

If you are sure that you know what to do, begin. If you have any questions, ask for assistance.

1. Rank the following in the order in which you think they would be helpful in improving instruction in general.

a. More group activities and more opportunities for the student to get to know each other well.
b. Projects, assignments, and presentations more directly related to course content.
c. More emphasis on letting the students think through their capabilities and set goals for their own performance.
d. More objective and frequent information so the students could better judge their performance in relation to others.

2. Rank the following in the order in which you feel they describe the most effective teachers or instructors.

a. They like students and have a sincere desire to understand and help them.
b. They are precise about what is to be done, how it is to be done, when it is to be done, etc.
c. They consider each person as an individual and let students work to their individual abilities and interests.
d. They control their classrooms and require everyone to meet some minimum requirement.

3. Rank the following kinds of courses in terms of their general appeal to you.

a. Science/Mathematics
b. History/Literature
c. Laboratory/Shop/Clinic
d. Psychology/Sociology

4. Instruction typically involves the following kinds of activities. Rank them in the order in which you typically prefer doing them.

a. Giving lectures, making audio tapes, handling question-answer sessions.
b. Preparing hand-outs, bibliographies, and writing supplementary reading materials.
c. Preparing graphs, slides, charts, and using movies, videotapes, and other audio-visuals.
d. Preparing experiments, conducting role plays, or arranging for field projects.

5. Generally speaking, I feel that the students who are doing very poorly in their school work. . . .

a. Could probably do well if they received the type of instruction they need to learn the material.
b. Would do OK if the instructors had more time to work with them.
c. Have probably not done well in the past and are so far behind they'll probably never catch up.
d. Shouldn't be in school at that stage of their lives.

6. Student performance evaluation is a typical and often difficult part of the instructor's job. Rank the following in terms of their possible negative consequences. (Give the most important negative consequence a 1, to a 4 for the least important consequence.)

a. They sometimes create jealousies and hard feelings among the students.
b. Sometimes they are unrelated to the supposed content and purpose of the course.
c. They sometimes aren't very helpful to the students in evaluating their progress and in helping them focus their study activities.
d. Sometimes they don't really distinguish between those who are doing well and those not doing well.

7. Rank the following descriptions in the order in which they best describe you.

a. Pleasant, friendly, and takes a personal interest in the students.
b. Provides specific and detailed information about assignments and requirements.
c. Gives students the opportunity to decide what they want to study and how they want to do things.
d. Sets high standards and requires the students do the work necessary to accomplish them.

8. If you were part of a group that had agreed to assist the residents of a home for the aged, rank the following in terms of your preference for doing them.

a. Help them with income tax or financial matters.
b. Read to them or write a letter for them.
c. Help repair or replace things in the building.
d. Sit and visit with small groups and encourage their interaction with one another.

9. Rank the following in terms of your preference for teaching a class in ecology.

a. Bring in an authority and have that person talk to the class.
b. Have the students locate and read appropriate articles in newspapers and magazines.
c. Locate and show appropriate movies and TV programs.
d. Make arrangements for the students to work on a specific local program.

10. Rank the following in the order in which you would typically do them if some of your students appeared disinterested.

a. Vary my approach and type of assignments to try and spark their interest.
b. Put them with some of the better and more enthused students on a group project.
c. Call on them more to try and force them to put more application on their studies.
d. Consider that it's the student's problem since basically it's the student's responsibility to get the material.

11. Rank the following in terms of their importance in conducting an effective class.

a. The students share their ideas and enjoy one another.
b. The course is well organized and the topics follow one another so they can be easily interrelated.
c. Students are allowed to set their own goals and study those things of most interest to them.
d. Frequent information is given the students on how their work compares and the best work is fairly recognized.

12. Rank the following topics for training in the order in which you think they would be generally most helpful to instructors.

a. How to get along with students and maintain good relationships with them.
b. How to determine and communicate to students the requirements for assignments, the basis for grades, etc.
c. How to utilize independent study techniques so students can work more or less on their own.
d. How to maintain classroom discipline and get students to do the assigned work.

13. Rank the following in the order in which you typically enjoy doing them.

a. Solving mathematical puzzles.
b. Solving crossword puzzles.
c. Building or repairing something.
d. Doing volunteer work with people.

14. If you were given the assignment to teach a group of fellow instructors about a new synthetic material, what would be your order of preference as ways of doing it.

a. Through a prepared or extemporaneous talk.
b. Provide a report and some literature from the manufacturer.
c. Through a visual presentation showing how the material can be used.
d. Provide people with samples of the material so they could experiment with it.

15. Rank the following in terms of their likely reasons for a student doing very badly in a course.

a. The instructor didn't volunteer or provide enough guidance or help.
b. The student didn't ask for help when the difficulties first developed.
c. The student didn't study enough.
d. The student probably shouldn't have been enrolled in the class in the first place.

16. Rank the following in terms of how accurately they describe the characteristics of classes that students dislike.

a. There is a lot of arguing, bickering, and fighting among the students.
b. The class is disorganized and the students can't tell what topic is coming next.
c. There is no opportunity for the students to pursue their own special interests or to branch off on anything.
d. No matter how well or how little anyone does, the instructor just accepts it.

17. Rank the following in terms of their value in helping students learn.

a. Having an opportunity to develop a good relationship with the instructor through informal discussions and personal contact.
b. Having a detailed course outline and specific knowledge about the rules to be followed in submitting their work.
c. Having a chance to adopt their own approach and make some contribution independently.
d. Having well informed instructors explain the material and direct their studies in the most meaningful and useful way.

18. Rank the following sections of a survey course in occupations in terms of their interest to you.

a. Occupations in scientific research.
b. Occupations in communications.
c. Occupations in manufacturing.
d. Occupations in the helping professions.

19. If you were teaching a course in "Tests and Measurements", rank the following in the order in which you'd most likely use them to evaluate your students.

a. Oral examinations
b. Written examinations
c. Illustrated reports or audio-visual productions
d. An actual test they had produced

20. In looking over the grades on an early examination in a course, suppose you found a few students who didn't seem to be getting much from the assignments or the class sessions. Rank the following in terms of how you would most likely feel about them.

a. They needed some extra coaching and a change in instruction to better meet their needs.
b. They probably weren't interested in the subject and something would have to be done to make them want to learn the material.
c. They needed more time to learn the material and they should be given that extra time.
d. They possibly shouldn't be enrolled in the course and might better spend their time doing something else.

21. Rank the following instructor's responsibilities in terms of their importance as you view them.

a. Get the students to cooperate with and help one another.
b. Organize course content and programs in a logical and meaningful order.
c. Encourage the students to make their own decisions as to what they can accomplish.
d. Motivate each student to try to do the best work of anyone in the class.

22. Rank the following in terms of how accurately they describe the worst instructors you've known.

a. They were more interested in the subject matter than in the students.
b. They were vague about assignments and the students were never sure of exactly what was expected of them.
c. They were too restrictive and did not let the students come to their own conclusions or do things on their own.
d. They were too easy and the students lost respect for them.

23. If you were required to perform one of the following jobs for a service group during the coming year, rank them in the order of your preference for doing them.

a. Act as treasurer and handle the books.
b. Keep the minutes of the meetings and handle the correspondence.
c. Keep the supplies, equipment, and meeting place in good condition.
d. Greet newcomers and help everyone feel welcome.

24. If you were asked to present a plan for a multi-purpose classroom to a group of administrators, rank the following in terms of your preference for making the presentation.

a. A speech from prepared notes.
b. A written report
c. Blueprints and sketches
d. A scale model.

25. Rank the following in terms of what you would likely do if a few of the better students in the class either dominated it with questions or became very disruptive.

a. Give them a special project which required them to go into more depth than the regular class and let them present their findings.
b. Talk with them, let them know that I understand their situation, and ask them to cooperate with me.
c. Ignore their behavior and hope the rest of the class would help control them.
d. Suggest to the students that they drop out of the class, take it later, enroll with someone else, or something similar to that.

APPENDIX C

CROSSTABULATION OF SEX AND AGE BY CULTURAL GROUPS

Table 100

Cree Students

Age	Sex		Row Total and Percent
	Male	Female	
12	1	8	9 11.1
13	11	8	19 23.5
14	8	13	21 25.9
15	8	11	19 23.5
16	4	4	8 9.9
17	1	2	3 3.7
18	1	0	1 1.2
19	1	0	1 1.2
Column Total	35 43.2	46 56.8	81 100.0

Table 101

Dene Students

Age	Sex		Row Total and Percent
	Male	Female	
12	1	2	3 4.6
13	2	5	7 10.8
14	7	8	15 23.1
15	7	6	13 20.0
16	1	7	8 12.3
17	6	6	12 18.5
18	2	3	5 7.7
19	1	1	2 3.1
Column Total	27 41.5	38 58.5	65 100.0

Table 102

Metis Students

Age	Sex		Row Total and Percent
	Male	Female	
12	11	10	21 15.7
13	13	5	18 13.4
14	17	26	43 32.1
15	19	18	37 27.6
16	3	7	10 7.5
17	3	1	4 3.0
18	1	0	1 0.7
Column Total	67 50.0	67 50.0	134 100.0

Table 103

Non-Native Students

Age	Sex		Row Total and Percent
	Male	Female	
12	6	9	15 14.3
13	19	25	44 41.9
14	16	14	30 28.6
15	6	6	12 11.4
16	2	2	4 3.8
Column Total	49 46.7	56 53.3	105 100.0

Table 104

Native Teachers

Age	Sex		Row Total and Percent
	Male	Female	
20 to 29	2	5	7 46.7
30 to 39	3	1	4 26.7
40 to 49	1	0	1 6.7
50 to 59	1	2	3 20.0
Column Total	7 46.7	8 53.3	15 100.0

Table 105

Non-Native Teachers

Age	Sex		Row Total and Percent
	Male	Female	
20 to 29	5	13	18 28.1
30 to 39	22	7	29 45.3
40 to 49	8	4	12 18.8
50 to 59	3	1	4 6.3
60+	0	1	1 1.6
Column Total	38 59.4	26 40.6	64 100.0