The effect of learning style of Native Americans on achievement in academic subject areas in Montana tribal colleges
by Beverly Arlene Atwell

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Education
Montana State University

Abstract:
Because Native Americans have had difficulties in conventional college settings resulting in wide-spread attrition, this study investigated the effect of learning styles on achievement in subject areas of Native Americans in Montana tribal colleges. The Canfield Learning Style Inventory was administered to 693 students.

A one-way analysis of variance was used to investigate the differences in achievement depending on learning style in each of eight subject areas of Liberal Arts, Science, Mathematics, Business, Vocational, Native American Studies, Developmental, and Physical Education. Tukey a priori post tests were performed on all significant differences.

Significant differences at the .05 level were found in all eight subject areas. A total of 39 significant differences were found. These differences suggest that learning styles contribute to the success of the Native American student in all subject areas. Native American students should be made aware of learning style strengths, and should receive counseling on learning strategies. Instructors should use a variety of teaching methods.

Overall conclusions suggest that since most students can learn, changes need to be made to teaching-learning methods, grading, and staff development. Areas for further research include similar studies with other ethnic and age populations, replication using larger samples in mathematics and science, and use of results along with learning strategies to counsel students to see if such counseling would produce better achievement.

THE EFFECT OF LEARNING STYLE OF NATIVE AMERICANS ON ACHIEVEMENT IN ACADEMIC SUBJECT AREAS IN MONTANA TRIBAL COLLEGES

by

Beverly Arlene Atwell

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ABSTRACT

Because Native Americans have had difficulties in conventional college settings resulting in wide-spread attrition, this study investigated the effect of learning styles on achievement in subject areas of Native Americans in Montana tribal colleges. The Canfield Learning Style Inventory was administered to 693 students.

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Overall conclusions suggest that since most students can learn, changes need to be made to teaching-learning methods, grading, and staff development. Areas for further research include similar studies with other ethnic and age populations, replication using larger samples in mathematics and science, and use of results along with learning strategies to counsel students to see if such counseling would produce better achievement.

CHAPTER I

INTRODUCTION

The Problem

A growing body of research shows that distinct learning styles exist. At the same time, researchers have recently acknowledged that Native Americans have a totally different cultural identity than have members of the dominant culture; this is a factor which could affect their learning styles (Haukoos & Satterfield, 1986).

Most attempts to relate cultural relevance to the classroom have focused on content rather than on instruction (More, 1984). Learning style awareness has the potential for focusing cultural relevance on the instructional process. A learning style approach that attempts to understand differences and similarities in the learning styles of Native American students and then tries to match teaching to learning styles shows a great deal of promise for improving the academic achievement of Native Americans (More, 1984).

While little is known about the influence of learning styles on achievement, even less is known about the effect of learning styles on achievement in various subject areas within an academic program. Some research has been done on

individual subject areas and achievement (Copenhaver, 1979; Hoffer, 1986). However, no one has previously investigated the effect of learning styles on achievement of Native Americans in subject areas. This study carried out this investigation.

The Purpose

The purpose of this study was to investigate the effect of an individual's learning style on achievement in subject areas among Native American students in the tribal colleges in Montana. To achieve this goal, learning styles were analyzed according to the components of learning style as defined by Canfield (1980). Canfield's Learning Styles Inventory is concerned with (a) the conditions under which the student prefers to learn, (b) the content the student prefers to learn about, (c) the mode by which the student prefers to learn, and (d) the expectancy of the student regarding success or failure in the particular learning situation. It was the purpose of this research to study the effects of the components identified by the Canfield Learning Styles Inventory on the achievement of Native American tribal college students in Montana in the various subject areas.

Research Questions

The eight subject areas explored in this study were:

Liberal Arts, Science, Mathematics, Business, Vocational, Native American Studies, Developmental, and Physical Education. Liberal Arts included subjects such as psychology, sociology, English, and Art. Science included subjects such as biology, chemistry, and physics. Mathematics included subjects such as algebra, geometry, and calculus. Business included courses such as accounting, management, shorthand, typing, word processing, and computer courses. Vocational included courses dealing with agricultural, automotive mechanics, forestry, and building trades. Developmental courses included subjects such as remedial math, remedial reading, and writing skills. Physical education included course subjects such as swimming, weight lifting, basketball, and archery.

This study wanted to discover if learning styles made a difference in each of these eight subject areas. Do the Canfield learning style areas under which the students prefer to learn affect achievement differently in each of these eight subject areas?

Definition of Terms

Terms used in this study included the following:

CONDITIONS:

Conditions are the dynamics of the situation in which learning occurs (Canfield, 1980, p. 4).

CONTENT:

Content is the student's preferred area of interest (Canfield, 1980, p. 5)

EXPECTANCY:

Expectancy is the level of performance anticipated (Canfield, 1980, p. 5).

LEARNING STYLE:

Learning style is an attribute of the individual which interacts with instructional circumstances in such a way as to produce differential learning achievement as a function of those circumstances (Canfield, 1980, p. 1).

MODE:

Mode is the general modality through which learning is preferred (Canfield, 1980, p. 5).

NATIVE AMERICANS:

Native Americans are identified in a number of different ways by groups such as the Bureau of Indian Affairs, Indian Health Service, and different tribal entities. Individual Native Americans tend to apply these different definitions of what constitutes a Native American to themselves according to their perception of their identity. Thus, for the purposes of this study, a Native American was any individual who defined him/herself as a Native American on the questionnaire filled out by the students at the time the data was gathered with the Canfield Learning Styles Inventory.

TRIBAL COLLEGE:

According to Public Law 95-471 (more commonly known as the Tribally Controlled Community College Act) "a tribally controlled community college is an institution of higher education which is formally controlled, or has been formally sanctioned, or chartered, by the governing body of an Indian tribe or tribes, except that no more than one such institution shall be recognized with respect to any such tribe."

Significance of the Study

Learning style research is a relatively new research area. Most of the research in this area has been done in the past 25 years. This body of research has established that using a student's learning style strengths can help to improve his or her achievement (Dunn, 1984; Szewczyk, 1987; Vondrell, 1987). Because of the potential for increased learning, this is a major research area. However, most of the research concerning learning styles has been carried out among middle class white populations.

The Native American population is one significant minority group whose learning style patterns have not yet been sufficiently investigated. Native Americans are part of a cultural environment in which no single individual directs or controls activities, in which public verbal praise is embarrassing, and in which social harmony is more

important than task achievement. The typical classroom, however, has a single leader who regards praise of achievement as normal and tends to separate the personal aspects of an activity from the task (Kleinfeld, 1972). These cultural differences establish a definite question as to whether or not the learning styles of the White American are the same as those of the Native American. Therefore, any research which can produce new information about how Native Americans learn best cannot fail to assist educators in establishing better educational practices for the Native American.

Staff members at the Kellogg Center for Adult Learning Research at Montana State University have been investigating the relationship of learning style to achievement among the Native Americans in the seven tribal colleges in Montana. The first part of their research investigated the influence of teaching and learning styles on student achievement in the seven tribal colleges in Montana (Conti & Fellenz, 1988a). The second part of the study involved a naturalistic inquiry to identify the exact behaviors by specific teachers that made a difference in students' academic success (Conti & Fellenz, 1988b).

The research in learning styles has been, for the most part, general research with little done specifically in the area of Native American learning styles. Although there has been some interest in styles with regard to learning to read

and to do mathematics, the influence of styles in various subject areas has been largely neglected. If a particular style is found to have a positive effect on student achievement in a particular subject area, then educators can work to assist the student in strengthening those characteristics which will produce better achievement in that particular subject area.

Assumptions and Limitations

This study was based on the assumption that participants had no reason to give biased responses. Thus, it can be assumed that the students who answered the learning style questionnaires answered the questions to the best of their ability with no attempt to be other than truthful in their answers. It was also assumed for the purposes of this study that differences in data collection methods at the various sites had no effect on the outcome of this study.

A limitation of this study was that the Canfield Learning Styles Inventory had never been normed on Native Americans. The results were limited to the traits measured by the Canfield Learning Styles Inventory. However, the study by the Kellogg Center related Native American responses to the norm and found that Native Americans did not differ significantly from the norm (Conti & Fellenz, 1988a).

A delimitation of this study was that participants were restricted to students enrolled in the tribal colleges in Montana during the winter and spring quarters of the 1986-1987 academic year. A further delimitation was that academic grades, the common measure in postsecondary education for defining the degree of student achievement, were used as the sole measurement of achievement.

This study should provide an important contribution to Native American learning styles research. No research exists concerning the effect of Native American learning styles on achievement in the various subject areas. Chapter II, the Review of the Literature, describes what prior research has discovered about this subject. There will be three important divisions: a section on learning styles in general, a section on cultural differences and learning styles of the Native American, and a section on the relationship of learning styles and characteristics to various subject areas.

CHAPTER II

REVIEW OF THE LITERATURE

There has been a great increase in the number of Native Americans entering colleges and universities in the past 20 years. However, the attrition rate of Native Americans in some institutions has been estimated to be as high as 85%. A number of reasons have been given for such attrition. The most common reasons have been inadequate preparation, low motivation, and lack of family support for education. More important than any of these reasons is that

> For white students the college setting is simply an extension of the national social institution of their culture. The college institution reflects dominant society's white middle-class values and, by and large, reinforces prevailing attitudes. . . . Native American students, on the other hand, tend to bring to college a strong sense of their cultural identity and are generally oriented toward a set of values and goals which are different from those institutionalized in the college or university. . . . The challenge for Native American students becomes the ability to interact on two cultural levels simultaneously (Huffman, Sill, & Brokenleg, 1986, pp. 32-38).

An analysis of learning styles to student learning is important because

> People think in different ways. Some people think with their sensory apparatus; others think with their hearts. A few think with their intuition; and some think with their intellect. . . . Learning style research indicates that people's styles reveal how they identify, judge, substantiate, confirm, and validate truth (Gregoric, 1982, pp. 3-5).

Through a discussion of the results of research already completed, a conceptual base will be laid for this study.

Learning Styles

Of prime concern to the education profession has been the need to discover the processes by which learning and teaching take place. Recent efforts to explain these phenomena have led to two general lines of research. One group, represented by Rita Dunn, Kenneth Dunn, David Hunt, Joseph Hill, and others, has been working with applied models of learning style. This group has used questionnaires to allow students to identify their own learning styles. The other group has been concerned with cognitive styles. McKenney (Harvard Business School) and Messick, among others, have been involved in this type of research (Keefe, 1979).

Confusion has arisen over the years concerning the difference between cognitive styles and learning styles. Cognitive style has been defined as information processing habits representing the learner's typical mode of perceiving, thinking, problem solving, and remembering (Messick, 1969). Learning style is the broader term and includes not only cognitive styles but also affective characteristics and physiological characteristics (Keefe, 1979). Affective characteristics include items such as motivation, belief in external or internal control, and

desire for competition vs. cooperation. Physiological styles include items such as differences resulting from health related behaviors, preferences for study at different times of day, degree of need for mobility, and environmental needs such as varying levels of light, sound, and temperature.

One aspect of cognitive styles is the sensory modality through which a person learns best. The three modalities that have the greatest use in the classroom are auditory, visual, and kinesthetic (Barbe & Swassing, 1979). The auditory modality is defined as learning by hearing; the visual modality is defined as learning by seeing; the kinesthetic modality is defined as learning by touching or doing. An individual's dominant modality is that modality which results in information being processed the most efficiently. In elementary school, children usually have a modality which can be expressed as being the child's dominant modality. As the children mature, however, they normally discover other modalities or approaches to learning until, as an adult, some integration of auditory, visual, and kinesthetic has occurred. This makes it much more difficult to find the major dominant modality in the adult. However, "When a situation is stressful, or when the consequences associated with an event are great, an adult will resort to his or her dominant modality" (Barbe & Swassing, p. 6).

A large amount of research on learning styles has involved children. However, since this study concerns adults, this study examined that portion of the learning style literature which dealt with adult learning styles. Kenneth Dunn (1982) described a study done by his group during the 1976-1980 period to find out whether differences existed among adults at various levels of academic involvement and employment. He found that the adults in his study did have very definite learning style preferences. Some of the differences which Dunn observed were the differences in preferences for a noisy or a quiet environment in which to learn, differences in preferences for learning in a structured setting or an unstructured setting, differences in time of day for activity, amount of light desired, and differences in preferences for learning by audio, visual, or kinestetic modes.

Several instruments have been developed to determine individual learning styles. Some instruments were developed to allow the individual to indicate his/her learning style preference while others were tests of learning style. Most of the instruments are for determining the learning styles of children while a few were developed for determining the learning styles of adults. The Canfield Learning Styles Inventory was developed for adults and is an instrument in which the student indicates his/her preference in several areas.

The Canfield Learning Styles Inventory (Canfield, 1980) defines learning style as being made up of four elements. These elements include preferred conditions, content, mode of learning, and expected level of success. The preferred conditions of learning consist of four factors: affiliation, structure, eminence, and achievement; preferred content includes rating for the scales of numeric, qualitative, inanimate, and people; subject matter preferred mode has the scales of listening, reading, direct experience, and iconic (making use of visual images). Expectancy has four levels which range from expecting to do poorly to expecting to do extremely well.

The Canfield Learning Styles Inventory was initially developed in 1972. Since that time it has been used in a number of research studies. A study to gather data that would allow the agricultural economics faculty at Texas A & M University to improve their efficiency in teaching courses which included computer assisted instruction used the Canfield Learning Styles Inventory. The results of this study indicated that the students in the agricultural economics area at Texas A & M University had a wide range of learning styles (Conti & Fellenz, 1985).

In a similar study, Welborn (1985) used the Canfield Learning Styles Inventory to determine if teaching and learning style had any effect on achievement of health care professionals. Welborn concluded that learning style had no

significant effect on achievement whereas teaching style had a significant effect on achievement.

Conti and Fellenz (1988a) conducted a Kellogg Center research project at Montana State University examining learning style and teaching style. They used the Canfield Learning Styles Inventory to test 457 students from the seven tribal colleges in Montana. The preliminary results of the learning style portion of the project indicated that:

1. Tribal college students had a below average preference for working with fellow students and for knowing the instructor well personally.

2. Tribal college students had about average preference for structure, but were slightly higher than average on preference for detail for specific information on assignments, requirements, and rules.

3. Tribal college students were slightly above average in a preference for setting their own goals and slightly below average for doing things for themselves.

4. Tribal college students showed a preference for desiring comparison with others, knowing how one is doing in relationship to others, preferring classroom discipline and maintenance of order, and having knowledgeable instructors.

5. Tribal college students showed their greatest preference in the two content areas that involve abstract thinking--numeric and qualitative.

6. Tribal college students showed a high preference for listening and for reading.

7. The tribal college students expected to either do extremely well or extremely poorly (Conti & Fellenz, 1988a).

The tribal college group was compared to two other studies carried out with groups from the dominant culture. Since many of the findings were contrary to Native American stereotypes, it can be concluded that researchers should take a more careful look at these findings before continuing to use these stereotypes (Welborn, 1985; Conti & Fellenz, 1985).

Belisle (1987) used the Canfield Learning Styles Inventory to study the effects of advance disclosure of learning style on academic achievement and course satisfaction in adult learners. The subjects were 635 technical school students stationed at Lackland Air Force Base. Three groups were given the Canfield Learning Styles instrument. The first group received a profile of his or her learning style. The second group received a profile and an 11-page interpretation of learning style and learning strategies. The third group received the profile, the interpretation, and a list of local learning resources. Although several hypotheses were listed, the only area of significance occurred when students received advanced disclosure of learning style, along with information on

learning strategies and counseling on learning resources increased in academic achievement. This appears to demonstrate that there is an advantage to disclosure of learning style information to adults.

Ferrell (1983) examined four learning-style instruments. These instruments had differing forms, length, and conceptualization of learning style. All four instruments were administered to 471 high school and community college students. The data were analyzed to compare common factors with the conceptualization of learning style as outlined by each of the authors and compared with the aspects of learning style as identified by Keefe (1979). The following is a brief description of the scales used in the study.

The Grasha-Riechmann Student Learning Style Scales, General Class Form (SLSS), is a 90-item self-report scale which is administered to a group. The scale assesses six learning styles which are: Independent, Avoidant, Collaborative, Dependent, Competitive, and Participant. This scale has been used with high school, two-year college students, four-year college students, and graduate students (Ferrell, 1983).

The Kolb Learning Styles Inventory (Kolb LSI) ranks nine sets of four words by subject. The inventory assesses Concrete Experience versus Abstract Conceptualization and Active Experimentation versus Reflective Observation. The

Kolb LSI obtained a learning style profile with scores for each measure. This instrument was developed for college students but is being used with high school and junior high school students (Ferrell, 1983).

The Dunn Learning Styles Inventory (Dunn LSI) uses 104 true-false statements. The Dunn LSI assesses immediate environment, own emotionality, sociological needs, and physical requirements. The assessment of this instrument includes the development of individual child profiles with the intention of changing the child's environment to fit this profile. It was designed for upper grade school students but it is being used with high school and college students (Ferrell, 1983).

The Johnson Decision Making Inventory (DMI) is a 20-item scale that assesses Spontaneous versus Systematic and Internal versus External. It was designed to be used with college students (Ferrell, 1983).

According to Ferrell (1983), none of the instruments examined all of the types of behaviors that Keefe considered to comprise a learning style. The instruments also assessed some traits that were not mentioned by Keefe. Ferrell pointed out that an examiner may wish to assess only one aspect of learning style but that it should be possible to construct an instrument that contains all types of behavior and assesses all aspects of learning style.

Learning Styles and Achievement

As indicated above, research bears out the existence of differences in learning styles. This would be of little or no significance to education, however, unless it could be shown that learning style characteristics do have an effect on achievement. One problem in trying to analyze the various studies that have been completed regarding learning styles and achievement is that they have used many different instruments to assess learning style. These instruments, in turn, analyze various facets of learning style. However, by including all facets of learning style which may affect achievement, some sense can be made out of the research.

Rita Dunn (1984) has researched extensively into the learning styles of children. She was convinced that teaching according to learning styles does increase academic achievement. She described attribute, treatment, and interaction studies where each youngster's scores were compared with the individual's own "baseline" data. In those cases, she stated that there was repeated evidence of statistically significant increased academic achievement and improved attitudes toward learning when students were taught according to their personal characteristics.

In another study, Pask (1975) studied differences in learning styles of students characterized as holists versus serialists. Later, Pask (1976) showed that when these styles were matched to different teaching strategies,

learning was facilitated. Marton and Saljo (1976) studied text learning by university students and found that they operated at two distinct levels of processing--surface and deep level. The surface level was directed at what was said, and the deep level was directed at what was meant. Achievement could be affected depending on which method of testing the instructor chose.

In a study of learning styles of limited English proficient and English proficient high school students, significant cognitive and learning styles differences between the limited English proficient students and the English students were found. Furthermore, there was a statistically significant relationship between the cognitive style of LEP students and academic performance in reading, mathematics, and English proficiency. There was also a significant relationship between reflective observation as a learning style dimension and reading achievement (Hainer, 1987). Since some Native Americans require English as a second language, the Hainer study may have some implications for this study.

Another study of high school students sought to determine the effects of integrating experience and perceptual preference upon achievement, attitude, and enrollment intention in advanced mathematics courses of students in secondary school geometry classes. Among other findings, it was determined that there was differential

achievement with respect to learning style classification (Szewczyk, 1987).

The purpose of a study by Jacobs (1987) was to determine whether a difference existed in the learning style of Afro-American high, average, and low achievers and to compare the learning styles of Afro-American and Euro-American high, average, and low achievers. The results of the study indicated that there were differences in learning styles, according to achievement level, sex, and race and that students preferred to learn in ways that were personally unique to each individual student. This study involving another minority group might have implications for the Native American students.

Another study sought to determine if the identification of learning styles would assist in predicting success of adult students participating in an independent study program. This study, using the Kolb Learning Style Inventory, identified several items that correlated with achievement at a statistically significant level. Kolb concluded that adult students self-selecting to participate in an independent study program can be expected to successfully complete the experience (Vondrell, 1987).

Another study of adult learners investigated the relationship between cognitive style as measured by the Group Embedded Figures test and academic achievement of adult learners on a General Educational Development (GED)

test. A review of the different publicly supported GED test preparation programs in New York State revealed that each program had a different approach and that approach might be of significance in the achievement of field dependent learners. The results indicated that this aspect of cognitive style was significantly related to achievement of adult learners in the GED test preparation program (Rupert, 1987).

Field independence/dependence was the focus of a study to determine whether field independence/dependence affected achievement in college-level economics courses. Using several achievement models, McCorkle (1987) found that field independence/field dependence was related to student achievement.

A study in the math subject area investigated the relationship between knowledge of students' preferred learning styles and study habits and attitudes to achievement of college freshmen. Correlations for both learning style and study habits and attitudes to achievement were low, although significant. The four best discriminators for achievement were responsibility, flexibility, non-tactile mode, and delay avoidance (Clark-Thayer, 1987).

A study of Native American students found that a number of variables affected achievement of these students. Field independence/dependence was found to be positively related to the grade point average of Native American

undergraduate students but to have no significant relationship to the grade point average of Native American graduate students in this study (Spence, 1987).

A study by Rahr (1987) investigated the relationships of learning styles to achievement in allied health and nursing. The results of the study indicated that learning styles were not predictive of achievement in the case of nursing students.

Is there a relationship between student and faculty match/mismatch of learning styles and achievement? A study by Shmaefsky (1987) was designed to answer this question. The results supported the theory that students with a cognitive style that matched that of the instructor had significantly higher final grades than those of students whose cognitive styles did not match that of the instructor.

Native American Learning Styles

"The sociocultural system of which the student is a product must be clearly understood if education is to be effective" (Ramirez & Castenada, 1974, p. 4). Witkin's (1967) research has shown that members of some cultures tend to be field independent while those of other cultures tend to be field dependent. This would appear to mean that people of various cultures, because of their socialization practices, encourage their children to be more field

independent or more field dependent (Ramirez & Castenada, 1974).

Barbe and Milone (1981) agree that differences in minority learning styles are probably not inherent. By this they mean that learning styles are probably a result of environment rather than being caused by heredity. They conducted a study involving 1,000 southern California children and found that minority children, who were exposed on a continuing basis to the culture of the majority, developed dominant learning style strengths similar to those of the majority. Children, however, who were from groups outside the American cultural mainstream, such as Native Americans, may show unique modality characteristics.

In a study of Sioux students (Huffman, Sill, & Brokenleg, 1986), success by the students seemed to be related to their cultural identity. The crucial factor for the likelihood of college achievement was retention of their traditional cultural identity and heritage. Thus, traditional Sioux students seem to have a better chance for achievement in college than their nontraditional counterparts. This is surprising since the typical college expects its students to learn in the way of the White American and usually adapts teaching very little to accommodate other learning methods.

A demonstration of the importance of these cultural differences is the wide acceptance that everyone's culture

plays an important part in one's life (Butterfield, 1985). However, in academic settings, this does not cause a problem for the White American; for the Native American, it can result in failure. Phillips (1972) reported that in the Native American home and community, no one person tells others what to do or when to speak. The regulation of conversational exchange and designation of attention differ greatly from that of the Anglo system. Phillips went on to suggest that when Native Americans enter a school in which most of the instructors are not Native Americans, they encounter a totally unfamiliar way of communicating. For the first time, the Native American student is expected to engage in a highly structured and directive interaction. In particular, the instructor is likely to have complete control of the conversation as far as who talks and when they should talk. During Native American social activities there is no single individual directing and controlling activities. Access is open to everyone. No one is just an observer, and there is no sharp distinction between the audience and the performer. Individuals choose for themselves how much they participate in the conversation.

Another cultural factor is that public verbal praise frequently embarrasses the Native American student, but nonverbal praise such as a smile or positive eye contact tends to reinforce learning. Also, Kleinfeld (1974) points out that the instructor who tries to motivate the Native

American student by appealing solely to the student's own interests and goals (for example, do it for learning's sake so you can get a good job or good grade) often has little success. However, instructors who motivate students by appealing to a personal teacher-student relationship tend to be successful.

Kleinfeld (1974) states that in the intercultural classroom, students are comfortable with expressing themselves. The successful instructor will have a personal orientation rather than a task orientation. This is because among Native Americans and Eskimos, the value of social harmony is more important than task achievement, and a task cannot be separated from the relationships among the individuals performing it. White society, in contrast, tends to separate the personal aspects of an activity from the task so that personal feelings do not interfere with the more important value of task achievement. Thus, Kleinfeld believes that for Native Americans and Eskimo students, the instructor's ability to establish good interpersonal relationships may be a necessary condition for effectiveness in the classroom.

There is support for the view that there is no one Native American learning style (Bland, 1975; Wyatt, 1978). Conti and Fellenz (1988b) also stated that there is no one Native American learning style; however, they did maintain

that culture plays an important role in learning style among certain Native American individuals. According to Wyatt (1978) and Bland (1975), many Native American children learn by observing a process and then practice the process with a minimum of verbal comments. Native American children learn by observing and by self-directed exploration and experience. Also, Native American students learn better when the teacher uses the concrete approach and moves to the abstract--that is, from practice to theory. There is also a need to be more visual in presenting instructional information. Bland (1975) and Gardner (1980) state that visual perception and recall are the primary factors for Native Americans in determining their learning styles. Native Americans, according to Bland, learn better in an environment where they capitalize on as many of the human senses as possible. Using sight, sound, and touch will greatly assist the Native American in his/her learning experiences.

Bland (1975) asserted that research does show that to be the most compatible with a large number of Native American students' learning styles, instructors should do the following:

1. Use informal and varied seating patterns;

2. Motivate by providing frequent positive feedback and praise success;

3. Allow for pairs or small teams to work together. Allow for many group projects rather than individual assignments; and

4. Incorporate many manipulative activities which rely heavily on visual as well as tactile/kinesthetic senses.

Boseker and Gordon (1983) stated that cooperation is more important than competition for the Native American. This view is upheld by recent research. Conti and Fellenz (1988b) found that in the tribal colleges in Montana competition of the collaborative type, in which the students work together to improve the performance of the group, is desired by students. According to Boseker and Gordon (1983), Native Americans also make decisions by consensus rather than by majority rule. In addition, while people from the dominant culture tend to find silence uncomfortable, silence among Native Americans communicates oneness. In the dominant culture, if a pause is perceived as too lengthy, someone will say something, while Native Americans like to wait and think before answering a question. Therefore, giving the Native American more wait time increases the chances that he/she will give an answer to the question.

Clinical and laboratory evidence suggests that certain human cognitive functions depend predominantly on either the left or right hemisphere of the brain. The left hemisphere

is thought to be specialized for processing stimuli, especially oral language, details, and step-by-step analysis. The left brain then is the one predominantly used in school activities. It has become popular in recent years to say that Native Americans are right-brained and, therefore, cannot be expected to do well in left-brained activities. Research done suggests that Native Americans are not right-brained (Stellern, Collins, Gutierrez, & Patterson, 1986). The Native American's apparent preference for right-brained activities is probably caused by cultural and environmental factors. Chrisjohn and Peters (1984) state

> The emphasis on training the right-brained child with a right-brained curriculum, is rather peculiar. If there were any substance to this entire issue, one might expect the educator to focus on so-called left-brain skills, under the assumption that the right-brain skills are sufficiently developed (p. 1).

The aforementioned Native American learning characteristics demonstrate the complexity of the problem of determining which factors affect the ability of students to learn in the classroom. Cornett (1985) and Gardner (1980) maintain that educators need to understand learning styles as they are manifested in the classroom, interacting and influencing one another in an infinite number of ways. There are aspects of learning style which include emotional and personality characteristics related to such areas as

motivation, attention, locus of control, interests, willingness to take risks, persistence, responsibility, and sociability. Knowledge of this aspect of learning style can, according to Cornett, "help educators understand why praise and external reinforcement have a positive effect on some learners but a negative effect on others" (p. 10).

A cross-sectional study investigated the relationships among cultural attachment, cognitive style, and academic achievement for Native American and majority students in the 4th, 8th, and 10th grades (Grieg, 1987). Factorial analysis of 15 items revealed five separate factors of cultural attachment for the Native Americans. Four of the five cultural attachment factors were significantly and negatively related to academic achievement scores for the 8th-grade Native Americans, but there were no relationships for the 4th or 10th-grade Native Americans. No cultural attachment factors were significantly related to cognitive style at any grade level (Grieg, 1987). This would seem to support the theory that there is no one Native American learning style.

Diessner and Walker (1986) reported possible validity of particular American Indian cognitive styles. They found a statistically different pattern of spatial ability, sequential ability, and verbal conceptual ability in 75 junior and senior high school Yakima Indian students. In addition, McShane and Plas (1982), through statistical

analysis of WISC, WISC-R, and WPPSI (tests which deal with investigation of cognitive aptitudes such as sequencing and spatial awareness skills) subtest scores, uncovered evidence of an Indian Wechsler Scale performance pattern which was different from that found in normal and learning disabled groups. They found that the Indian pattern shows more well-developed spatial abilities compared to sequencing skills, which in turn are superior to conceptual and acquired knowledge performances.

Learning styles seem to be a combination of nature and environment, and some aspects of learning style do change with age. According to Ramirez and Castenada (1974), there tended to be a move in the direction of greater abstraction with age, but this tended to be confined to the technical societies. American children from Mexican backgrounds and American Indians did not tend to show this same pattern.

Cornett (1985) said,

> Such researchers as Manuel Ramirez and Alfredo Castaneda and others have found that American Indians educated in their own culture tend to become more field dependent, just the opposite of their Anglo neighbors. So, while the learning style blueprint is initially based on inheritance and prenatal influences, a person's learning predisposition is subject to qualitative changes resulting from maturation and environmental stimuli (p. 12).

The foregoing studies demonstrate evidence that Native Americans do have individual learning styles and in some instances have different ways of looking at things than do members of the dominant society. This seems to indicate

that instructors should look closely at their subject areas to find ways in which they can accommodate these differences in their classes.

Learning Styles in Subject Areas

Is there a difference in achievement in different subject areas depending on learning style? The research in this area is sparse. Hunt (1979) maintained that this question was difficult to answer because of the variation in the different subjects. He stated that mathematics is a much more structured area with more definite concepts than the social sciences, for example; therefore, it would be very difficult to teach mathematics with different degrees of structure. He went on to say that what might seem to be an unstructured approach in math might appear to be a structured approach in the social science courses.

According to Hunt, there did appear to be a tendency for students with structured learning styles to perform better in engineering and mathematics while students who desired less structure tended to perform better in the social sciences. Hunt qualified this by saying that this difference may have been due to the nature of the examination given in the two areas since students who desired less structure tended to prefer essay tests. Wragg (1982) confirmed this when he discussed a study done by Shanks in 1975 in which Shanks investigated the learning style of

trainee primary science specialists at Ohio State University using the Sigel Cognitive Style Test and found a positive relationship between learning style and the ability to grasp new concepts in science.

Hoffer (1986) conducted an experimental study involving adult volunteers who engaged in learning activities devised by Hoffer. The learning styles tested included auditory, visual, and tactual-kinesthetic. This tactual area was divided into two categories: auditahm (touch and hand movement combined with the auditory mode) and visitahm (touch and hand movement combined with the visual mode). The study was designed as a repeated measures experimental study with adult volunteers engaging in 12 learning activities divided into the four learning modes. Three activities, which represented the subject areas of English, mathematics, and science, were developed for each learning mode. The results of this study were:

1. Adults do possess a dominant sensory modality by which they learn more effectively across at least two subject matter areas.

2. There is no one dominant modality by which all adults learn more effectively within subject matter.

3. Adults' dominant sensory modalities are not related to age or years of formal education.

4. Multimodal teaching approaches are not beneficial for most adult learners.

Hoffer concluded that these tests could be of value in directing students to materials which were the most compatible with their dominant learning mode.

Copenhaver (1979) investigated the consistency of student learning styles as students moved from English to mathematics. His study showed that:

1. A student has a significantly more positive attitude toward a subject area if his/her learning style is similar to his/her teacher's learning style.

2. A wide range of learning styles exist in most classrooms.

3. A wide range of student learning styles exist in each subject area classroom and across time, requiring multiple teaching styles to meet the needs of those students.

Summary

Authorities generally agree that the use of learning styles in the classroom does improve achievement. However, the ability of the student to integrate visual, auditory, and tactile modes in his/her learning is highly valuable.

Native Americans, because of their cultural backgrounds, tend to show individualized learning style characteristics. The typical classroom has been foreign to these Native American learning styles. Therefore, more knowledge about these individual Native American learning

styles may help the Native American improve his/her chances of success in the classroom.

There has been very little research in regard to the learning style characteristics that promote success in a particular subject area. What little research exists in this area produces more questions. Research is available on learning styles by Native Americans in isolated subject areas such as mathematics, but none is available on comparisons of learning style characteristics and achievement in various subject areas.

CHAPTER III

METHODOLOGY

This study investigated the effect of the learning styles of Native Americans on achievement in various subject areas. Included in this chapter is a discussion of the research design, hypotheses, population and sample, data, reliability and validity of the Canfield Learning Styles Inventory, and data analysis.

Research Design

This was an ex post facto research study. The independent variables were the subject areas in which courses were offered and the learning styles of Native Americans at Montana's seven tribal colleges. The dependent variable was the student's achievement, which was measured by the final grades achieved in courses. The grades used were from all courses taken by each student during the Fall Quarter, 1986, and Winter Quarter, 1987, in the tribal colleges in Montana. These tribal colleges are Blackfeet Community College, Fort Belknap Community College, Fort Peck Community College, Little Bighorn College, Salish Kootenai College, and Stonechild Community College.

The subject areas were divided into eight categories. These areas were (a) Liberal Arts which includes history, psychology, sociology, human services, economics, music, art, and English courses; (b) Science which includes courses such as biology, chemistry, and physics; (c) Mathematics which includes courses such as algebra, geometry, and calculus; (d) Business which includes all business management, secretarial science, and computer science courses; (e) Vocational which includes all courses aimed at teaching for a vocation except business; (f) Native American Studies which includes all courses in the history, culture, crafts, and arts of the Native American; (g) Developmental which includes remedial reading, writing improvement, remedial math, and study skills; and (h) Physical Education courses.

Individual courses in the curriculum were assigned to subject area categories according to similarities. Three dimensions appear to characterize the subject matter of academic areas in most institutions (Biglan, 1973). These dimensions involve (a) the degree to which a paradigm, which specifies the appropriate problems to be studied and the appropriate methods to be used in studying those problems, exists; (b) the degree of concern with application; and (c) the concern with life systems, i.e. the coursework deals with subjects which are living.

One way to classify subject areas is by the existence of easily recognizable paradigms in the field. The physical sciences are "characterized by the existence of paradigms that specify the appropriate problems for study and the appropriate methods to be used. It appears that the social sciences and nonscience areas such as history do not have such clearly delineated paradigms" (Biglan, p. 195). Therefore, two distinct areas are the liberal arts and the sciences.

The business and vocational areas are more concerned with application than other subject areas. Math courses are not concerned with life systems while some science areas are concerned with life systems. This provides a rationale for separating math and science. Developmental courses, which have a purpose which is radically different from other courses, and Native American studies, which have a distinct cultural purpose, need to be separate areas. Physical education courses which focus on body development courses also need to be treated separately. Liberal arts courses lack a significant paradigm and are not as directly applicable as the vocational and business courses; however, unlike the math courses, liberal arts courses are, in some instances, concerned with life systems.

The statistical analysis used in this study was the one-way analysis of variance. The study explored the effect of learning styles in subject areas on achievement.

Hypotheses

Eight hypotheses were examined in this study. Each hypothesis was tested at the .05 level. These hypotheses were as follows:

1. There is no significant difference between achievement in the Liberal Arts subject area and learning style.

2. There is no significant difference between achievement in the Science subject area and learning style.

3. There is no significant difference between achievement in the Mathematics subject area and learning style.

4. There is no significant difference between achievement in the Business subject area and learning style.

5. There is no significant difference between achievement in the Vocational subject area and learning style.

6. There is no significant difference between achievement in the Native American Studies subject area and learning style.

7. There is no significant difference between achievement in the Developmental Studies subject area and learning style.

8. There is no significant difference between achievement in the Physical Education subject area and learning style.

Population and Sample

The population for this study was adult students attending tribally controlled colleges in Montana. These colleges are Blackfeet Community College, Fort Belknap Community College, Fort Peck Community College, Little Big Horn College, Salish Kootenai Community College, and Stone Child Community College. The vast majority (82%) of the sample taken from these colleges identified themselves as Native Americans. Participants included both males and females and students of a wide variety of ages. The majority of the students can be described as adults who have returned to formal education to seek an associate degree or further training.

The sample for this study was made up of 497 students from the tribal colleges. This sample represented 48.9% of the population. These students enrolled in a total of 1,447 classes. This figure represents the students who were in classes which were matched up with teaching styles. The number of students from each of the colleges was: Blackfeet Community College--113; Fort Belknap College--27; Fort Peck College--87; Little Big Horn College--50; Salish Kootenai Community College--148; and Stonechild Community College--32. A number of different Indian tribes were represented in the sample, but the main tribes included in the sample were Assiniboine, Blackfeet, Chipewa Cree, Crow, Gros Ventre, Kootenai, Northern Cheyenne, Salish, and Sioux.

Participation in this study was voluntary. The students were enrolled in a wide range of curricula. Demographic information from the questionnaire shows that the study was representative of the population with the volunteers being 60.6% female and 39.4% male. The average age of the sample was 29.6 years.

Data Collection

The data for this statewide study were originally collected under the direction of Dr. Gary Conti through the Center for Adult Learning Research at Montana State University. A research assistant at each of the seven tribal colleges supervised the administration of the Canfield Learning Styles instrument and initiated the process for receiving student data information. This researcher was the research assistant at Blackfeet Community College. The precise methods of contacting students varied. In some colleges, students were recruited at the time of registration for the quarter; in others, the data collection instrument was administered in classes with the assistance of instructors. In order to systematically administer the learning style instrument at all seven tribal colleges, instruction sheets were provided to each person supervising the Canfield Learning Styles instrument administration. Achievement data were obtained at the end of Fall and Winter

quarters of the 1986-1987 academic year for all students who filled out the Canfield Learning Styles instrument.

Canfield Learning Styles Inventory

The Canfield Learning Styles Inventory (CLSI) was used to measure learning style factors. The student completed the CLSI by rank ordering the answers to each question from the most favored answer to the least favored response. No time pressure was placed on the participants; however, the the members of the research team for this statewide study reported that most participants completed the test in 15 to 20 minutes.

The Canfield Learning Styles Inventory measures preferences within four areas; conditions for learning, content, mode, and expectancy. There are subcategories in each of these four major areas.

Conditions refer to the dynamics of the situation in which learning occurs (Canfield, 1980, p. 4). In the area of conditions, the CLSI contains eight subcategories. These conditions are as follows:

1. Peer. This condition measures the degree of preference by the student for working in student teams, having good relations with other students, and having student friends (Canfield, 1980, p. 4).

2. Organization. This condition measures the degree of preference by the student for having course work

organized clearly and logically, having meaningful assignments, and having a logical sequence of activities (Canfield, 1980, p. 4).

3. Goal setting. This condition measures the degree of preference by the student for setting his/her own objectives, using feedback to modify goals and procedures, and making decisions on objectives (Canfield, 1980, p. 4).

4. Competition. This condition measures the degree of preference by the student for comparison with others and needing to know how one is doing in relation to others (Canfield, 1980, p. 4).

5. Instructor. This condition measures the degree of preference by the student for knowing the instructor personally, having a mutual understanding with the instructor, and liking and being liked by the instructor (Canfield, 1980, p. 4).

6. Detail. This condition measures the degree of preference by the student for specific information on assignments, requirements, and rules (Canfield, 1980, p. 4).

7. Independence. This condition measures the degree of preference by the student for working alone and independently, determining his/her own study plan, and doing things for his/herself (Canfield, 1980, p. 4).

8. Authority. This condition measures the degree of preference for classroom discipline and maintenance of

order and for having informed and knowledgeable instructors (Canfield, 1980, p.4).

Content refers to the student's preferred area of interest (Canfield, 1980, p. 5). In the area of content, the Canfield Learning Styles instrument contains four subcategories. These content areas are:

1. Numeric. This content area measures the preference by the student for working with numbers and logic and solving mathematical problems (Canfield, 1980, p. 5).

2. Qualitative. This content area measures the preference by the student for working with words or language, writing, editing, and talking (Canfield, 1980, p. 5).

3. Inanimate. This content area measures the preference by the student for working with things; building, repairing, designing, and operating things (Canfield, 1980, p. 5).

4. People. This content area measures the preference by the student for working with people and engaging in such activities as interviewing, counseling, selling, or helping (Canfield, 1980, p. 5).

Mode refers to the general modality through which learning is preferred (Canfield, 1980, p. 5). In the area of conditions, the Canfield Learning Styles instrument contains four subcategories. These modes are as follows:

1. Listening. This category area measures the preference by the student for learning by hearing information; for example, by lectures, tapes, or speeches (Canfield, 1980, p. 5).

2. Reading. This category area measures the preference by the student for learning by examining the written word; for example, by reading texts or pamphlets (Canfield, 1980, p. 5).

3. Iconic. This category area measures the preference by the student for learning by viewing illustrations, movies, slides, pictures, or graphs (Canfield, 1980, p. 5).

4. Direct Experience. This category area measures the preference by the student for learning by handling or performing; in the shop, laboratory, by taking field trips, or doing practice exercises (Canfield, 1980, p. 5).

Expectancy refers to the level of performance anticipated (Canfield, 1980, p. 5). In the area of expectancy, the Canfield Learning Styles instrument contains four subcategories. These subcategories are as follows:

1. Superior Expectancy. This category measures the expectations of the student to achieve extremely high grades (Canfield, 1980, p. 5).

2. Good Expectancy. This category measures the expectations of the student to achieve good grades (Canfield, 1980, p. 5).

3. Average Expectancy. This category measures the expectations of the student to achieve average grades (Canfield, 1980, p. 5).

4. Expect Failure. This category measures the expectations of the student to achieve low or failing grades (Canfield, 1980, p. 5).

Reliability and Validity of the CLSI

Conti and Fellenz (1988b) state that "the CLSI is a useful instrument which measures several important constructs that have been suggested as elements in learning style" (p. 75). Although mentioning some minor criticisms of the instrument, they state that "the CLSI remains a very usable instrument for rationalistic studies. It is reliable" (p. 75).

With regard to reliability of the instrument, Canfield (1980) stated:

> The initial study of Form S-A scale reliabilities utilized the Froelich method. The data were derived from a sample of 369 community college students. Scale reliabilities ranged from .59 to .92. . . . . Since shifts in learner preference may be anticipated as a result of maturation, as well as from an ever increasing experiential background, the precise time interval which would best reflect the test re-test reliability will necessarily be short (p. 33).

Numerous studies are quoted by Canfield (1980) to illustrate the validity of the CLSI. These indicated that statistically significant differences in learning style preferences were found consistently among different groups

which included criminal justice students, business students, education students, physical therapy students, and physical therapy faculty (p. 41).

Data Analysis

Scores on the CLSI were reported as percentiles. This study compared differences in achievement according to learning style in the various subject areas. Each subcategory of the four areas of the Canfield Learning Styles Inventory were examined with relation to the various subject areas and the achievement in those areas. There were a total of 20 subcategories of learning styles which were examined in conjunction with each subject area. In choosing preferences, the students ranked their choices as low, moderately low, moderate, moderately high, or high preference. Using one-way analysis of variance, each content area was examined with each learning style characteristic for significant differences in achievement. If there was a significant difference in any of the learning style characteristics in any of the subject areas, a Tukey analysis was used to pinpoint the location of this difference.

CHAPTER IV

DATA ANALYSIS

In order to examine the influence of learning style upon achievement in a specific subject area, the curriculum was divided into eight areas. These were (a) Liberal Arts, (b) Science, (c) Mathematics, (d) Business, (e) Vocational, (f) Native American Studies, (g) Developmental, and (h) Physical Education. The Canfield Learning Styles Inventory scores were grouped according to the five categories indicated on the female profile of the CLSI. These categories included: Low--1st to 10th percentile; Moderately Low--11th to 39th percentile; Moderate--40th to 69th percentile; Moderately High--70th to 89th percentile; and High--90th to 99th percentile. Analysis was completed for each learning style within each of the learning preference areas of conditions, content, mode, and expectancy. To identify the means of the groups causing the differences for learning style variables with a significant F ratio, Tukey a posteriori tests were conducted.

Liberal Arts Subject Area

The Liberal Arts subject area includes courses such as psychology, sociology, and English and there were 343

individual student grades in the Liberal Arts subject area. The results in this area were mixed with significant differences in achievement among some of the learning style components and no significant differences among other learning style components (see Table 1).

Table 1. Levels of Significance for Liberal Arts Students on CLSI Components

Learning Style	p	Learning Style	p
CONDITIONS			
Peer	.01		
Organization	.05	MODE	
Goal Setting	.26	Listening	.88
Competition	.46	Reading	.16
Instructor	.10	Iconic	.03
Detail	.32	Direct Experience	.01
Independence	.10	EXPECTANCY	
Authority	.03	Superior	.01
CONTENT		Good	.30
Numeric	.10	Average	.01
Qualitative	.01	Failure	.11
Inanimate	.22		
People	.01		

Those components with no significant differences in achievement at the .05 level included Goal Setting (F = 1.32, df = 4/343, p = .26), Competition (F = .90, df = 4/343, p = .46), Instructor (F = 1.98, df = 4/343, p = .10), Detail (F = 1.18, df = 4/343, p = .32), Independence (F = 1.94. df = 4/343, p = .10), Numeric (F = 1.94, df = 4/343, p = .10), Inanimate (F = 1.44, df = 4/343, p = .22), Listen (F = .29, df = 4/343, p = .88), Reading (F = 1.67, df = 4/343, p = .16), Iconic (F = 2.03, df = 4/343, p = .09), Good

Expectancy (F = 1.22, df = 4/343, p = .30), and Expect Failure (F = 1.89, df = 4/343, p = .11).

In the area of preferred conditions for learning, significant differences were found on the Peer scale (see Table 2). The Peer component measures the preference for working in student teams, for having good relations with other students, and having student friends. A Tukey analysis showed that those who had a high preference and those who had a moderate preference for good peer relationships achieved significantly higher grades than those who had a moderately high preference for good peer relationships.

The Organization component measures the preference to approach course work logically, to have it clearly organized, to have meaningful assignments, and to have a meaningful sequence of activities. There was a significant difference in this component (see Table 2). However, the Tukey analysis showed that no two groups were significantly different at the .05 level.

Significant differences were found in the condition of Authority (see Table 2). The Authority component measures the preference for discipline and maintenance of order and for the desire for having informed and knowledgeable instructors. The Tukey analysis showed that those who had a high preference for authority achieved significantly higher

grades than those who had a moderate preference for authority.

Table 2. ANOVA for Preferred Conditions of Learning in Liberal Arts

	df	SS	MS	F	p
Peer	4	22.83	5.71	4.17	.01
Unexplained	343	468.65	1.37		
Organization	4	13.53	3.38	2.42	.05
Unexplained	343	477.94	1.40		
Authority	4	15.12	3.78	2.72	.03
Unexplained	343	476.36	1.39		

A significant difference was found in the Content area of Qualitative (see Table 3). The qualitative component measures a preference for working with words or language and a desire to write, edit, or talk. A Tukey analysis showed that those who had a low or moderate preference for qualitative content in Liberal Arts courses achieved significantly higher grades than those who had a moderately low preference for qualitative content.

A significant difference was found in the Content area of People (see Table 3). The people component measures a preference for working with people by doing such things as interviewing, counseling, selling, or helping. A Tukey analysis showed that those who had a high preference for working with people achieved significantly higher grades

than those who had a moderately high, moderate, or moderately low preference for working with people.

Table 3. ANOVA for Preferred Learning Content in Liberal Arts

	df	SS	MS	F	p
Qualitative	4	19.45	4.86	3.53	.01
Unexplained	343	472.03	1.38		
People	4	17.41	4.35	3.15	.01
Unexplained	343	474.07	1.38		

Significant differences were found in the mode area of Direct Experience (see Table 4). The Direct Experience component measures a preference for learning by engaging in an actual activity such as going on a field trip, working in a shop or laboratory, or doing practice exercises. A Tukey analysis showed that those who had a low or moderate preference for learning by direct experience achieved significantly higher than those who had a moderately low preference for learning by direct experience.

Table 4. ANOVA for Preferred Modes of Learning in Liberal Arts

	df	SS	MS	F	p
Direct Experience	4	24.50	6.12	4.49	.01
Unexplained	343	466.98	1.36		

Significant differences were found in the Superior Expectancy component (see Table 5). The Superior Expectancy component measures the expectations of the student to perform extremely well in a learning situation. A Tukey analysis showed that those who had high expectations of achieving extremely well achieved significantly higher grades than those who had a low, moderately low, moderate, or moderately high expectancy of achieving extremely well.

Table 5. ANOVA for Expected Achievement in Liberal Arts

	df	SS	MS	F	p
Superior Expec	4	36.98	9.24	6.98	.01
Unexplained	343	454.50	1.32		
Average Expec	4	43.64	10.91	8.36	.01
Unexplained	343	447.84	1.31		

Significant differences were found in the Average Expectancy component (see Table 5). The Average Expectancy component measures the expectancy of the student to do average work. A Tukey analysis showed that those who had a low or moderately low expectation of achieving at an average level achieved significantly higher grades than those who had a high, moderately high, or moderate expectation of achieving at an average level.

The Science Subject Area

The Science subject area includes courses such as:

chemistry, physics, and biology and there were 78 individual student grades in the Science subject area. The only significant difference in this area was in the Direct Experience component (see Table 6).

Table 6. Levels of Significance for Science Students on CLSI Components

Learning Style	p	Learning Style	p
CONDITIONS			
Peer	.16		
Organization	.48	MODE	
Goal Setting	.71	Listening	.11
Competition	.10	Reading	.85
Instructor	.23	Iconic	.74
Detail	.67	Direct Experience	.01
Independence	.27	EXPECTANCY	
Authority	.63	Superior	.44
CONTENT		Good	.09
Numeric	.25	Average	.11
Qualitative	.06	Failure	.36
Inanimate	.30		
People	.33		

Those components with no significant differences in achievement at the .05 level included Peer ($F = 1.69$, $df = 4/78$, $p = .16$), Organization ($F = .88$, $df = 4/78$, $p = .48$), Goal Setting ($F = .54$, $df = 4/78$, $p = .71$), Competition ($F = 2.00$, $df = 4/78$, $p = .10$), Instructor ($F = 1.45$, $df = 4/78$, $p = .22$), Detail ($F = .59$, $df = 4/78$, $p = .67$), Independence ($F = 1.32$, $df = 4/78$, $p = .27$), Authority ($F = .65$, $df = 4/78$, $p = .63$), Numeric ($F = 1.38$, $df = 4/78$, $p = .25$), Qualitative ($F = 2.42$, $df = 4/78$, $p = .06$), Inanimate ($F = 1.24$, $df = 4/78$, $p = .30$), People ($F = 1.18$, $df = 4/78$,

p = .33), Listen (F = 1.95, df = 4/78, p = .11), Reading (F = .34, df = 4/78, p = .85), Iconic (F = .50, df = 4/78, p = .74), Superior Expectancy (F = .94, df = 4/78, p = .44), Good Expectancy (F = 2.24, df = 4/78, p = .09), Average Expectancy (F = 1.93, df = 4/78, p = .11), and Expect Failure (F = 1.11, df = 4/78, p = .36).

Significant differences were found in the Mode area of Direct Experience (see Table 7). The Direct Experience component measures a preference for learning by engaging in an actual activity such as going on a field trip, working in a shop or laboratory, or doing practice exercises. A Tukey analysis showed that those who had a low or moderate preference for learning by direct experience achieved significantly higher grades than those who had a high preference for learning by direct experience.

Table 7. ANOVA for Preferred Modes of Learning in Science

	df	SS	MS	F	p
Direct Experience	4	14.34	3.58	3.65	.01
Unexplained	78	76.62	.98		

Mathematics Subject Area

The Mathematics subject area includes courses such as algebra, geometry, and calculus and there were 33 individual student grades in the Mathematics subject area. The results in this area were mixed with significant differences in

achievement among some of the learning style components and no significant differences among other learning style components (see Table 8).

Table 8. Levels of Significance for Mathematics Students On CLSI Components

Learning Style	p	Learning Style	p
CONDITIONS			
Peer	.93		
Organization	.54	MODE	
Goal Setting	.74	Listening	.38
Competition	.13	Reading	.45
Instructor	.05	Iconic	.05
Detail	.30	Direct Experience	.84
Independence	.35	EXPECTANCY	
Authority	.26	Superior	.82
CONTENT		Good	.95
Numeric	.01	Average	.41
Qualitative	.88	Failure	.76
Inanimate	.70		
People	.58		

Those components with no significant differences at the .05 level included Peer (F = .22, df = 4/33, p = .93), Organization (F = .79, df = 4/33, p = .54), Goal Setting (F = .49, df = 4/33, p = .74), Competition (F = 1.95, df = 4/33, p = .13), Detail (F = 1.26, df = 4/33, p = .30), Independence (F = 1.16, df = 4/33, p = .35), Authority (F = 1.39, df = 4/33, p = .26), Qualitative (F = .30, df = 4/33, p = .88), Inanimate (F = .55, df = 4/33, p = .70), People (F = .59, df = 4/33, p = .59), Listening (F = 1.09, df = 4/33, p = .38), Reading (F = .89, df = 4/33, p = .45), Direct Experience (F = .35, df = 4/33, p = .84), Superior

Expectancy (F = .389, df = 4/33, p = .82), Good Expectancy (F = .17, df = 4/33, p = .95), Average Expectancy (F = 1.02, df = 4/33, p = .41) and Expect Failure (F = .47, df = 4/33, p =.76).

Significant differences were found in the condition area of Instructor (see Table 9). The Instructor component measures a preference for knowing the instructor personally, having a mutual understanding with the instructor, and liking one another. A Tukey analysis, however, showed that no two groups were different at the .05 level.

Table 9. ANOVA for Preferred Conditions of Learning in Mathematics

	df	SS	MS	F	p
Instructor	4	12.26	4.09	2.80	.05
Unexplained	34	49.24	1.45		

Significant differences were found in the content area of Numeric (see Table 10). The Numeric component measures a preference for working with numbers and logic, computing, and solving mathematical problems. A Tukey analysis showed that those students who had a high preference for numeric content achieved significantly higher than those who had a moderately low preference for numeric content. Also, those who had a moderately high, low, or medium preference for numeric content scored significantly higher than those who had a moderately low preference for numeric content.

Table 10. ANOVA for Preferred Content in Mathematics

	df	SS	MS	F	p
Numeric	4	29.85	6.46	5.98	.01
Unexplained	33	35.65	1.00		

Significant differences were found in the Mode area of Iconic (see Table 11). The Iconic component measures a preference for learning by viewing movies, slides, pictures or graphs. However, a Tukey analysis showed that no two groups were significantly different at the .05 level.

Table 11. ANOVA for Preferred Modes of Learning in Mathematics

	df	SS	MS	F	p
Iconic	4	14.76	3.69	2.60	.05
Unexplained	33	46.74	1.42		

Business Subject Area

The Business subject area includes courses such as accounting and marketing from business administration; typing, shorthand, word processing, and secretarial procedures from secretarial science; and introduction to computers and BASIC from computer courses. There were 489 individual student grades in the Business subject area. The results in this area were mixed, with significant differences in achievement among some of the learning style

components and no significant differences among other learning style components (see Table 12).

Table 12. Levels of Significance for Business Students on CLSI Components

Learning Style	p	Learning Style	p
CONDITIONS			
Peer	.35		
Organization	.01	MODE	
Goal Setting	.38	Listening	.07
Competition	.07	Reading	.54
Instructor	.04	Iconic	.31
Detail	.01	Direct Experience	.16
Independence	.01	EXPECTANCY	
Authority	.01	Superior	.01
CONTENT		Good	.02
Numeric	.93	Average	.01
Qualitative	.82	Failure	.01
Inanimate	.10		
People	.62		

Those components with no significant differences at the .05 level included Peer ($F = 1.11$, $df = 4/489$, $p = .35$), Goal Setting ($F = 1.04$, $df = 4/489$, $p = .38$), Competition ($F = 2.17$, $df = 4/489$, $p = .07$), Numeric ($F = .21$, $df = 4/489$, $p = .93$), Qualitative ($F = .38$, $df = 4/489$, $p = .82$), Inanimate ($F = 1.97$, $df = 4/489$, $p = .10$), People ($F = .66$, $df = 4/489$, $p = .62$), Listening ($F = 2.15$, $df = 4/489$, $p = .07$), Reading ($F = 1.17$, $df = 4/489$, $p = .54$), Iconic ($F = 1.19$, $df = 4/489$, $p = .31$), and Direct Experience ($F = 1.65$, $df = 4/489$, $p = .16$).

Significant differences were found in the Conditions area of Organization (see Table 13). The Organization

component measures the preference to approach course work logically, to have it clearly organized, to have meaningful assignments, and to have a meaningful sequence of activities. A Tukey analysis showed that those who had a high preference for organization achieved significantly higher grades than those who had a moderate preference for organization.

Significant differences were found in the condition area of Instructor (see Table 13). The Instructor component measures the preference for knowing the instructor personally, having a mutual understanding, and liking one another. A Tukey analysis showed that students who had a moderate preference for Instructor achieved significantly higher grades than those who had a high preference for the Instructor component.

Significant differences were found in the condition area of Detail (see Table 13). The Detail component measures the preference for specific information on assignments, requirements, and rules. A Tukey analysis showed that those who had a high, moderately high, moderate, and moderately low preference for detail achieved significantly higher grades than those who had a low preference for detail.

Significant differences were found in the condition area of Independence (see Table 13). The Independence component measures the preference for working alone and

independently, determining one's own study plan, and doing things for oneself. A Tukey analysis showed that those who had a low preference for independence achieved significantly higher grades than those who had a moderately high or moderate preference for independence. Also, those who had a moderately low or moderate preference for independence achieved significantly higher grades than those who had a moderately high preference for independence.

Table 13. ANOVA for Preferred Conditions of Learning in Business

	df	SS	MS	F	p
Organization	4	21.08	5.27	3.55	.01
Unexplained	489	724.79	1.48		
Instructor	4	15.27	3.82	2.55	.04
Unexplained	489	730.59	1.49		
Detail	4	28.73	7.18	4.89	.01
Unexplained	489	717.13	1.47		
Independence	4	56.51	14.13	10.02	.01
Unexplained	489	689.36	1.41		
Authority	4	25.37	6.34	4.40	.01
Unexplained	489	720.50	1.47		

Significant differences were found in the condition area of Authority (See Table 13). The Authority component measures the preference for discipline and maintenance or order, and the desire for having informed and knowledgeable instructors. A Tukey analysis showed that those who had a high, moderately high, or moderate preference for authority

achieved significantly higher grades than those who had a moderately low preference for authority.

Significant differences were found in the Superior Expectancy component (see Table 14). The Superior Expectancy component measures the expectations of the student to perform extremely well in a learning situation. A Tukey analysis showed that those who had high, moderately high, moderate, or moderately low expectations of achieving extremely well achieved significantly higher grades than those who had low expectations of achieving superior grades. Also, those who had high expectations of achieving extremely well achieved significantly higher grades than those who had moderately low expectations of achieving extremely well.

Significant differences were found in the Good Expectancy component (see Table 14). The Good Expectancy component measures the expectations of the student to achieve at a good level. A Tukey analysis showed that those who had moderate or moderately low expectations of achieving at a good level achieved significantly higher grades than those who had low expectations of achieving at a good level.

Significant differences were found in the Average Expectancy component (see Table 14). The Average Expectancy component measures the expectations of the student to perform at an average level. A Tukey analysis showed that

those who had low or moderately low expectations of achieving average achieved significantly higher grades than those who had high expectations of achieving average.

Significant differences were found in the Failure Expectancy component (see Table 14). The Expect Failure component measures the expectations of the student to achieve at a low or failing level. A Tukey analysis showed that those who had low or moderate expectations of achieving at a low or failing level achieved significantly higher grades than those who had a high expectation of achieving at a low or failing level.

Table 14. ANOVA for Expected Achievement in Business

	df	SS	MS	F	p
Superior	4	46.31	11.70	8.18	.01
Unexplained	489	699.06	1.43		
Good	4	25.43	6.36	4.32	.01
Unexplained	489	720.43	1.47		
Average	4	21.62	5.41	3.65	.01
Unexplained	489	724.24	1.48		
Failure	4	32.55	8.14	5.57	.01
Unexplained	489	713.32	1.46		

Vocational Subject Area

The Vocational subject area includes all vocational courses except those included in the Business subject area and there were 201 different student grades. Examples

include building trades, agriculture, and forestry courses. The results in this area were mixed, with significant differences in achievement among some of the learning style components and no significant differences among other learning style components (see Table 15).

Table 15. Levels of Significance for Vocational Subjects on CLSI Components

Learning Style	p	Learning Style	p
CONDITION			
Peer	.12		
Organization	.15	MODE	
Goal Setting	.07	Listening	.02
Competition	.46	Reading	.34
Instructor	.30	Iconic	.16
Detail	.10	Direct Expectancy	.01
Independence	.01	EXPECTANCY	
Authority	.01	Superior	.01
CONTENT		Good	.10
Numeric	.40	Average	.01
Qualitative	.97	Failure	.15
Inanimate	.01		
People	.01		

Those components with no significant differences at the .05 level included Peer (F = 1.88, df = 4/201, p = .11), Organization (F = 1.73, df = 4/201, p = .15), Goal Setting (F = 2.24, df = 4/201. p = .07), Competition (F = .91, df = 4/201, p = .46), Instructor (F = 1.23, df = 4/201, p = .30), Detail (F = 1.95, df =4/201, p = .10), Numeric (F = 1.08, df = 4/201, p = .40), Qualitative (F = .13, df = 4/201, p = .97), Reading (F = 1.14, df = 4/201, p = .34), Iconic (F = 1.65, df = 4/201, p = .16), Expect Good (F = 1.96, df =

4/201, p = .10), and Expect Failure (F = 1.72, df = 4/201, p = .15).

Significant differences were found in the condition area of Independence (see Table 16). The Independence component measures the preference for working alone and independently, for determining one's own study plan, and for doing things for oneself. A Tukey analysis showed that those who scored low, moderately low, or moderate preference for independence achieved significantly higher grades than those who had a high preference for independence.

Table 16. ANOVA for Preferred Conditions of Learning in Vocational Courses

	df	SS	MS	F	p
Independence	4	20.15	5.04	5.16	.01
Unexplained	201	196.04	.97		
a					
Authority	4	24.41	6.10	6.39	.01
Unexplained	201	191.79	.95		

Significant differences were found in the condition area of Authority (see Table 16). The Authority component measures the preference for discipline and maintenance of order, and the preference for having an informed and knowledgeable instructor. A Tukey analysis showed that those who had a high or moderately high preference for authority achieved significantly higher grades than those who had a low, moderately low preference for authority.

Also, those who had a moderately high preference for authority achieved significantly higher grades than those who had a moderately low or moderate preference for authority.

Significant differences were found in the Content area of Inanimate (see Table 17). The Inanimate component measures the preference for working with things and for building, repairing, designing, or operating those things. A Tukey analysis showed that those who had a high preference for inanimate content achieved significantly higher grades than those who had a moderately high or a moderately low preference for inanimate content. Also, those who had a moderate preference for inanimate content achieved significantly higher grades than those who had a moderately high preference for inanimate content.

Table 17. ANOVA for Preferred Learning Content in Vocational Courses

	df	SS	MS	F	p
Inanimate	4	28.52	7.13	7.63	.01
Unexplained	201	187.67	.93		
People	4	14.03	3.51	3.48	.01
Unexplained	201	202.16	1.01		

Significant differences were found in the Content area of People (see Table 17). The People component measures a preference for working with people by doing such things as

interviewing, counseling, selling, or helping. A Tukey analysis showed that those who had a moderately high preference for working with people achieved significantly higher grades than those who had a moderately low preference for working with people.

Significant differences were found in the Mode area of Listening (see Table 18). The Listening component measures the preference for learning by hearing information such as lectures, tapes, or speeches. A Tukey analysis showed that those who had a moderate preference for learning by listening achieved significantly higher grades than those who had a low preference for learning by listening.

Significant differences were found in the Mode area of Direct Experience (see Table 18). The Direct Experience component measures a preference for learning by engaging in an actual activity such as going on a field trip or working in a shop or laboratory. A Tukey analysis showed that those who had a low, moderate, or moderately high preference for learning by direct experience achieved significantly higher grades than those who had a high preference for learning by direct experience. Also those who had a moderately high preference for learning by direct experience achieved significantly higher grades than those who had a moderately low preference for learning by direct experience.

Table 18. ANOVA for Preferred Modes of Learning in Vocational Courses

	df	SS	MS	F	p
Listening	4	12.75	3.19	3.15	.02
Unexplained	201	203.44	1.01		
Direct Experience	4	22.58	5.64	5.86	.01
Unexplained	201	193.61	.96		

Significant differences were found in the Superior Expectancy component (see Table 19). The Superior Expectancy component measures the expectations of the student to achieve at a superior level. A Tukey analysis showed that those who had high or moderately high expectations of achieving at a superior level achieved significantly higher grades than those who had moderately low expectations of achieving at a superior level.

Table 19. ANOVA for Expected Achievement in Vocational Courses

	df	SS	MS	F	p
Superior	4	17.83	4.46	4.51	.01
Unexplained	201	198.36	.99		
Average	4	46.80	11.70	13.88	.01
Unexplained	201	169.40	.84		

Significant differences were found in the Average Expectancy component (see Table 19). The Average Expectancy component measures the expectancy of the student to achieve

average. A Tukey analysis showed that those who had low, moderately low, moderate, or moderately high expectations of achieving average achieved significantly higher grades than those who had high expectations of achieving average.

Native American Studies Subject Area

The Native American studies area includes all types of courses which involve the Native American culture. Courses include Native American history, art, music, and language courses. In this area, there were only two components which showed any significant difference in achievement at the .05 level (see Table 20).

Table 20. Significance Levels for Native American Studies on CLSI Components

Learning Style	p	Learning Style	p
CONDITION			
Peer	.86		
Organization	.19	MODE	
Goal Setting	.06	Listening	.63
Competition	.11	Reading	.29
Instructor	.40	Iconic	.47
Detail	.22	Direct Experience	.07
Independence	.03	EXPECTANCY	
Authority	.95	Superior	.10
CONTENT		Good	.50
Numeric	.51	Average	.04
Qualitative	.10	Failure	.77
Inanimate	.35		
People	.77		

Those components which showed no significant difference at the .05 level included Peer ($F = .32$, $df =$

4/91, p = .86), Organization (F = 1.57, df = 4/91, p = .19), Goal Setting (F = 2.40, df = 4/91, p = .06), Competition (F = 1.96, df = 4/91, p = .11), Instructor (F = 1.02, df = 4/91, p = .40), Detail (F = 1.46, df = 4/91, p = .22), Authority (F = .18, df = 4/91, p = .95), Numeric (F = .83, df = 4/91, p = .51), Qualitative (F = 1.98, df = 4/91, p = .10), Inanimate (F = 1.13, df = 4/91, p = .35), People (F = .45, df = 4/91, p = .77), Listening (F = .64, df = 4/91, p = .63), Reading (F = 1.27, df = 4/91, p = .29), Iconic (F = .90, df = 4/91, p = .47), Direct Experience (F = 2.24, df = 4/91, p = .07), Superior Expectancy (F = 2.00, df = 4/91, p = .10), Good Expectancy (F = .85, df = 4/91, p = .50), and Expect Failure (F = .46, df = 4/91, p = .77).

Significant differences were found in the preferred Condition area of Independence (see Table 21). The Independence component measures the preference for working alone and independently, determining one's own study plan, and doing things for oneself. A Tukey analysis showed that those who had a moderately low preference for independence achieved significantly higher grades than those who had a moderate preference for independence.

Table 21. ANOVA for Preferred Conditions of Learning in NAS

	df	SS	MS	F	p
Independence	4	12.33	3.08	2.82	.03
Unexplained	91	99.66	1.09		

Significant differences were found in the Average Expectancy component (see Table 22). The Average Expectancy component measures the expectations of the student to achieve average grades. A Tukey analysis showed that those who had low expectations of achieving average grades achieved significantly higher grades than those who had moderately high expectations of achieving average grades.

Table 22. ANOVA Expected Achievement in NAS

	df	SS	MS	F	p
Average	4	11.67	2.92	2.65	.04
Unexplained	91	100.33	1.10		

Developmental Studies Subject Area

The Developmental Studies subject area includes all remedial types of courses and there were 86 different student grades Examples include Reading improvement, Math improvement, Writing improvement, and Studies skills. The results in this area were mixed, with significant differences in achievement among some of the learning style components and no significant differences among other learning style components (see Table 23).

Those components with no significant differences at the .05 level included Peer (F = .87, df = 4/86, p = .49), Organization (F = .22, df = 4/86, p = .93), Goal Setting (F

= 1.17, df = 4/86, p = .33), Instructor (F = .38, df = 4/86, p = .82), Detail (F = 1.07, df = 4/86, p = .38), Numeric (F = 1.55, df = 4/86, p = .19), People (F = 1.16, df = 4/86, p = .34), Listening (F = .97, df = 4/86, p = .43), Reading (F = 1.06, df = 4/86, p = .38), Iconic (F = 1.53, df = 4/86, p = .20), Good Expectancy (F = 1.20, df = 4/86, p = .32), Average Expectancy (F = 2.07, df = 4/86, p = .09), and Failure Expectancy (F = .67, df = 4/86, p = .62.

Table 23. Overview of Levels of Significance for Developmental Studies

Learning Style	p	Learning Style	p
CONDITIONS			
Peer	.49		
Organization	.93	MODE	
Goal Setting	.33	Listening	.43
Competition	.05	Reading	.38
Instructor	.82	Iconic	.20
Detail	.38	Direct Experience	.01
Independence	.01	EXPECTANCY	
Authority	.01	Superior	.01
CONTENT		Good	.32
Numeric	.19	Average	.09
Qualitative	.01	Failure	.62
Inanimate	.01		
People	.34		

Significant differences were found in the Condition area of Competition (see Table 24). The Competition component measures the preference for comparison with others and the need to know how one is doing in relation to others. Although the one-way ANOVA showed a significant difference

at the .05 level, a Tukey analysis showed no two pairs were significantly different.

Significant differences were found in the Condition area of Independence (see Table 24). The Independence component measures the preference for working alone and independently, determining one's own study plan, and doing things for oneself. A Tukey analysis showed that those who had a moderately low preference for independence achieved significantly higher grades than those who had a high preference for independence.

Table 24. ANOVA for Preferred Conditions of Learning in Developmental Courses

	df	SS	MS	F	p
Competition	4	19.31	4.83	2.51	.05
Unexplained	86	165.22	1.92		
Independence	4	26.57	6.64	3.62	.01
Unexplained	86	157.96	1.84		
Authority	4	30.90	7.73	4.32	.01
Unexplained	86	153.62	1.79		

Significant differences were found in the Condition area of Authority (see Table 24). The Authority component measures the preference for discipline and maintenance or order, and the desire for having informed and knowledgeable instructors. A Tukey analysis showed that those who had a moderate or moderately high preference for Authority

achieved significantly higher grades than those who had a moderately low preference for Authority.

Significant differences were found in the Content area of Qualitative (see Table 25). The Qualitative component measures a preference for working with words or language and a desire to write, edit, or talk. A Tukey analysis showed that those who had a moderately high or moderate preference for Qualitative content achieved significantly higher grades than those who had a moderately low preference for Qualitative content.

Table 25. ANOVA for Preferred Content in Developmental Courses

	df	SS	MS	F	p
Qualitative	4	28.86	7.21	3.99	.01
Unexplained	86	155.67	1.81		
Inanimate	4	27.75	6.94	3.81	.01
Unexplained	86	156.77	1.82		

Significant differences were found in the Content area of Inanimate (see Table 25). The Inanimate component measures a preference for working with things and for building, repairing, designing, or operating those things. A Tukey analysis showed that those who had a low preference for Inanimate content achieved significantly higher grades

than those who had a moderate preference for Inanimate content.

Significant differences were found in the Mode area of Direct Experience (see Table 26). The Direct Experience component measures a preference for learning by engaging in an actual activity such as going on a field trip, working in a shop or laboratory, or doing practice exercises. A Tukey analysis showed that those who had a low or moderate preference for learning by direct experience achieved significantly higher grades than those who had a high preference for learning by direct experience.

Table 26. ANOVA for Preferred Content in Developmental Courses

	df	SS	MS	F	p
Direct Experience	4	26.46	6.61	3.59	.01
Unexplained	86	158.07	1.84		

Significant differences were found in the Superior Expectancy component (see Table 27). Superior Expectancy component measures the expectations of the student to achieve at an extremely high level. A Tukey analysis showed that those who had moderately high expectations of achieving at an extremely high level achieved significantly higher grades than those who had moderate expectations of achieving at an extremely high level.

Table 27. ANOVA for Expected Achievement in Developmental Courses

	df	SS	MS	F	p
Superior	4	28.17	7.04	3.87	.01
Unexpected	86	156.36	1.82		

Physical Education Subject Area

The Physical Education subject area includes courses in which physical activity is involved and there were 86 student grades in the Physical Education subject area. The only significant difference in this area at the .05 level was in the Peer component (see Table 28).

Table 28. Levels of Significance for Physical Education Students on CLSI Components

Learning Style	p	Learning Style	p
CONDITIONS			
Peer	.01		
Organization	.48	MODE	
Goal Setting	.46	Listening	.97
Competition	.41	Reading	.81
Instructor	.34	Iconic	.82
Detail	.76	Direct Experience	.87
Independence	.95	EXPECTANCY	
Authority	.20	Superior	.32
CONTENT		Good	.34
Numeric	.52	Average	.07
Qualitative	.45	Failure	.37
Inanimate	.92		
People	.38		

Those components with no significant differences in achievement at the .05 level included Organization (F = .87, df = 4/86, p = .48), Goal Setting (F = .91, df = 4/86, p = .46), Competition (F = 1.00, df = 4/86, p = .41), Instructor (F = 1.13, df = 4/86, p = .34), Detail (F = .47, df = 4/86, p = .76), Independence (F = .18, df = 4/86, p = .95), Authority (F = 1.55, df = 4/86, p = .20), Numeric (F = .81, df = 4/86, p = .52), Qualitative (F = .92, df = 4/86, p = .46), Inanimate (F = .23, df = 4/86, p = .92), People (F = 1.06, df = 4/86, p = .38), Listening (F = .13, df = 4/86, p = .97), Reading (F = .40, df = 4/86, p = .81, Iconic (F = .39, df = 4/86, p = .82), Direct Experience (F = .31, df = 4/86, p = .87), Superior Expectancy (F = 1.19, df = 4/86, p = .32), Good Expectancy (F = 1.15, df = 4/86, p = .34), Average Expectancy (F = 2.25, df = 4/86, p = .07), and Failure Expectancy (F = 1.09, df = 4/86, p = .37).

Table 29. ANOVA for Preferred Conditions of Learning in Physical Education

	df	SS	MS	F	p
Peer	4	17.92	4.48	5.03	.01
Unexplained	86	76.52	.89		

Significant differences were found in the preferred Conditions area of Peer (see Table 29). The Peer component measures the preference for working in student teams, for having good relations with other students, and having

student friends. A Tukey analysis showed that those who had a moderate, moderately high, or low preference for good peer relationships achieved significantly higher grades than those who had a high preference for good peer relationships.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to investigate the effect of an individual's learning style on achievement in eight subject areas among Native American students in the tribal colleges in Montana. The eight subject areas chosen were Liberal Arts, Science, Math, Business, Vocational, Native American Studies, Developmental, and Physical Education. The learning styles were analyzed according to the components of learning style as described in the Canfield Learning Styles instrument. The CLSI was completed by students in the tribal colleges during the Winter Quarter of 1987. The grades used were from all courses taken Fall and Winter Quarters of the 1986-1987 academic year.

The analysis of the data showed that there were a number of significant differences in achievement depending on learning style (see Table 30). Each of the eight subject areas had at least one component which produced a difference. The Liberal Arts subject area had significances in Peer, Organization, Authority, Qualitative, People, Direct Experience, and Superior and Average Expectancy. Science had a significant difference in the Direct Experience component. Math had significances in the Numeric

Table 30. Significant Learning Characteristics in Subject Areas

Char	LA	Sci	Math	Bus	Voc	NAS	Dev	PE
Peer	.01							.01
Organization	.05			.01				
Goal setting								
Competition							.05	
Instructor			.05	.04				
Detail				.01				
Independence				.01	.01	.03	.01	
Authority	.03			.01	.01		.01	
Numeric			.01					
Qualitative	.01						.01	
Inanimate					.01		.01	
People	.02				.01			
Listening					.02			
Reading								
Iconic			.05					
Direct Exper	.01	.01			.01		.01	
Superior Expec	.01			.01	.01		.01	
Good Expec				.01				
Average Expec	.01			.01	.01	.04		
Failure Expec				.01				

and Iconic components. Business had significances in the Organization, Instructor, Detail, Independence, Authority, and Superior, Good, and Average Expectancies. The Vocational subject area had significances in the Independence, Authority, Inanimate, People, Listening, Direct Experience, and Superior, Average, and Failure Expectancies. Native American Studies had significances in the Independence and Average Expectancy components. Developmental had significances in Competition, Independence, Authority, Qualitative, Inanimate, Direct Experience, and Superior Expectancy. Physical Education had

significance in the Peer component. This represents a total of 38 significances over all subject areas. This is important because it demonstrates that certain learning style characteristics are in all probability assets to the student in achieving in each subject area.

Liberal Arts

The Liberal Arts subject area had eight components which were of significance. These were Peer, Organization, Authority, Qualitative, People, Direct Experience, Superior Expectancy, and Average Expectancy. Students who had a high or moderate preference for peer relationships, a high preference for authority and working with people, a moderate preference for qualitative content, and a low preference for learning by direct experience, and who expected to achieve high grades, achieved significantly better grades than those who did not have these preferences.

The student's relationship with his/her peers is significant in achievement in this area. Although those with a high peer preference achieved extremely well, there were only 21 in this group. On the other hand, the moderate peer preference was a very large group with 132 student grades. The results indicate that those who are friendly with their peers are the ones who do well in liberal arts courses. Assisting students who have a low preference in

this group to develop skills in group participation, therefore, might help achievement in this area.

Organization is important in the liberal arts area. However, the Tukey did not discriminate among differing groups. Since the SPSS program restricts a posteriori analysis with the Tukey to the .05 level, the Duncan was used for additional exploration because the Duncan allows for user control of the alpha level. This less powerful test indicated differences at the .05 level. It did not show where the significance between groups was. The Duncan shows that those with a high preference for organization in liberal arts achieved at a significantly higher level than all other groups. Instructors should be aware that those who prefer a less structured classroom may not achieve as well as those who prefer a structured learning environment.

The Authority component showed that those who had a high preference for authority achieved significantly better grades than those who had a moderate preference for authority. The instructors should be aware that there are those students in their classes who may not be doing as well because they have a preference for a less disciplined and less structured class.

In the Content area, those who had a moderate preference for qualitative content performed significantly better in liberal arts courses than those who had a moderately low preference for qualitative content. There

were 164 cases in the moderate preference group. However, those who had a low preference performed at an even higher level than did the moderate group but the group was extremely small with only 25 cases. This group was too small to be significant. Preference for qualitative content is important in the liberal arts courses, but apparently only a moderate preference. This could be because the People component showed itself to be even more important.

Those students who had a high preference for working with people achieved significantly higher than those with a moderately high, moderate, or moderately low preference for working with people. These students also achieved at a higher level than those with a low preference. People skills are extremely important in the liberal arts courses. This, perhaps, should not be too surprising because many of these courses such as psychology and sociology are very people-oriented and in the tribal colleges, there are a large number of students enrolled in the human services courses which are also people-oriented. The student who is going to enroll in these courses needs to be assisted in his/her communications skills, and the instructor needs to be aware that the student, who shows a low preference for people, needs to be assisted so that he/she can achieve at a higher level in these courses.

Those who had a low or moderate preference for learning by engaging in an actual activity achieved at a significantly higher level than those who had a moderately low preference for learning by direct experience. Those who had a high preference for learning by direct experience performed at a very high level, but there were only eight cases in this group. Preference for direct experience does make a difference in achievement. Perhaps the reason it does not seem very clear cut is because the People component was so very important, and the Canfield a forced choice instrument. If the participant indicates his/her highest preference for people, that participant cannot also indicate direct experience as the highest choice but must give it a lower rating. It may also be that these courses are not usually taught in a fashion which would take advantage of a preference for direct experience.

Expectancy for levels of achievement is very important in the Liberal Arts subject area with those who expected to achieve high grades achieving significantly better than all other groups. This demonstrates the importance of a high self-image in learning situations. Those students who think they will do well usually do. On the other hand, those who had a low or moderately low expectation for performing at an average level performed at a significantly higher level than those who had a high expectation of performing at an average level. The importance of this information is that the

instructor may be able to improve the level of performance of his/her students to some extent by helping the students to have a higher expectation of their level of achievement. This can be done by praising the student and by demonstrating that the student can perform well in the class. The student should be assisted in setting realistic goals and defining how the student will achieve those goals. If the instructor does this, the student will be more likely to believe he/she can achieve at a higher rate.

Science

Preference for learning by Direct Experience was the only component which showed a significant difference in the Science area. Although this area only had 78 cases, students who had a low or moderate preference for learning by direct experience achieved at a significantly higher level than those who had a high preference for learning by direct experience. This is probably due to the current teaching practices in the tribal colleges. Because of limited laboratory facilities, science courses in the tribal colleges do not concentrate on the laboratory aspects of the science courses. Rather, they tend to be courses of a theoretical nature where direct experience would not be very useful in achieving grades. While this type of organization of the science courses appears to be meeting the needs of those who do not have a preference for direct experience,

instructors may want to experiment with more laboratory type classes to see if improvement is improved for those who have a strong preference for direct experience.

Mathematics

The Mathematics subject area had three components which were of significance. These were Numeric, Iconic, and Instructor. However, this sample of 33 was too small to have any meaningful statistical significance to this study. These analyses showed that students who had a preference for working with numbers achieved significantly better grades than those who did not have this preference. Learning through the Iconic mode and a low preference for warm, friendly relationships with their instructor may have an effect on achievement. Although the sample size was too small to be of any useful significance, the relationships were explored to indicate trends.

Preference for warm friendly relationships with the Instructor was a significant component in the Mathematics subject area. Unfortunately, this was another of those components where there were no significant pairs in the Tukey. It is important to remember that the mathematics sample was extremely small with only 33 cases. In looking at the numbers, the group with a low preference for warm, friendly relations with the instructor had the highest achievement level, with the moderately low coming next,

followed by the moderate and moderately high preferences. If the cell sizes had been larger and if these trends had been maintained with this larger sample, it might mean that warm, friendly relationships with the instructor affected mathematics negatively. However, this cannot be scientifically stated with the statistics available.

Another component that showed significance was the Numeric component. It showed that those with a high preference for numeric content achieved significantly higher grades than those who had a moderately low preference for numeric content. However, those who had a moderately high, moderate, and low preference also achieved significantly higher than those who had a moderately low preference for numeric content. Again, this could indicate that one of the most important factors in success in mathematics is that the students like the subject content. This would seem to have implications for those teaching this subject. If the instructors could get their students to like mathematics, they would have gone a long way towards having their students achieve at a high level in their courses.

The preference for learning through the Iconic mode was a significant factor in achievement among mathematics students. However, there were no significant pairs on the Tukey. Again, this was a small sample; therefore, it was difficult to have any significant pairs. If this component had had larger cell sizes and if the ANOVA significances had

held up this would have been very important. This is because the Iconic component measures a preference for learning by viewing movies, slides, pictures, or graphs. This component can involve symbols, and since mathematics involves a symbolic language, the data suggests that this could be an important factor. In looking at the groups those with a high preference for the Iconic mode had the highest achievement level, followed by moderately high, moderate, moderately low, and low in that order, which would lead us to expect that those who prefer to learn visually and symbolically do achieve at a higher level in mathematics than those who do not have this preference. This could also mean that the instructor needs to look for ways to address the needs of those who prefer to learn by listening or by direct experience, and there are methods that could be employed in math instruction to assist those students.

Business

There were several components which showed a significant difference in achievement in the Business subject area. Those with a high preference for Organization, Detail, and Authority achieved better grades than those with other preferences. Those with a moderate preference for warm, friendly relationships with their instructors and a low preference for independence also achieved better grades

than those who did not have those preferences. Also, the higher the expectation for high achievement in learning activities, the better grades those students achieved.

Those who had a high preference for Organization achieved significantly higher grades than those who had a moderate preference for organization. Those who achieved high grades in the business courses were those who liked a logical approach, a course which is well-organized and laid out in a logical sequence from beginning to end. Those who have the opposite approach to learning did not do as well in business subjects. Perhaps counseling should be done to direct those with this preference for logic and order to the business area. What can be done to assist those who do not prefer to approach everything logically? Those who do not have a preference for logic and order should not be excluded from the business subject area because among this group are a number of very creative people, and business needs creativity. Although many business positions need to be filled by logical, methodological people, the top management needs to be filled by innovative, creative people--the idea people. Perhaps the instructors in the business subjects should give more opportunity for students to show creativity through creative problem-solving activities. If this were a part of business courses, the creative but non-logical student could have a better chance for success in business courses.

Those who had a moderate preference for good relationships with their business instructors achieved at a significantly higher level than those who had a high preference for good instructor relationships. The business courses tend to be more formal than some other areas. However, it could be helpful to the student with a high preference for Instructor to have more discussions in which the instructor became more involved in the discussions with the students.

Detail was a significant component in achievement in the Business subject area. Those with a high preference for detail achieved extremely well in comparison with those who had a low preference for detail. This is not too surprising when one considers the importance of detail in such subjects as accounting, typing, shorthand, and word processing. Again, though, instructors should provide for those who like to look at the big picture.

Those who had a low preference for Independence achieved significantly higher grades than those who had a moderately high or moderate preference for independence. Also, those who had a moderately low or moderate preference for independence achieved significantly higher grades than those who had a moderately high preference for independence. In business it is important for employees to work together. Those people with a moderately high preference for independence like to work on their own. Therefore, this

could be detrimental to the normal business atmosphere and success in the business classroom. Again, this may be prejudicial to the individual who prefers to work alone. This type of individual should have a place in the business world and the business classroom. This type of student should be given independent projects to work out which will end up being of value to the class as a whole.

The Authority component showed that those who had a high, moderately high, or moderate preference for authority achieved significantly higher grades than those who had a moderately low preference for authority. In other words, those who wanted to have their instructors manage the classroom were the ones who achieved at the highest level in the business courses. Business needs those people who like to have their activities laid out for them. However, as stated before, business needs those independent folks as well. The instructor should provide activities which provide opportunities for working independently as well as activities which encourage following directions.

In the Expectancy area, again those who expected to do extremely well in learning activities usually did achieve very well. Those who had a moderate or moderately low expectation of achieving a good level achieved the highest grades; those who had a low expectation of achieving at an average level achieved the highest grades; and those who had a low expectation of failure achieved the highest

grades. This can be summed up by saying that the higher the expectations of the student, the better the student will achieve in the business courses. Again, it is extremely important for the instructor to build the self-esteem of the student wherever possible by assisting the student in setting up reasonable goals and direction on how to achieve those goals.

Vocational

Students who have a preference for authority and working with inanimate content and people achieve better grades in vocational courses than those who do not have these preferences. Those who have a preference for direct experience and independence do not achieve as well as those who do not have strong preferences in these areas and expecting to achieve well continued to be an important factor in achieving well in yet another subject area.

The Independence component was significant in the Vocational subject area. Those who had a low, moderately low, or moderate preference for independence achieved significantly higher grades than those who had a high preference for independence. This means that those who achieved high grades in the vocational courses did not prefer to work independently. The very nature of the courses mean that there is a necessity for working co-operatively rather than independently. The instructor

should provide activities for those who choose to work independently.

In the Vocational subject area students also achieved well by comparison when they had a high or moderately high preference for the Authority component. It appears that the successful students do not want to work independently but prefer to have their instructors be well-informed and the classroom well-ordered. For the most part, these will be employees who will be well-supervised and need to take orders. Thus, the classroom is reinforcing students who have preferences which coincide with real world working conditions. The student who does not have these preferences should probably be counseled into another area.

Those students who achieved the highest grades in the Vocational subject area had a strong preference for Inanimate content. The definition of the Inanimate content component was preference for working with things and for building, repairing, designing, or operating those things. Vocational subjects include subjects such as construction, plumbing, electrical work, and agriculture. All of these are subjects that are involved with things--building, repairing, designing, and operating things.

Surprisingly then, vocational subject students who achieved the highest grades also showed a moderately high preference for working with people. The preference for people probably arises from the fact that there are some

vocational subjects such as sales where working with people is important. Also, these people will have to work with their co-workers.

Those students who had a moderate preference for Listening achieved significantly higher grades than those with a low preference for listening. This is probably because many directions for these vocational subject activities are given orally by an authority figure so that while listening does not appear to be critical to the extent that it must be a strong preference, a person who is not at all successful at listening does not appear to do well in vocational subjects.

Those students with a low, moderate, or moderately high preference for learning by direct experience achieved significantly higher grades than those who had a high preference for learning by direct experience. Since vocational subjects are typically courses where the students are learning to do things, this was surprising. Can it be that the vocational courses in the tribal colleges are not being taught or tested in this way? Perhaps the theoretical is being stressed because of lack of equipment to work on.

Finally, in the Expectancy area, those students who expected to achieve extremely well did so, and those who expected to achieve average did not achieve as well. So, in yet another subject area self-esteem appears to be crucial.

Native American Studies

A moderately low preference for working independently resulted in higher grades for those students having a moderately low preference for Independence preference than those who had other preferences. Also those who did not expect to achieve average grades achieved higher grades than those who expected to achieve average grades in Native American Studies courses.

In the Native American Studies subject area, the independence component showed that those who had a moderately low preference for independence achieved significantly higher grades than those who had a moderate preference for independence. The low preference group had high achievement also but was too small with seven in the group to allow a meaningful interpretation. Native Americans have a tradition of working together so it is not too surprising that a person who does not prefer to work independently would achieve at a higher rate in one of their cultural classes.

The only other significance in the Native American subject area was the Average Expectancy component where those who had low expectations of achieving average grades achieved significantly higher grades than those who had moderately high expectations of achieving average grades. This agrees with other subject areas. Those who expect to achieve only average do not get the best grades. Also, the

forced choice aspect of the Canfield indicates that their preference was in other areas.

Developmental Studies

Competition was a significant component in the Developmental Studies area. Also, those who did not prefer to work independently, those who had a moderate or moderately high preference for authority, and those who had a moderately high or moderate preference for qualitative content achieved higher grades than those with different preferences. Those who had a low preference for inanimate content and a low or moderate preference for learning by direct experience also achieved higher grades than those who did not have these preferences. Finally, those who had moderately high expectations of achieving high grades achieved higher grades than those who did not expect to achieve high grades.

The Competition component was a significant component in the Developmental studies area. This was the only subject area where this was true. The Tukey did not discriminate among differing groups. Since the SPSS program restricts a posteriori analysis with the Tukey to the .05 level, the Duncan was used for additional exploration because it allows for user control of the alpha level. This less powerful test indicated differences at the .05 level. The Duncan indicated that those who had a low preference for

competition achieved at a significantly higher level than those who had a moderately high or moderate preference for competition. It must be remembered that the competition referred to on the CLSI is external competition. In most developmental courses, the students are usually working at their own speed as they try to master the developmental course. It may be that what competition exists is competition with him/herself in order to meet his/her goal.

The component of Independence showed that those who had a moderately low preference for independence achieved significantly higher grades than those who had a high preference for independence. Although the student does work at his/her own rate, the developmental student is typically very dependent on the instructor and feels inadequate because he/she is in a developmental course. The student who is doing developmental course work probably feels too inadequate because of his/her deficiency to dare to work in a state of total independence. Those who would have such a desire probably would not work with the instructor as much as he/she should and this could explain the lower grades. Also, the Native American students are acclimated to this instructor dominance from their public school days. The Developmental Studies program is perpetuating this status quo.

The Authority component showed that those who had a moderate or moderately high preference for authority

achieved significantly higher grades than those who had a moderately low preference for authority. These are usually people who realize that they need help and prefer to have their instructor help them. They, therefore, tend to want course work that is designed for them. Although they know what their deficiencies are, they depend on the instructor to work with them to help them determine what they should do to correct those deficiencies.

Those who had a moderately high or moderate preference for Qualitative content achieved significantly higher grades than those who had a moderately low preference for qualitative content. Reading is a very important part of developmental courses. If the preference for working with words or language and writing, editing, or talking is not present, it would be very difficult to succeed in courses like remedial reading or writing. It is difficult enough to achieve when one has such deficiencies, but if the student did not have at least a moderate desire for learning about these topics, it would be very difficult for him/her to succeed.

The Inanimate content showed that those who had a low preference for this component achieved significantly higher grades than those who had a moderate preference for Inanimate content. The inanimate component measures a preference for working with things and for building, repairing, designing, or operating those things. Very

little, if any, of these activities take place in the developmental courses. Rather, the student is engaged in improving with such courses as reading, writing, or math. None of these is involved with working with things. Those who are involved in the study of learning styles know that there are ways of involving things and using the sense of touch in the learning of some of these activities, but the typical developmental course instruction does not do this.

Related to this is the Direct Experience component which showed that those who had a low or moderate preference for learning by direct experience achieved significantly higher grades than those who had a high preference for learning by direct experience. Again, there is not much chance for learning by direct experience in these developmental courses.

Although the Expectancy results were not as pronounced in this subject area as in some of the other areas, those who had a moderately high expectation of achieving well in learning activities achieved higher grades than those who had moderate expectations of achieving extremely well. This points out once again that expecting to do well usually results in the student achieving at a higher level.

Physical Education

The only component which had a significant difference in the Physical Education subject area was the Peer

component. Those who had a moderate, moderately high, or low preference for good peer relationships achieved significantly higher grades than those who had a high preference for good peer relationships. These findings may be surprising. In competitive sports, teamwork is extremely important. However, it may mean that the person who has an extremely high preference for good peer relationships may be concentrating too much on the people and not enough on the activitity, so that while some preference for peer relationships is important in physical education courses, there needs to be a balance between the personal interaction and the skills being developed.

Conclusions

An analysis of the eight subject areas indicates that different factors are associated with academic success in each subject area. In fact, in no subject area were exactly the same learning style components significant (see Table 30).

There were several components which were associated to achievement in four subject areas. The Independence component was important in four areas--Business, Vocational, Native American Studies, and Developmental courses. Authority was also important in four areas--Liberal Arts, Business, Vocational, and Developmental. Direct Experience was significant in the four areas of Liberal Arts, Science,

Vocational, and Developmental. Superior Expectancy was significant in Liberal Arts, Business, Vocational, and Developmental. Average Expectancy was significant in Liberal Arts, Business, Vocational, and Native American Studies. These components would appear to affect the largest number of students, and, therefore, a great deal of attention should be paid to these particular components. Instructors should be made aware of their importance to students, and counselors should be given this information so that they can assist students in developing learning strategies.

Also, special attention should be paid to the Expectancy division. Five subject areas are affected by this area of the CLSI. The three subject areas which did not have significances in this area were Physical Education, which is largely a physical activity; Science; and Math. Science and Math both had small numbers which limited this analysis. Therefore, for the vast majority of the students, expectancy is important. Furthermore, the results showed that if students expect to do well, they will do well. This places a heavy burden on the instructor to build up the self-esteem of the Native American student. Too many times, students have said that they have been told by elementary or secondary teachers that they cannot do a particular learning activity in school. Now the college instructor has to

create an environment where these students feel that, indeed, they can do anything they really want to do.

There were several components which were important to only two subject areas. In each case, what do these two areas have in common? Peer was significant in the Liberal Arts and the Physical Education areas. While a cursory observation may suggest that two areas have very little in common, it appears that working with people is important in both areas. Organization is important in both Liberal Arts and Business. These two subject areas are not quite as diverse as the former two areas, but having the course well organized is significant to both of these subject areas. Warm, friendly relations with the instructor was significant to both Math and Business. However, in Math a preference for these warm, friendly relations with the instructor had a negative impact on academic achievement whereas in Business a moderate preference had a positive effect on achievement. Qualitative content was important in both Liberal Arts and Developmental courses.

The components of Goal Setting and Reading were not significant in any subject areas. At least in this study, they are not related to achievement. The components of Competition, Detail, Numeric, Listening, Iconic, Good Expectancy, and Failure Expectancy are significant in only one subject area. Competition was significant only to the Developmental area, Detail was significant only to Business,

and Numeric was significant only to Math. Also, Listening was significant only to Vocational, Iconic was significant only to Math, and both Good Expectancy and Failure Expectancy were significant only to Business. Instructors of those areas should pay special attention to those components as being especially important to their subject areas.

Learning styles are important to the success of the Native American student and this has a number of implications. What can be done with this knowledge? First, teachers can make the student aware that he/she has certain preferences with regard to learning styles. These preferences should be supported and nourished to help the students use their strengths in each subject to learn. Secondly, the student can be counseled to use certain learning strategies to better cope with the peculiarities of the different subject areas which this study has shown to be unique. Thirdly, it is not known whether the subject areas are different because of the innate differences between them, the fact that the instructors in those subject areas approach them differently, or a combination of the two. Certainly the instructor could try some variety in teaching methods. If a student cannot seem to achieve under the standard method, another teaching technique which is compatible with another learning style could be tried.

Instructors of Native Americans in the Liberal Arts subject area should (a) improve students' interpersonal

skills, (b) provide for those students in their classes who may not be doing as well as they could because they have a preference for a less disciplined and less structured class, and (c) try different teaching methods occasionally to help those who prefer to learn by direct experience. Also, these instructors should provide for building of self-esteem.

Instructors of Native Americans in the Science area should include more laboratory activities in this area. This will give those students with a preference for learning by direct experience a better chance of high achievement.

Little can be said about Mathematics because of the small sample size. However, the trends may indicate that instructors of Native Americans in the Math area should seek to inspire in their students a greater appreciation of working with numbers and maintain an awareness that the iconic mode appears to induce higher achievement. If the trends were to be followed, the instructor could take one of two approaches. He/she could assist the student in learning better iconically, or he/she could introduce activities into the math class which make use of other learning style modes.

Instructors of Native Americans in the Business area should (a) encourage counseling to direct those students who have a preference for logic and order to the business area, (b) have activities such as case studies which encourage the independent students, the non-methodological students and those with a low preference for detail to use their

creativity in the business area, and (c) build the self-esteem of their students.

Instructors of Native Americans in Vocational subjects should (a) assist their students to work more cooperatively, (b) provide activities for those students who need to work independently, (c) help students in improving skills in working with people, and (d) help students to develop better listening skills but give directions which can be read as well as those that can be listened to. Those students who do not wish to work with inanimate content should probably be directed to other subject areas. Also, instructors should be aware that perhaps more direct experience should be introduced into their course work. Finally, build up the self-esteem of the students.

Instructors of Native Americans in the Native American Studies subject area should assist those who prefer to work independently. They should also work to improve the self-esteem of their students.

Instructors of Native Americans in the Developmental studies subject area should encourage the desire of the student to compete with his/herself in order to meet his/her goal. Also, the instructor should be aware that those students who prefer to work independently in these courses may find their grades in jeopardy. Therefore, the student should be counseled on the need for working with the instructor. The students in these courses need to realize

the importance of the qualitative content preference in this area if they are to succeed. Things/gadgets can be introduced for the benefit of those who prefer inanimate content. Also, activities to benefit those who prefer direct experience should be introduced. Build self-esteem.

Instructors of Native Americans in the Physical Education subject area need to be assisted in working cooperatively with others in the physical education courses. They also need to be aware that some students need counseling in achieving a balance between peer relationships and skill development.

There are important conclusions to be drawn for overall education. Bloom (1976) said that what any person in the world can learn, almost all persons (95%) can learn if provided with appropriate prior and current conditions of learning. Bloom was referring to two major factors: the time allowed for the student to learn and the ways in which the student is encouraged to learn (learning styles). The fact that almost any student can learn almost anything is exciting. This is far different from the conventional educational system where most instructors require that all students learn by the same methods and within the same time constraints. If time and methods allow students to learn more effectively, why aren't the educational institutions paying attention to this?

If massive changes are to take place in these basic philosophic issues which dominate our educational institutions, staff training must be introduced on a widespread scale throughout the country and at all levels. The administrators, instructors, and other staff who are actively involved in teaching and counseling students must become aware of the importance of learning styles and mastery learning concepts. Once the importance of these has made its mark on education, the necessary changes in methods will become apparent. Faculty/staff development in these methods will be seen as necessary.

This concept calls the whole grading system into question. Most instructors require that all students take the class exam at the same time despite the fact that individuals learn and grow at different intellectual rates. Exam grades for those students who are not quite ready to take the exams do not show an accurate picture of what these students have actually learned before the course is completed (Page, 1984). Also, students are rushed along to more advanced learning activities before they have mastered the more elementary activities. If these students are allowed more time and different methods of learning, Bloom's 95% could get A's in most courses. This is in direct contrast with the usual method of grading by using the bell-shaped curve where only a small percentage can possibly get A's.

According to Cross (1976), the normal curve is a curve which demonstrates the results of random processes. She maintains that if no factors are operating except chance, the result is the normal curve. Do educators really want to leave academic grading to chance or do they want their students to learn? Taking advantage of the knowledge of learning styles, strategies, and mastery learning can allow students to learn. If the goal is for a normal curve, then an instructor who has more than the usual number of A's in the class is too "easy." However, if the goal is for the students to learn, which Bloom and Cross maintain they can do, then the teacher who gives more than the usual number of A's for this learning is a truly excellent teacher. Attention to learning styles, strategies, and the time to learn is all that is necessary to learn and to succeed.

What happens to the whole concept of "slow" learners, dumb students, 70 IQ, and the disadvantaged learner? If, in fact, 95% of these students can learn almost anything, we need to change the labels. In this new educational world, only 5% are rated as unable to learn adequately. However, learning would be raised to a new height as yet unknown to mankind, a world in which almost everyone is learning, and this study has supported Bloom's concept that learning methods (learning styles) assist this 95% in learning. Also, in this world, society could see progress such as it has never seen before.

Further Research

This study is a preliminary step in the study of the effect of learning styles on achievement with minority groups. It used a Native American population of adults. Similar studies should be done using other ethnic populations--Blacks, Hispanics, and Orientals, as well as Whites. Further, although this study is with adults, the implications are so great to education that studies need to be completed with high school students and elementary students.

In this study some subject areas had rather small samples. There might have been more significant areas if the samples in science and math had been larger. Therefore, the study should be replicated with a bigger sample in these areas.

Since learning style preferences in the subject areas does make a difference in achievement with Native American students, the information gained from this study, along with learning styles and strategy information about individual students should be used to counsel students. Would this boost the achievement of these students?

Native American students have been at a great disadvantage in our schools. Although there appears to be no one Native American learning style, more research needs to be done to discover just what part culture does play in the development of learning styles. Instructors need to be

more sensitive to the cultural differences and the values of those cultural differences. There have been many studies which demonstrate that adults are not all alike. Therefore, the Native American should not be made to fit into the mold when, in fact, there is room for many learning styles within our classrooms. More studies are needed to discover ways in which the styles and culture of the Native American can be made to work to his/her advantage.

Every research study opens a door for more possible studies. A single research study does not answer all the questions related to the topic. This study has uncovered a number of significant differences. More studies need to be carried out to try to explain why these factors are significant. Naturalistic studies using interviews with students and instructors to get at the heart of these matters might be helpful. The challenge is here; hopefully more researchers will try to find answers to some of these questions.

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APPENDIX

Table 31. No. of Cases and Mean Scores of Preferences for Learning Styles in Liberal Arts

	Low	Mod Low	Mod.	Mod High	High
Peer	60 2.90	108 2.85	112 3.13	45 2.42	23 3.43
Organization	39 2.74	78 2.79	132 2.84	78 3.23	21 3.28
Authority	30 3.10	70 2.74	98 2.75	87 2.96	63 3.30
Qualitative	25 3.16	36 2.41	164 3.05	74 3.05	69 2.61
People	36 2.97	102 2.12	112 2.86	66 2.77	26 3.69
Direct Experience	92 3.21	102 2.57	117 3.04	62 2.12	8 3.37
Superior Expectancy	31 2.52	69 2.75	93 2.73	79 2.93	76 3.51
Average Expectancy	54 3.61	85 3.07	117 2.85	62 2.53	30 2.47

Table 32. No. of Cases and Mean Scores of Preference for Learning Style Components in Science

	Low	Mod Low	Mod.	Mod High	High
Direct Experience	27 3.37	16 2.81	36 3.28	3 2.67	1 .01

Table 33. No. of Cases and Mean Scores of Preference for Learning Style Components in Mathematics

	Low	Mod Low	Mod.	Mod High	High
Instructor	6 3.0	7 3.0	21 2.47	4 1.0	0
Numeric	4 2.75	3 .00	10 2.1	14 3.0	7 3.0
Iconic	7 3.42	7 2.0	14 2.78	3 1.33	7 2.0

Table 34. No. of Cases and Mean Scores of Preference for Learning Style Components in Business

	Low	Mod Low	Mod.	Mod High	High
Peer	57 2.84	117 2.79	212 2.57	80 2.86	28 3.43
Instructor	58 2.83	188 2.66	174 2.94	42 2.67	32 2.28
Detail	26 1.77	114 2.82	187 2.77	109 2.92	58 2.71
Independence	79 3.21	126 2.95	180 2.74	85 2.12	24 2.5
Authority	21 2.62	110 2.84	133 2.88	145 2.85	85 2.94
Superior Expectancy	36 1.8	112 2.58	126 2.83	122 2.87	98 3.05
Average Expectancy	98 2.99	111 2.87	139 2.77	118 2.57	28 2.14
Failure Expectancy	146 2.95	98 2.74	66 3.07	107 2.62	77 2.27

Table 35. No. of Cases and Mean Scores of Preference for Learning Style Components in Vocational Courses

	Low	Mod Low	Mod.	Mod High	High
Independence	13 3.61	42 3.4	86 3.21	50 2.92	15 2.27
Authority	13 2.31	37 2.81	62 3.03	48 3.58	46 3.3
Inanimate	9 3.44	37 2.89	75 3.35	46 2.56	39 3.56
People	45 3.18	68 2.82	71 3.24	19 3.68	3 3.67
Listen	6 2.17	51 3,06	79 3.37	50 2.92	20 3.25
Direct Experience	38 3.39	49 2.82	86 3.19	28 3.46	5 1.6
Superior Expectancy	15 3.0	43 2.79	65 2.95	55 3.43	28 3.37
Average Expectancy	18 3.61	65 3.41	63 3.32	28 2.96	32 2.09

Table 36. No. of Cases and Mean Scores of Preference for Learning Style Components in Native American Studies

	Low	Mod Low	Mod.	Mod High	High
Independence	7 3.43	25 3.44	35 2.6	19 2.89	10 3.2
Average Expectancy	22 3.5	26 2.73	22 3.14	17 2.53	9 3.11

Table 37. No. of Cases and Mean Scores of Preference for Learning Style Components in Developmental Courses

	Low	Mod Low	Mod.	Mod High	High
Competition	5 3.4	18 2.3	28 3.21	34 2.53	6 3.63
Independence	13 2.77	21 3.57	34 2.92	17 2.53	6 1.33
Authority	6 2.33	27 2.26	18 3.5	27 3.37	13 2.23
Qualitative	3 3.33	15 1.6	39 2.95	27 3.18	7 3.28
Inanimate	8 3.87	22 2.95	32 2.15	17 3.25	12 3.17
Direct Experience	19 3.16	18 2.5	40 3.72	12 2.33	2 .00
Superior Expectancy	12 3.25	11 2.27	31 2.22	23 3.43	14 3.28

Table 38. No. of Cases and Mean Scores of Preference for Learning Style Components in Physical Education

	Low	Mod Low	Mod.	Mod High	High
Peer	9 3.67	39 3.07	20 3.75	18 3.67	9 2.0