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The relationship of the match/mismatch of student learning style to teacher teaching style with student attendance and achievement in adult basic skills/GED programs on Oahu

Robinson, Beverly Yuriko, Ed.D.

University of Hawaii, 1989

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THE RELATIONSHIP OF THE MATCH/MISMATCH OF
STUDENT LEARNING STYLE TO TEACHER TEACHING STYLE
WITH STUDENT ATTENDANCE AND ACHIEVEMENT
IN ADULT BASIC SKILLS/GED PROGRAMS ON OAHU

A DISSERTATION SUBMITTED TO THE GRADUATE DIVISION OF
THE UNIVERSITY OF HAWAII IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF EDUCATION

IN EDUCATIONAL ADMINISTRATION

DECEMBER 1989

By

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ABSTRACT

This study examined the relationship of the match/mismatch of student learning style to teacher teaching style with student rate of attendance and achievement in adult basic skills/GED programs on Oahu.

An ex post facto design was employed. The sample consisted of adult basic skills/GED students at all 8 adult education schools on Oahu ($N = 365$). The independent variable was the match/mismatch of student learning style as measured by Kolb's Learning Style Inventory to teacher teaching style as measured by McCarthy's Teaching Style Inventory. Age, ethnicity, and sex were moderator variables. The dependent variables were student achievement as measured by the Tests of Adult Basic Education and student rate of attendance.

Analysis of variance was used to examine differences between groups on attendance. Chi square was then used to examine differences in the number of attendance completions and noncompletions between matched and mismatched groups. Univariate analysis of variance tests were conducted using the pre-post test group to examine differences between the groups on rate of attendance and achievement in math.

Findings indicated no significant differences between matched and mismatched groups on rate of attendance or achievement. Significant differences in attendance were noted on age ($p < .05$). Also, significant differences in achievement were found on the interaction between sex and age, and ethnicity and age. However, the resulting cell sizes were too small to allow meaningful interpretation.

Based upon the results of this study it appears that adult students were able to achieve regardless of whether learning styles-teaching styles were matched or mismatched.

Recommendations for further research include replication using a larger sample size, different age groups and different instruments to assess cognitive learning style and teaching style.

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Chapter I

INTRODUCTION AND STATEMENT OF THE PROBLEM

Instructional supervision is a major function of the school operation. Improving the effectiveness of instructional programs is central to almost all supervisory endeavors. Learning motivation, achievement, attendance and attrition are major concerns in the design of curriculum and instruction in adult education programs.

A persistent problem in Adult Education has been the high drop out rate. Among the eight adult education schools on Oahu, a range of 7-50% drop out is reported. Schools tend to differ in their interpretation of drop out and completion. Administrators comment that the drop out rate would be higher if attendance at the end of the term were to be considered in the interpretation. In some adult education schools, students are not considered to have dropped out 1) if they have met their own personal objective for having attended the class for the term, 2) if they have attended 75% of the classes even if they leave the program and fail to return the last quarter, or 3) if they have not expressly stated that they have dropped the course.

Much of the research on drop out conducted to date examines demographic factors and motive categories which best relate to persistence and retention. These studies have repeatedly shown a variety of nonschool related reasons for not persisting in the formal learning setting. Factors affecting attendance and drop out tied to learning achievement remain uncertain and open to developments in research.

Studies on adult learning suggest significant differences in learning styles between persisters and dropouts. Students who persisted in adult high school completion programs were found to perceive the classroom environment more positively than dropouts (Donaldson, 1980). They were also found to be significantly more satisfied than dropouts (Plummer, 1981). Dropouts tended to prefer strong direction in the learning activity. Teacher use of direct instruction practices was associated with higher rates of academic progress. Attendance was also positively correlated with academic progress (Jain, 1982).

Studies on higher education indicate that differences in hierarchical levels of cognitive development are significantly related to the students' learning styles. Learning styles are further found to correlate with grade point average (Kirk, 1986).

Bright (1982) found a significant relationship between habits, attitudes and academic achievement, and student retention in higher education. Altieri (1987) found anxiety to be clearly the dominant learning problem among adults in basic skills classes. Based on Kolb's LSI, students reporting anxiety as a major learning problem showed higher concrete experience and lower abstract conceptualization modes of cognition than the less anxious cohort.

Studies indicate that there are differences in student learning style preferences and that these differences relate to student preferences for teaching styles (Merritt, 1982). Differences in processing styles of the right and left hemispheres of the brain appear to relate to performance on learning tasks (Haulman, 1987). Cognitive style was found to be significantly related to learning style preference. Field dependence-independence was found to be related to learning style preference (Vitols, 1985; Burke, 1985) and achievement (Walker, 1981; Wallace, 1980). Findings also revealed a significant difference in the dominant learning style of different adult age groups and student preferences for different teaching methods based on Kolb's Learning Style Inventory (Koch, 1984). Student preferences for teaching styles was also found to be related to age grouping (Daughenbaugh, 1985). Studies also suggest differences in student preferred learning modalities. Modalities as

defined by McCarthy are the sensory channels by which we receive information. These are identified as visual, auditory and kinesthetic. According to McCarthy, a visual learner learns by seeing and imagining. An auditory learner learns by listening and verbalizing. A kinesthetic learner learns by doing and manipulating. Hoffer (1982) found that adults do possess a dominant sensory modality through which they learn more effectively across subject matter and that multi-modal instruction is not as beneficial for adult learners as instruction presented in their dominant learning modes.

Learning motivation, achievement, attendance and attrition in adult learning programs are major concerns in the curriculum and instructional design of adult education programs.

It is generally agreed that all adult students do not learn in the same way. Brain research has documented differences in left and right hemispheric brain functions that contribute to cognitive learning style. Data on brain growth, spurts, and hemispheric specialization offer a perspective on how the teaching-learning process within schools can become more brain-congruent and thus more responsive to students' learning potential.

Hemisphere research shows that the ways of thinking that seem to be primarily the province of the left

hemisphere are used extensively in the basic subjects of the school curriculum (Ornstein, 1978). Educational policies have tended to support greater emphasis upon left hemisphere skills.

While many approaches have been used to determine individual learning differences, no single theory has found widespread acceptance (Danielson and Seiler, 1976). Two concepts have been developed to foster an understanding of how people process information: cognitive style and learning style. Cognitive style is the manner in which a learner encodes, decodes, processes, stores, and retrieves information. Learning style is defined as the individual's characteristic means of perceiving and processing information (Kolb, 1976).

The learning model chosen for research is based upon the works of David Kolb and Bernice McCarthy. Learning style is conceived conceptually in terms of cognitive style and reflects a process whereby knowledge is continuously derived from and tested out in the experiences of the learner. Bernice McCarthy, in her review of the work of researchers in fields ranging from psychology to management training, found that learning style research presented almost perfectly parallel learning schemes. David Kolb's research represented a breakthrough in formulating learning

style findings into model form (McCarthy, 1980). Kolb's model utilizes a four-state learning paradigm.

David Kolb identifies four styles of learning based upon the theory of experiential learning: accommodators, assimilators, divergers, and convergers. To identify the learning styles, Kolb provides a model based upon experiential learning theory, which is grounded on the Jungian (Jung, 1923) concept of styles and types. Convergers, by using abstract conceptualization and active experimentation, seem to do best in learning interaction where specific problems have a single right answer or one solution. Divergers, by using concrete experiences and reflective observation, organize information and impressions into a meaningful whole. They tend to work with ideas on an imaginative level. Assimilators, by using abstract conceptualization and reflective observation are interested in the use of models on a practical level. They bring together different observations and are good at integration. Accommodators, by using concrete experiences and active experimentation, tend to rely on the judgment and impact of others. They generally solve problems on a trial and error basis (Kolb, 1976).

Adult programs have found that if students have difficulty learning, they tend to drop out quickly. Learning style may be a key factor in student learning and

attendance. If the learning style of a student is congruent with the teaching style of the teacher, the student may experience less anxiety with the learning process and persist longer in terms of attendance. The effect of teaching style upon the learning may further lead to higher achievement gains.

This study proposes to examine one aspect of the educational process that may affect voluntary adult learner attendance and achievement. Findings will hopefully lead to information upon which sound policy decisions in administering cost-effective adult education programs could be based.

STATEMENT OF THE PROBLEM

The problem to be addressed is to identify selected in-class factors related to maintaining attendance and fostering student achievement in adult education basic skills programs. The target population are adults who for the most part have experienced learning difficulty in traditional classroom settings and are now enrolled in basic skills classes to upgrade their skills primarily to achieve a high school diploma. Attendance is voluntary and heavily based upon the adult learners' motivation to attend.

While studies of drop out have repeatedly shown a variety of nonschool related reasons for not persisting in

the formal learning setting, few studies have addressed the teaching-learning process and the learning environment of the class. Most of the studies regarding learning styles and teaching styles have been conducted with elementary and secondary students. The studies on the adult population are very limited and have not addressed the relationship of attendance (and drop out) to the match or mismatch of learning styles and teaching styles. Both learning achievement and student attendance have been major concerns in establishing cost effectiveness of programs.

PURPOSE OF THE STUDY

The purpose of this study is to determine whether or not there is a relationship between the congruence of teaching style and learning style and student achievement and attendance in adult education basic skills programs in Hawaii. This study examines student rate of attendance and math achievement outcomes when learning styles are matched with teaching styles and when learning styles and teaching styles are mismatched. The study is conducted to specifically address the styles in teaching and learning of adults in adult education basic skills programs. The collection of information concerning the congruence of learning style and teaching style in adult education is a crucial step toward policy decisions to address learning

effectiveness outcomes. Findings are intended to provide informational support for administrative decisions regarding programming, curriculum design, staffing and instructional decisions in administering adult education programs. Such information can provide administrators with a rational research basis for creating an effective educational program and can support the learning process of both students and staff.

DOCUMENTATION OF THE PROBLEM

Student attendance, drop out, and achievement are continuing concerns that plague administrators in establishing cost effective programs in adult education. The high drop out rate among adults particularly in the basic skills classes has created exceptional concern over program maintenance. While there is little doubt that the need exists for basic skills instruction, the high drop out rate in adult education classes where attendance is voluntary has perplexed school administrators. The high drop out rate among high school juniors and seniors, particularly with the public and private demand for higher levels of basic skills competencies, and the steady influx of immigrants to Hawaii needing basic skills have contributed to the increased demand for adult education programs.

Adult Basic Education in Hawaii has experienced tremendous growth since its establishment in 1945. In 1966-67 the enrollment in adult education was 10,006 students in 609 classes. In 1986-87, twenty years later, the enrollment in adult education was 74,803 students in 4221 classes. It is anticipated that post-1990 enrollment in adult education statewide will exceed 100,000 students with 5500 adult basic education classes. Despite the growth in enrollment, adult education programs have continued to experience steady drop out rates of as much as 50% within a single semester. This has created considerable resource waste both in terms of program output (student completion) and potential community/manpower resource.

A number of writers have pointed out the pressing need for appropriate research relating to persistence of adults participating in formal learning programs where attendance is voluntary. Limited success has been achieved in some studies of predictor variables, with no significant research findings that would provide guidance for improving the persistence rate of adults in adult education programs. Drop out and low attendance at adult education programs have continued to pose problems for individuals, institutions, and society. The purpose of adult education programs, namely, to enable students to develop to their fullest potential, to participate actively and productively as a

member in society, and to meet career-life goals, will not have been accomplished. The tremendous waste in terms of human resource is particularly felt within the realm of the nation's economic structure as the United States struggles to provide social services and economic assistance to the unemployed and underemployed due to lack of basic skills while having to import foreign products and utilize foreign skilled labor force.

CONCEPTUAL BASIS OF THE STUDY

Kolb (1978, 1981) proposed a model for examining individual learning style which is based on experiential learning theory. He credited his conceptualization of the learning process to Jung's theory of psychological types (styles) and to the work of Kurt Lewin in social psychology. Kolb's model of learning is a four stage cycle which consists of the following learning modes: (a) concrete experiencing (CE) of a learning situation; (b) reflective observation (RO) of relevant phenomena; (c) abstract conceptualization (AC) about the meaning of what has been observed; and (d) the active experimentation (AE) or testing of hypotheses relative to what has been experienced, observed, and conceptualized as pertinent to a learning situation. The cycle suggests two primary dimensions (poles) to the learning process. Concrete experiencing is

the polar opposite of abstract conceptualizing while reflective observation is the opposite of active hypothesis testing. Kolb suggested that the degree to which a person favors particular stages of the cycle indicates the learning style preference of that individual.

Based on a learner's preference for a particular phase of the learning cycle, Kolb (1978) defined the following four specific learning types (a) diverger, (b) assimilator, (c) converger, and (d) accommodator. (See Operational Definitions)

McCarthy (1979, 1980) synthesized the research of Kolb and other learning style researchers into an instructional model with learning-style descriptions based on the dualities of Kolb. These learning-style descriptions resulted in the identification of four basic learning style preferences. Her instructional model, 4MAT, systematically teaches to each learning style. McCarthy (1987) also developed an instrument, The Teaching Style Inventory (TSI), to determine the teaching style of teachers. Her approach has been for teachers to develop an awareness of their own learning style and teaching style to purposefully teach all four modes of learning to all students. Thus students would progress through the entire learning cycle and develop the skills that do not come naturally while refining the skills of their preferred learning styles (McCarthy, 1980, 1987).

The relationship of learning style to teaching style is proposed as a factor related to student attendance and achievement. Where learning styles are matched with the teaching style of the class, the expectation would be higher achievement gains and higher rates of attendance than under mismatched conditions. Attrition should also be lower among students matched than mismatched.

To determine the relationship of match/mismatch of students learning style and teacher teaching styles to student attendance and performance, an ex post facto design is proposed.

The student learning styles are determined through the use of Kolb's Learning Style Inventory and teacher teaching styles are examined through the use of McCarthy's Teaching Style Inventory. The match/mismatch of learning styles and teaching styles are then studied in relation to student rate of attendance and completion, and learning achievement as measured by the Tests of Adult Basic Education.

THE RESEARCH QUESTION

Is there a relationship between the match/mismatch of teaching styles and learning styles to student rate of attendance and achievement?

HYPOTHESES TO BE TESTED

Students whose learning styles are matched with the teaching style of the instructor tend to learn better (have higher achievement). They also tend to have better attendance with less tendency to drop out than students whose learning styles are not matched with the teaching style of the instructor.

The following are three major hypotheses and an ancillary research question set forth in null form:

Null Hypothesis 1

There is no significant difference ($p < .05$) in rate of attendance between students whose learning styles are matched with the teaching style of the instructor and students whose learning styles are not matched.

Ancillary Research Question

There is no significant difference ($p < .05$) between matched and mismatched students in the number of students completing the term and the number of students leaving before the end of the term.

Null Hypothesis 2

There is no significant difference in achievement ($p < .05$) between students whose learning styles are matched with the teaching style of the instructor and students whose

learning styles are not matched among students who complete the term as measured by the Tests of Adult Basic Education (TABE), math test.

Null Hypothesis 3

There is no significant difference ($p < .05$) in attendance between students whose learning styles are matched with the teaching style of the instructor and students whose learning styles are not matched among students who complete the term.

Other Moderating Variables:

1. Ethnicity: Hawaiian, Japanese, Filipino, Caucasian, Chinese, Korean, Indochinese, Pacific Islander and Other (Students were to list all that applied to them.)
2. Sex: Male, Female
3. Age group: 17-24, 25-34, 35-44, 45-54, 55-64, 65+

OPERATIONAL DEFINITIONS OF INDEPENDENT AND DEPENDENT VARIABLES

1. **ACHIEVEMENT.** Learning gains as measured by the Tests of Adult Basic Education (TABE).
2. **ATTENDANCE.** Physical presence or absence in class as indicated by the instructor's record of attendance behavior.

3. RATE OF ATTENDANCE. Percentage of hours attended.
Rate of attendance for hypothesis 1 was based upon attendance from entry to the end of the term.
Rate of attendance for hypothesis 3 was based upon attendance between pretest to post test.
4. COMPLETION. Student who had taken both the pre- and post test of the Tests of Adult Basic Education (TABE).
5. NONCOMPLETION. Student who had not taken the pre- and post test of the Tests of Adult Basic Education (TABE).
6. LEARNING STYLE. An individual's orientation toward learning (how an individual perceives and processes information) as measured by the Learning Style Inventory (LSI). (David A. Kolb)
Characteristic ways each individual collects, organizes, and transforms information into useful knowledge as measured by the LSI.

Most researchers recognize four distinct learning styles (McCarthy, 1980). These are defined by the LSI as:

DIVERGER (Learning Style 1) - emphasizes concrete experience and reflective observation.

ASSIMILATOR (Learning Style 2) - utilizes the dominant learning abilities of abstract

conceptualization and reflective observation.

CONVERGER (Learning Style 3) - relies primarily on the dominant learning abilities of abstract conceptualization and active experimentation.

ACCOMMODATOR (Learning Style 4) - emphasizes concrete experience and active experimentation.

7. **MATCH.** A one-to-one correspondence between learning style types and teaching style types using Kolb's Learning Style Inventory (LSI) and McCarthy's Teaching Style Inventory (TSI).
- MISMATCH.** Any other combination of the LSI learning style and the TSI teaching style.

In specific, matching occurs with the following combinations of learning styles and teaching styles:

Learning Style	Teaching Style
Style 1 (Diverger)	Style 1
Style 2 (Assimilator)	Style 2
Style 3 (Converger)	Style 3
Style 4 (Accommodator)	Style 4

8. **TEACHING STYLE.** Identifiable sets of classroom behaviors which are consistent even though the content that is being taught may change. This style is the operational behavior of the teacher's educational philosophy. (Fischer & Fischer, 1979).

Teaching Style operationally defined for use in this study as part of the methodology is any one of the four teaching styles identified by The 4MAT Teaching Style Inventory (TSI) developed by Bernice McCarthy. Teachers of teaching style types 1-4 exhibit the following traits:

Style 1:

As teachers they are interested in facilitating individual growth. They try to help people become more self-aware. They believe curricula should enhance the ability to be authentic. They see knowledge as growth in personal insight and encourage authenticity in their students. They like discussions, group work, and realistic feedback about feelings. They are caring people who seek to engage their students in cooperative efforts. They are aware of social forces that affect human development. They are able to focus on meaningful goals. They tend to become fearful under pressure and sometimes lack daring.

Style 2:

As teachers they are interested in transmitting knowledge. They try to be as accurate and knowledgeable as possible. They believe curricula should further understanding of significant information and should be presented systematically. They see knowledge as deepening comprehension. They encourage outstanding students. They like facts and details and organized sequential thinking. They are traditional teachers who seek to imbue a love of knowledge.

They believe in the rational use of authority.
Sometimes their dominating attitude tends to discourage creativity.

Style 3:

As teachers they are interested in productivity and competence.
They try to give students the skills they will need to be economically independent in life.
They believe curricula should be geared to this kind of focus.
They see knowledge as enabling students to be capable of making their own way.
They encourage practical applications.
They like technical things and hands-on activities.
They are exacting and seek quality and productivity.
They believe the best way is determined pragmatically.
They use measured rewards.
They tend to be inflexible and self-contained and lack teamwork skills.

Style 4:

As teachers they are interested in enabling student self-discovery.
They try to help people act on their own visions.
They believe curricula should be geared to learners' interests.
They see knowledge as a tool for improving the larger society.
They encourage experiential learning.
They like variety in instructional methods.
They are dramatic teachers who seek to energize their students.
They attempt to create new forms, to stimulate life and to draw new boundaries.
They tend to rashness and manipulation.
(McCarthy, 1987, pp. 37-43)

MAJOR TERMS

1. **ADULT GED CLASSES.** Adult education classes in GED (General Education Development) preparation, focusing mainly on English, math, and reading skills in the 5 GED test areas of writing, social studies, science, reading and math.
2. **ADULT BASIC SKILLS (9-12) CLASSES.** Classes in high school English, math, and reading and GED preparation.
3. **ADULT COMMUNITY EDUCATION SCHOOLS.** The schools, both public and private, providing classes for adult learners in the community. These are defined in the study as the adult community schools within the State Department of Education, Adult and Early Childhood Section and the Kamehameha Schools Continuing Education Program.
4. **AFFECTIVE.** Emotional and personality characteristics related to such areas as motivation, attention, locus of control, interests, willingness to take risks, persistence, responsibility; learner's mode of arousing, directing, and sustaining behavior.
5. **ATTRITION RATE.** Rate of gradual reduction or drop in overall enrollment in a class as calculated by the number of dropouts over the duration of the term.

6. CEREBRAL DOMINANCE. Relationship between the two brain hemispheres whereby one hemisphere, usually the left in right-handers, was seen as the director of speech and other higher functions; the right or "minor," hemisphere was without special functions and subordinate to control by the dominant left; the idea of one half of the brain directing behavior.
7. COGNITIVE STYLE. Conditions under which students process information; the way learners encode, decode, process, store, and retrieve information.
8. EXPERIENTIAL LEARNING. Learning is the process whereby knowledge is created through the transformation of experience. (Kolb, 1984)
9. HEMISPHERICITY. (Hemispheric Preference) The idea that the two hemispheres of the brain are specialized for different modes of thought and that a given individual relies more on one mode or hemisphere than on the other. The different utilization is presumed to be reflected in the individual's cognitive style - the person's preferences and approach to problem solving. (Springer & Deutsch, 1985).
10. INTUITION. The act or faculty of knowing without the use of rational processes. Insight.

11. KNOWING. Modes or kinds of intelligence or sets of information-processing rules; modes of consciousness and cognitive style form.
12. LEFT BRAIN. The left hemisphere of the human brain, currently thought by many researchers to be the locus of linear, logical, sequential, and abstract thinking.
13. MODALITIES. The sensory channels by which the learner receives information. The three sensory channels noted by Bernice McCarthy are visual, auditory and kinesthetic.
14. PERSISTENCE. Continued attendance despite occasional absences.
15. PHYSIOLOGICAL ASPECTS OF LEARNING STYLE. Includes sensory perception (visual, auditory, kinesthetic, verbal); environmental characteristics.
16. RIGHT BRAIN. The right hemisphere of the human brain, currently thought by many researchers to be the locus of global processing of data, of processing visual-spatial information, and of recognizing and forming patterns. (Springer & Deutsch, 1985).
17. REASON. Verbal, analytic process; the faculty of thinking logically, involving the analysis of

discrete elements, inferentially and sequentially linked.

18. STYLE FLEX. Make style adjustments, depending on the nature of the task and the teaching style being used.

ASSUMPTIONS AND LIMITATIONS

Assumptions:

1. Teaching Styles as measured by the TSI will be the same as the actual teaching style in practice.
Learning Styles as measured by the LSI will be the same as the actual learning style of the students in practice.
2. Students attending classes voluntarily are motivated to attend.
3. All 7 DOE adult education schools in Hawaii are organized and operate according to the same DOE guidelines.
4. The curriculum for the High School English and High School Math classes are similar in content to the GED courses. The curriculum for the High School English, High School Math and GED classes are similar across schools.
5. The Kamehameha Schools Continuing Education Program operates a program similar to the DOE adult and community schools. The Basic Skills Program is

similar in its offering of English, math and reading with the focus primarily targeted to the GED.

6. The adult education population served is similar across all eight adult education schools with respect to the target being that of the high school dropout.
7. Students enrolled have been randomly placed into classes.

Limitations:

1. The study is limited to adult education programs on Oahu. These programs consist of the 7 Department of Education adult education schools and the Kamehameha Schools Continuing Education Program. Classes included in the study are those located at the central (main) adult education school sites and selected field sites.
2. The focus of the study is upon Basic Skills/GED classes, 9-12 grade levels.
3. Attendance is voluntary. Drop outs are randomly distributed.
4. Reasons for students dropping out are not known and exit interviews were not conducted.
5. The time period for collecting the data in this study is limited to one semester.

Chapter II

REVIEW OF THE LITERATURE

This chapter examines the research on learning styles and teaching styles. In particular it presents the different models on learning styles and the link with recent brain research. Research on teaching styles is also presented, beginning with the early studies on teaching effectiveness to later research which focus on specific components of different teaching styles and strategies. Finally, a survey of studies on various learning conditions of match and mismatch is given.

INTRODUCTION

The research on learning styles, according to Dunn and Dunn (1975), indicates that individuals differ significantly in the ways they perceive, process, remember, and organize information. Methods of instruction and types of technology are accepted differently by individuals and make different demands on their minds (Dunn & Dunn, 1975).

When students learn in ways that are suited to their learning styles, the outcomes reportedly found are increased academic achievement, improved self-esteem, a liking for

learning, improved basic skills, stimulated creativity, and gradually increasing learner-independence (Dunn & Dunn, 1975). When teaching styles do not fit the learning styles, students may experience feelings of great insecurity, frustration, anger, anxiety, alienation, overcompensation and futility (Gregorc, 1979).

DEFINITION OF LEARNING STYLE

The literature on learning styles offers a range of definitions that have been adopted to describe this construct. These definitions range from concerns about preferred sensory modalities (e.g., visual, auditory, tactile, etc.) to descriptions of personality characteristics that have implications for behavior patterns in learning situations (e.g., the need for structure versus flexibility). Others have focused attention on cognitive information processing patterns, such as Kolb's (1978) work on concrete versus abstract thinking abilities.

Learning styles may be perceived in terms of the cognitive, affective, and physiological aspects. The cognitive aspect includes the ways we decode, encode, process, store, and retrieve information. Much of a person's cognitive learning style may be related to hemispheric brain functioning (Cornett, 1983).

Affective aspects of learning style include emotional and personality characteristics related to such areas as motivation, attention, locus of control, interests, willingness to take risks, persistence, responsibility and sociability. It describes the learner's typical mode of arousing, directing, and sustaining behavior.

The physiological aspects of learning style include sensory perception (visual, auditory, kinesthetic, taste, and smell), environmental characteristics (noise level, light, temperature, room arrangement), need for food during study, and times of day for optimum learning (Cornett, 1983).

Researchers have examined the conditions under which students begin processing information. These investigators hypothesize that these cognitions may not occur or will be comparatively inefficient unless selected characteristics are responded to through complementary resources or approaches.

Various researchers define the concept of learning style differently (Dunn, DeBello, Brennan, & Murrain, 1981). Dunn defines learning style basically as the way individuals concentrate on, absorb, and retain new or difficult information or skills. Style comprises a combination of environmental, emotional, sociological, physical, and psychological elements that permit individuals to receive,

store, and use knowledge or abilities. They are relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment. The basis of learning style lies in the structure of neural organization and personality which both molds and is molded by human development and the learning experience of home, school and society.

Keefe (1979) conceptualized learning style as comprised of three types of behaviors: cognitive, affective, and physiological/physical. A cognitive behavior was viewed as one resulting from a preference for a given type of information processing or cognitive style. An affective behavior was the result of a given attitude or opinion. Physical/physiological learning style behaviors are of two types: environmental factors that impinge on learning and biological factors in the makeup of the individual that have an impact on the learning situation.

Gregorc (1979) defines learning styles as behaviors that reflect the mind's natural abilities, capacities, and preferences by which a person interacts with his environment to gather and process data from it. While some people operate from their natural style almost exclusively, others may make style adjustments, depending on the nature of the task and the teaching style being used. These people, according to Gregorc, have style flex which helps them to

accommodate or adapt to the needs of others or the environment.

Kolb (1971) found that the combination of the two dimensions of perceiving and processing results in four different learning styles: divergence, assimilation, convergence and accommodation. Some perceive in a sensing/feeling way, connecting the experience, the information, to meaning. Those who sense and feel tend more to the actual experience itself and are intuitive. On the other hand, others think through the experience and tend more to the abstract dimensions of reality. They analyze what is happening, reason experience and perceive with a logical approach. In processing experience and information, some are watchers, while others are doers.

The relationship between learning style and constructs such as cognitive style has been interpreted in an number of ways in the literature (Kirby, 1979). While their definitions were different, all were concerned with how the mind actually processed information or was affected by each individual's perceptions. For the purpose of this study, Kolb's definition will be used: the way individuals perceive and process information through experience in response to the learning environment.

MODELS OF LEARNING STYLES

Numerous schemes for classifying the many different elements of learning style have been devised. Some researchers have constructed models of learning style that include only variables in the cognitive area. Others have focused their attention on the perceptual or affective domains. Finally, some researchers and writers have attempted to compile the varied research on learning style into general models.

During the 1970s Canfield and Lafferty, Gregorc, Hunt, Kolb, Ramirez and Castaneda and Schmeck all developed varied definitions, models, instruments, and techniques for assessing students characteristics. Ferrell (1983), in an examination of learning style instruments, pointed out that each author of learning styles instruments had a conceptualization of learning style that was unique to his or her instrument and that theory development in regard to a learning styles paradigm had been divergent. In some ways those models differed, particularly in the use of concept labels, but their many strands revealed essential similarities and were mutually supportive (Dunn, DeBello, Brennan, & Murrain, 1981; McCarthy, 1980, 1987).

Keefe (1979) developed a classification of learning style consisting of cognitive style (information processing habits of the learner's typical mode of perceiving,

thinking, problem-solving, and remembering), affective style, and physiological style (biologically-based modes of response based on sex-related differences, personal nutrition and health and accustomed reaction to the physical environment). Rita Dunn proposed a model based on input/output factors of style such as the environment surrounding a learner, the learner's perceptual preferences for receiving information, and the learner's preferred means of expression. These elements of learning style were categorized as being environmental, emotional, sociological, physical, and psychological. Environmental elements included sound, light, temperature, and design of surroundings. The model was later revised to include elements of cognitive style (1979) and hemispheric preference (1980).

Gregorc (1979) found that there is a duality in learning preference. These sets of dualities merge to form four distinct learning/teaching styles: concrete sequential, concrete random, abstract sequential and abstract random.

Kolb's conceptualization of learning style presented how the adult mind functioned. Kolb proposed that a major source of pattern and coherence in individual styles of learning is the underlying structure of the learning process. Learning, according to David Kolb, is the process whereby knowledge is created through grasping experience

(prehension via direct apprehension of immediate concrete experience and indirect comprehension of symbolic representations of experience) and transforming it (via intentional reflection and extensional action). Concrete experience/abstract conceptualization and active experimentation/reflective observation are viewed as two distinct dimensions, each representing two dialectically opposed adaptive orientations. Concrete experience/abstract conceptualization represents two different and opposed processes of grasping or taking hold of experience in the world either through reliance on conceptual interpretation and symbolic representation called comprehension, or through reliance on the tangible, felt qualities of immediate experience which Kolb calls apprehension. Active experimentation/reflective observation, on the other hand, is one of transformation, representation of experience either through internal reflection (intention), or active external manipulation of the external world (extension). This results in four elementary forms of knowledge and learning styles. Experience grasped through apprehension and transformed through intention results in divergent knowledge. Experience grasped through comprehension and transformed through intention results in assimilative knowledge. When experience is grasped through comprehension and transformed through extension, the result is convergent

knowledge. Finally, when experience is grasped by apprehension and transformed by extension, accommodative knowledge is the result. These forms of knowledge then become the building blocks for developmentally higher levels of knowing. Kolb suggests that the degree to which a person favors particular stages of the cycle indicates the learning style preference of that individual.

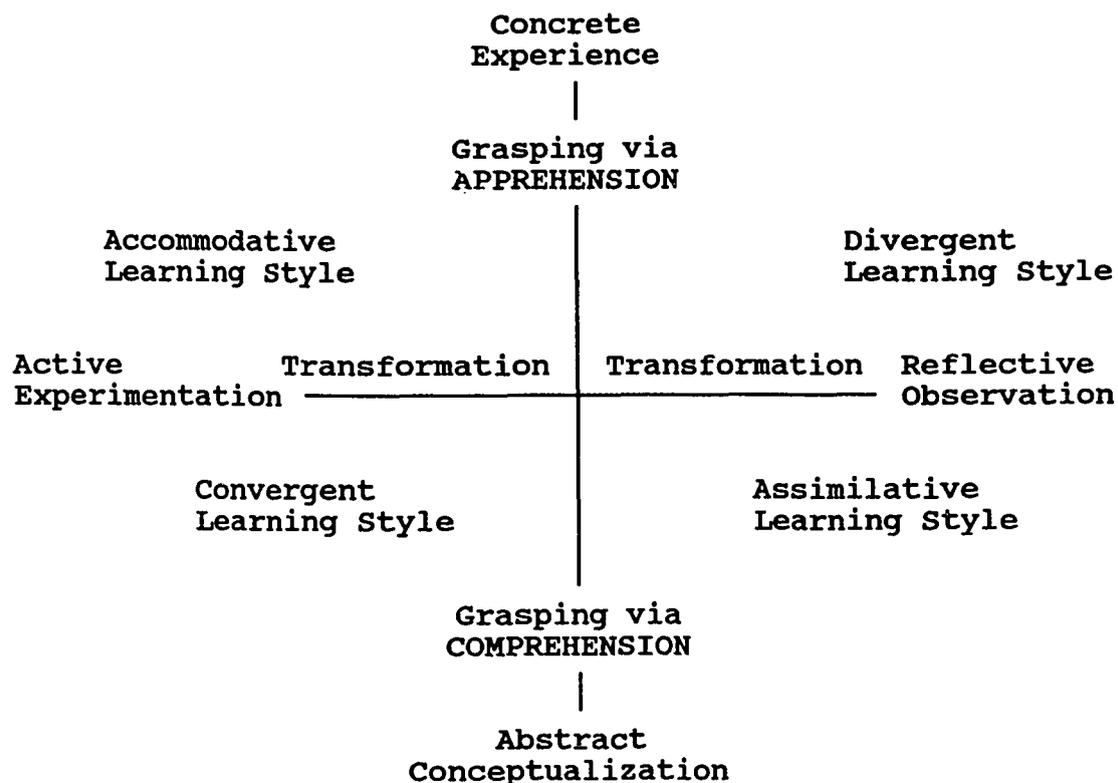


Figure 1. Experiential Learning Style Model of Kolb. Structural Dimensions Underlying the Process of Experiential Learning and the Four Learning Styles. Adapted from Experiential Learning Experience as the Source of Learning and Development (New Jersey: Prentice Hall, 1984), p. 42.

The divergent learning style emphasizes concrete experience and reflective observation. The greatest strength of this orientation lies in imaginative ability and awareness of meaning and values. The primary adaptive ability of divergence is to view concrete situations from many perspectives and to organize many relationships into a meaningful "gestalt." The emphasis in this orientation is on adaptation by observation rather than action. A person of this type performs better in situations that call for generation of alternative ideas and implications, such as a "brainstorming" idea session. Those oriented toward divergence are interested in people and tend to be imaginative and feeling-oriented.

In the assimilation learning style, the dominant learning abilities are abstract conceptualization and reflective observation. The greatest strength of this orientation lies in inductive reasoning and the ability to create theoretical models, in assimilating disparate observations into an integrated explanation. This orientation is less focused on people and more concerned with ideas and abstract concepts. Ideas, however, are judged less in this orientation by their practical value. Here, it is more important that the theory be logically sound and precise.

The convergent learning style relies primarily on the dominant learning abilities of abstract conceptualization and active experimentation. The greatest strength of this approach lies in problem solving, decision making, and the practical application of ideas. In this learning style, knowledge is organized in such a way that through hypothetical-deductive reasoning, it can be focused on specific problems. Convergent people are controlled in their expression of emotion. They prefer dealing with technical tasks and problems rather than social and interpersonal issues.

The accommodative learning style emphasizes concrete experience and active experimentation. The greatest strength of this orientation lies in doing things, in carrying out plans and tasks and getting involved in new experiences. The adaptive emphasis of this orientation is on opportunity

seeking, risk taking, and action. This style is best suited for those situations where one must adapt oneself to changing immediate circumstances. In situations where the theory or plans do not fit the facts, those with an accommodative style will most likely discard the plan or theory. People with an accommodative orientation tend to solve problems in an intuitive trial-and-error manner, relying heavily on other people for information rather than on their own analytic ability. Those with accommodative learning styles are at ease with people but are sometimes seen as impatient and "pushy." (Kolb, 1984, pp. 77-78)

Assessment of learning style based upon this model through the use of Kolb's Learning Style Inventory has been reported in the literature of various disciplines (Fox, 1984). Studies on the Learning Style Inventory provided support for the consistency between the learning style model proposed by Kolb and the LSI and the reliability of the instrument. A comparison of the LSI to the Grasha-Riechmann Student Learning Style Scales, the Dunn Learning Style Inventory, and the Johnson Decision Making Inventory, reported validation of only Kolb's conceptualization of learning style as having a match between factors and learning styles (Ferrell, 1983).

Similar distinctions between apprehension and comprehension has also been made by Russell, Feigl, and Pepper (Kolb, 1984). Jerome Bruner (1965) speaks of the two forms of knowing in terms of rational-logical knowing as opposed to the metaphoric-intuitive knowing. Abraham Maslow uses rational and intuitive in describing the dual modes of

thinking. Arthur Schopenhauer called the dichotomy objective and subjective. Robert Ornstein uses the terms analytic and holistic.

Based upon the dualities of Kolb, Bernice McCarthy (1987) identified four basic learning style preferences. These four style descriptions were found by McCarthy to be congruent with those of researchers from diverse fields. These include the psychological types of Jung, the learner types of Myers and Lawrence, and descriptions of Simon and Byram, the learning styles of Gregorc, and the social styles and behavior patterns of Merrill. The following descriptions represent the four learner types identified by McCarthy (1987):

Type One: The Imaginative Learners

As learners they perceive information concretely and process it reflectively. They integrate experience with the self. They learn by listening and sharing ideas. They are imaginative thinkers who believe in their own experience. They excel in viewing direct experience from many perspectives. They value insight thinking. They work for harmony. They need to be personally involved. They seek commitment. They are interested in people and culture. They are thoughtful and enjoy observing others. They absorb reality. They seek meaning and clarity.

Type Two: The Analytic Learners

As learners they perceive information abstractly and process it reflectively. They devise theories by integrating their observations into what is known. They seek continuity. They need to know what the experts think. They learn by thinking through

ideas. They form reality. They value sequential thinking. They need details. They critique information and collect data. They are thorough and industrious. They will re-examine the facts if situations perplex them. They enjoy traditional classrooms. They find ideas fascinating. They prefer to maximize certainty and are uncomfortable with subjective judgments. They seek intellectual competence and personal effectiveness.

Type Three: The Common Sense Learners

As learners they perceive information abstractly and process it actively. They integrate theory and practice. They integrate theory and practice. They learn by testing theories and applying common sense. They are pragmatists. They believe if it works, use it. They are down-to-earth problem-solvers, who resent being given answers. They do not stand on ceremony but get right to the point. They have a limited tolerance for fuzzy ideas. They value strategic thinking. They are skills oriented. They experiment and tinker with things. They need to know how things work. They edit reality, cut right to the heart of things. Sometimes they seem bossy and impersonal. They seek utility and results.

Type Four: The Dynamic Learners

As learners they perceive information concretely and process it actively. They integrate experience and application. They learn by trial and error. They are believers in self-discovery. They are enthusiastic about new things. They are adaptable, even relish change. They excel when flexibility is needed. They often reach accurate conclusions in the absence of logical justification. They are risk takers who are at ease with people. They enrich reality by taking what is and adding something of themselves to it. They are sometimes seen as manipulative and pushy. They seek to influence. (McCarthy, 1987, pp. 37-43)

WHAT DETERMINES LEARNING STYLE?

Learning style is said to be a combination of nature and nurture. Psychologists have identified which elements of style are biological and which develop as an outgrowth of life experiences (Restak, 1979; Thies, 1979). Husbands and wives tend to have many elements of style that are different from each other. Children do not necessarily reflect their parents' styles and in the same family, siblings' styles appear to be more different from each other than similar (Dunn, 1984).

While learning style has been defined as a consistent pattern of behavior, it changes with age and experience. Findings seem to indicate that dendrite branches of neurons in the cortex sometimes increase in density in response to stimulating environments (Wittrock, 1980). Both environmental stimulation and the effects of nutrients upon the brain, are found to be important for brain development (Chall and Mirsky, 1978).

With maturation, cognitive style tends to move in the direction of greater abstraction and field independence. This developmental trend, however, tends to be confined to technical societies like the United States, which seems to give credence to the effects of left-brain oriented curricula (Fox, 1979). American Indians educated in their

own culture tend to become more field dependent, just the opposite of their Anglo neighbors.

The research of Jean Piaget and Lawrence Kohlberg has identified discrete stages of cognitive development that are influenced by peers, parents, or teachers using cognitive processes not presently in a child's repertoire, but within reach developmentally. In particular, Kohlberg maintains that exposure to higher levels of cognitive functioning is critical to a child's growth in moral reasoning.

Kolb suggests that the learning process is not identical for all human beings. The physiological structures that govern learning allow for the emergence of unique individual adaptive processes that tend to emphasize some adaptive orientations over others. Heredity, past life experience, and present environment contribute to the development of learning styles that emphasize some learning abilities over others.

Feigl (1958) linked the distinction between the two forms of knowing, referring to felt qualities of experience (apprehension), and descriptive symbols (comprehension) to certain aspects of the neural processes. Research in neurophysiology provides evidence for the "double knowledge" theory. Physiological evidence suggests separate locations of the functions apprehension and comprehension in the right and left cerebral hemispheres and an integrative mechanism

in the corpus callosum. Similarly, intention and extension are independent modes of transforming experience and appear to be controlled in part by the separate and interrelated parasympathetic and sympathetic nervous systems.

Learning Styles and Brain Function

Research experiments indicate that two separate and unique ways of processing stimuli exist and each seems to stem from a separate hemisphere (Bogen, 1972, 1975; Galin, 1976; Ornstein and Galin, 1975; Sperry, 1975). The difference between the hemispheres seems to lie in the manner in which each receives stimuli and processes it (Bogen, 1972, 1975; Sperry, 1975).

Subsequent studies by Levy, Trevarthen, Nebes, Milner, and others found the left hemisphere as being more analytic, the right more holistic (Gazzaniga, 1977). The left hemisphere was further found to specialize in linear, sequential, and analytic operations. It appeared to be propositional, categorical, verbal, logical, detail oriented, symbolic, convergent, abstract, and deductive. Language processes in the adult brain was largely a property of the left cerebral hemisphere (Gazzaniga, 1983).

The right hemisphere was notably simultaneous, metaphoric-intuitive, appositional, perceptual, non-verbal, auditory, musical, visual, pattern-oriented, spatial, literal, inductive, concrete, divergent, and holistic (Kane,

1984; R.W. Sperry, 1975). It processed stimuli all at once rather than sequentially. The right hemisphere thought in images and excelled with tasks that were nonverbal in nature and less familiar. The right hemisphere is also thought to be the site of creative thought.

EEG studies by Kraft (1980), Galin and Ornstein (1972), and other researchers provide support for the functions of the two hemispheres. Studies conducted in recording the electrical activity of the two hemispheres found that different hemispheric activity goes on during different cognitive tasks.

Both of these modes of consciousness and cognitive style form an integrated whole in promoting specific behavior (Nebes, 1975; Bogen, 1972, 1975, Raina, 1979). Findings have shown that right hemispheric functions, perceptual in nature, are necessary in the processing of verbal as well as nonverbal information (Levy, 1976). The implication is that hemispheric contributions as well as unique functions derived from hemispheric asymmetry are crucial to the successful and complete processing of information (Zalma, Reynolds, Kaufman, 1977; Raina, 1979).

Right-Left Mode Processing

McCarthy summarized the results of these studies. Left-mode functioning corresponds to the comprehension process. It is abstract, symbolic, analytical, and verbal.

It functions in a linear sequential manner. Right-mode functioning, corresponding to the apprehension process, is concrete, holistic, and spatial. Its functioning is analogic and synthetic, drawing together likenesses among things to recognize patterns.

Left Mode

Rational
 Responds to verbal instructions
 Controlled, systematic experiments
 Problem solves by logically and sequentially looking at the parts of things
 Objective
 Looks at differences
 Is planned and structured
 Prefers established, certain information
 Analyzes
 Primary reliance on language in thinking and remembering
 Prefers talking and writing

 Prefers objective tests
 Controls feelings
 Responsive to structure
 Prefers hierarchical authority
 Talks and talks and talks

 Sees cause and effect
 Is theoretical
 More sensitive to verbal sounds
 Engaged by subtle conventions in grammatical sequencing
 Excels in propositional language
 Sees design details
 Localized and discretely organized
 Digitalized
 Formal laws

Right Mode

Intuitive
 Responds to demonstrated instructions
 Open-ended, random experiments
 Problem solves by hunching looking for patterns and configurations
 Subjective
 Looks at similarities
 Is fluid and spontaneous
 Prefers elusive, uncertain information
 Synthesizes
 Primary reliance on images in thinking and remembering
 Prefers drawing and manipulating
 Prefers essay tests
 Free with feelings
 Responsive to ambience
 Prefers collegial authority

 Is mute, uses pictures, not words
 Sees correspondences
 Is experiential
 More sensitive to natural sounds, i.e., water running
 Engaged by patterns of sound that have naturalistic meaning
 Excels in poetic, metaphoric language
 Sees overall design form
 Diffuse organization

 Patterned
 Paradigms--shared theories

(Continued)

Left Mode

Superior in:
Writing
Digit and letter recognition
Nameable shapes
Word recognition and recall
Phonics discriminations
Superior in:
Slower, serial, analytic
difference detection
Draws on previously
accumulated, organized
information

Right Mode

Superior in:
Drawing
Verbal material when imagery
is used to code
Nonverbal dimensions: light,
hue, depth perception
Photographs, schematic figures
Tactile discriminations
Superior in:
Rapid, global, identity
matching
Draws on unbounded qualitative
patterns that are not
sequential, but cluster around
felt images

McCarthy, The 4MAT System. (Barrington, Illinois: EXCEL, Inc., 1987) p. 78.

Hemispheric Preference

Research indicates that the human being has a single mind and that the brain's hemispheres are specialized for the kind of thought or information processing a person chooses to use, not necessarily for the type of material (verbal and spatial) he confronts. Galin and Ornstein (1978) found that people tended to use their preferred modes of thought (i.e. verbal and analytic mode of problem solving or spatial, intuitive mode), even when their preferred strategy was not suited to the task (Ornstein, 1978).

Thus, among the two hemispheric processing systems, there seems to be a hemispheric preference for specific functions in most individuals. However, at times a function

can be lateralized in the opposite hemisphere or even show mixed dominance. Both hemispheres work cooperatively to process information. Specialization in the hemispheres does occur, however, in the modes of consciousness, if not always for particular functions (Grady & Luecke, 1978). The hemispheric processing system seems to underlie the learning style of individuals.

Zenhausern (1982) proposed hemispheric preference based on the differential efficiency of the two hemispheres. In Zenhausern's model individuals with a right hemisphere cognitive style tend to express their thoughts internally in pictorial form, prefer deductive reasoning, and in general are more proficient at those tasks for which the right hemisphere is more specialized. Those with a left hemisphere cognitive style tend to be reflective, express their internal thoughts more abstractly, prefer inductive reasoning, and in general are more capable at tasks for which the left hemisphere is more specialized. Verification of this model has been found in the area of thinking style, memory, brain processing, and maze learning (Zenhausern, 1982).

A study conducted to determine whether relationships exist between learning style and hemispheric preference found a statistically significant correspondence between individual students' learning styles and their hemispheric

preference. Left-preferenced and right-preferenced students evidence different learning style characteristics (Dunn, Cavanaugh, Eberle, Zenhausern, 1982).

Studies indicate that the cerebral hemispheres of most right-handed people are specialized for different kinds of thought. Left-handers often show a reverse specialization, in which some information is processed in the opposite hemisphere from the one used by right handers. Ambidextrous people seem to have the least specialization of all the groups tested (Ornstein, 1978).

Learning preferences were found between generally classified groups. Canfield found that significant differences occurred between males and females (Heikkinen, Pettigrew, Zakrajsek, 1975).

Male and Female Asymmetries

Many researchers while acknowledging that a vast range of sex differences reflects social influences, also assert that the neurological constitutions of men and women lead them to think and behave in different ways. Kolb and Whishaw (1980), in addition to other researchers, have identified a number of anatomical asymmetries between males and females and associated them with observable, functional differences.

Research on males and females indicate females in general to be more sensitive to visual stimuli, sound, and

touch (Goleman, 1978). Research on school-age children (Townes, et al, 1980) reported the developmental advantage of girls over boys in the early acquisition of abstract verbal reasoning and pattern-matching skills. Girls also proved to possess better developed fine motor skills and excel in linguistic abilities.

Males excelled in visual-spatial and mathematical skills (Goleman, 1978). Spatial skills in males show up in tasks that involve seeing: perception of depth in space, mazes, picture completion, map reading, and the ability to mentally rotate an object in space. This ability remains fairly constant throughout the lifespan (Witelson, 1976). According to Levy, the fact that the behavioral differences between the sexes do not increase from childhood to maturity suggests biological rather than environmental factors as the cause (Springer & Deutsch, 1985).

Significant normative sex differences exist in brain growth patterns. Research conducted by Herman Epstein indicates that female brain growth is about two to three times that of males during the 10-12+ growth spurt (phrenoblysis), and the situation is reversed, favoring males, during the 14-16+ brain growth period. Conversely, he identified periods of growth plateaus between the ages of 4-6, 8-10, and 12-14 (Hart, 1981). The neural growth of axons and dendrites of the brain during periods of

phrenoblysis leads to increased brain complexity and functioning capacity (Epstein, 1978).

Behavioral and neurological evidence revealed differences between males and females in cerebral organization (Springer & Deutsch, 1985).

Research on differences between males and females has raised a number of theoretical issues and lines of inquiry. Scientific agreement on the interpretation of the facts at times tended to determine the facts themselves. The controversy over biological and social influence in the determination of behavior and variability among males and females, as well as the influence of bias has contributed to much skepticism toward research into the psychological differences between men and women. Studies by Money and Ehrhardt indicate that both biological endowment and the cultural responses to being labeled male or female at birth determined the child's gender identity and social behavior (Parlee, 1978).

Ethnic and Cultural Differences

Scientists argue two distinct kinds of knowledge exist. One kind is transmitted through the genes as evidenced by the presence of structural asymmetries from birth. A second kind of knowledge is learned after birth. This reflects, for the most part, the culture and circumstances in which the individual is raised and lives. Findings of brain

research points to the significance of environment and education in enabling learning to take place. The extensive research studies of Marian Diamond, Mark Rosenzweig, and others suggest that an enriched social environment can enhance the physical development of the brain's neural connections and glial support cells (Kane, 1984).

Restak (1979) and Thies (1979) verify that selected elements of style are imposed by genetic makeup and that others are developed as an outgrowth of experiences throughout life. Anthropological evidence seems to indicate that sex differences in an ability can be large, small, or can disappear (Clyne, 1981). The brain is exceedingly flexible (plastic) in the formative years of development. With time and experience, each individual develops a unique learning style (Kane, 1984).

George Hynd et al (1980) in a study on the bilingual Native American reported evidence that receptive speech functions may be lateralized to the right hemisphere and that shifts in the attended perceptual field occur as Native Americans mature, perhaps due to an increasing familiarity with a second culture and a more propositionally oriented language.

Marshall McLuhan, a Canadian researcher, reported on Robert J. Trotter's earlier research on the Inuits of Northern Canada, pointing out that societies that have not

developed the use of the phonetic alphabet tend to exhibit the same right hemispheric orientation. In addition to the right hemispheric orientation, the Inuit possessed a high degree of spatial orientation. Similar findings demonstrate that a higher level of spatial ability in the male has been biologically adaptive in evolution. Thus, significantly higher spatial skills are found in the hunting people such as the Eskimos (Clyne, 1981).

Cultural experience plays a major role in the development and expression of cognitive functioning. Lessor (1976) has shown consistent differences in thinking style across different American ethnic groups; Witkin (1976) has shown differences in global and abstract functioning in different cultures; and Bruner et al. (1966) have shown differences in the rate and direction of cognitive development across cultures. These cultural differences in cognition, however, may reside more in the situation to which cognitive processes are applied than in the existence of a process in one cultural group and its absence in another. Thus, Cole found that African Kpelle tribesmen were skillful at measuring rice but not at measuring distance. Similarly, Wober (1967) found that Nigerians function more analytically than Americans when measured by a test that emphasizes proprioceptive cues, whereas they were less skilled at visual analysis (Kolb, 1984).

Difficulties may arise not only from a failure to develop lateral specialization but also from individual or cultural differences in preferred cognitive style. A pupil's difficulty with one part of a curriculum may arise from his reluctance to choose the cognitive mode appropriate to the work he is doing. Several investigators have found that subcultures within the United States are characterized by a predominant cognitive mode. The middle class are likely to use the verbal-analytic mode; the urban poor are more likely to use the spatial-holistic mode (Cohen, 1969; Lessor, 1971). This dichotomy results in a cultural conflict of cognitive style and may in part explain the difficulties of urban poor children in a school system oriented toward the middle class. Analytical thinkers are likely to experience greater success in schools as they are currently structured.

It is generally thought by anthropologists that some groups do well in school because their cultures are congruent with school culture. Differences between teaching styles and learning styles in the family and the community and the style employed in school may result in cultural discontinuity and academic difficulties (Ogbu, 1982).

TEACHING STYLE

Definition

Teaching style is a label associated with various identifiable sets of classroom behaviors by the teacher which are consistent even though the content that is being taught may change (Fischer & Fischer, 1979). This style is the operational behavior of the teacher's educational philosophy. A variety of terms and behavior have been identified and labeled as teaching styles (Dunn & Dunn, 1979; Fischer & Fischer, 1979). Teaching style consists of the teacher's personal behaviors and media technologies chosen to deliver and receive information.

Teaching styles may be characterized in a variety of ways resulting in a number of global definitions. One way is according to instructional modes such as recitation and lecture, discussion, inquiry, or role-playing (Hyman, 1970). Another is in terms of teaching models. Joyce and Weil (1972) offer four broad categories of teaching models: social interaction, information processing, personal source, and behavior modification. A popular way of characterizing teaching styles is in some dichotomous fashion. Examples of these are authoritarian versus democratic styles, pupil-centered versus teacher-centered styles, and traditional versus progressive styles (Silvernail, 1979).

Anthony Gregorc defines teaching style as a teacher's personal behaviors and the media used to transmit data to or receive it from the learner. Style is the natural qualities of the individual's mind, manifested in four basic channels a person uses for thinking. Each of these channels can be recognized by the distinctive behavior, characteristics and mannerisms that attend it. These channels form a set of dualities which are reflected in the learning and teaching styles of individuals.

Rita and Kenneth Dunn in their examination of teaching style point out that teachers teach the way they learned. As a result some teachers are traditional instructors and others are informal ones. Nine elements of teaching style are identified. These are: (1) educational philosophy, (2) student preference, (3) instructional planning, (4) student groups (how a teacher permits learning to occur sociologically), (5) room design (the ways in which the teacher uses instructional areas to match the learning needs of students), (6) teaching environment, (how instruction is scheduled, the number and kinds of options available to students, and the provisions made for mobility and multilevel resources when they are needed), (7) teaching characteristics (the values and standards a teacher holds as observed through the operational approaches used to transmit them, i.e. the teacher's degree of flexibility, perceptions

of the importance of what and how much is taught and/or learned, and the amount of direction and supervision provided to students), (8) teaching methods, and (9) the evaluation techniques used to instruct and then to determine student achievement.

Bernice McCarthy identifies characteristics of teachers according to four types of style categories (types 1-4). The following descriptions reflect the teaching styles as measured by McCarthy's Teaching Style Inventory. For the purposes of this study, these descriptions are to be accepted.

Type One

As teachers they are interested in facilitating individual growth. They try to help people become more self-aware. They believe curricula should enhance the ability to be authentic. They see knowledge as growth in personal insight and encourage authenticity in their students. They like discussions, group work, and realistic feedback about feelings. They are caring people who seek to engage their students in cooperative efforts. They are aware of social forces that affect human development. They are able to focus on meaningful goals. They tend to become fearful under pressure and sometimes lack daring.

Type Two

As teachers they are interested in transmitting knowledge. They try to be as accurate and knowledgeable as possible. They believe curricula should further understanding of significant information and should be presented systemically. They see knowledge as deepening comprehension. They encourage outstanding students. They like facts and details and organized sequential thinking. They are traditional teachers who seek to imbue a love of knowledge. They believe in the

rational use of authority. Sometimes their dominating attitude tends to discourage creativity.

Type Three

As teachers they are interested in productivity and competence. They try to give students the skills they will need to be economically independent in life. They believe curricula should be geared to this kind of focus. They see knowledge as enabling students to be capable of making their own way. They encourage practical applications. They like technical things and hands-on activities. They are exacting and seek quality and productivity. They believe the best way is determined pragmatically. They use measured rewards. They tend to be inflexible and self-contained and lack team-work skills.

Type Four

As teachers they are interested in enabling student self-discovery. They try to help people act on their own visions. They believe curricula should be geared to learners' interests. They see knowledge as a tool for improving the larger society. They encourage experiential learning. They like variety in instructional methods. They are dramatic teachers who seek to energize their students. They attempt to create new forms, to stimulate life and to draw new boundaries. They tend to rashness and manipulation. (McCarthy, 1987, pp.37-43)

Reportedly, every teacher has a learning style. Studies indicate that one's learning style preference influences one's teaching style (Gephart, Strother, and Duchett, 1980; MacNeil, 1980). Canfield's analyses of learning style preferences among program majors at universities indicated that learning styles are linked to program selection and/or teaching styles. Research

conducted at the University of Idaho revealed that education majors did display learning style preferences. Moreover, each group of subject matter majors had strong preferences for some learning variables. The results also indicated significant learning style differences between elementary and secondary education majors, along with significant learning style differences between male and female education majors (Heikkinen, Pettigrew, and Zakrajsek, 1985).

Research on Teaching Style

The systematic study of teaching effectiveness has been sporadic. Early studies (1896-1950s) had one serious flaw. They did not include any attempt to measure the effects of teacher characteristics on pupil achievement (Medley, 1972). Unreliability of instruments and the general lack of interest in the research topic delayed the development of objective, valid, and reliable methods of examining the effects of teaching styles and behaviors on pupil learning. Through the works of Soar, Medley and Mitzel, and Flanders, studies defined teacher behavior traits as composites of a number of specific behaviors that could be categorized, observed, and recorded. These studies led to the development of new observation instruments and new research methodologies which have resulted in many significant examinations of the effects of teaching styles on pupil achievement (Silvernail, 1979).

Basically, teaching effectiveness research has focused upon one or more components of some model of the classroom teaching process. The most widely used model, one developed by Mitzel and later refined by Dunkin and Biddle, consisted of four classes of variables, presage, context, process, and product. Presage and context variables include such things as the personality, knowledge, abilities, and status characteristics of teachers and pupils. Process variables describe the interactions of teacher and pupil behaviors, and product variables are primarily concerned with measures of pupil changes. The work of Powell, Flanders, and Soar suggested that broad generalizations were inappropriate; that the effectiveness of a particular style depended on time factors, the flexibility of the teacher, and the nature of the learning tasks. Bennett (1976) pointed out that a teacher's style involved many different variables which may manifest themselves through a variety of classroom activities. Later research thus focused on specific components of different teaching styles and strategies. These included feedback, the effects of praise, the effects of criticism, the use of pupil ideas, the use of questions, structuring activities, clarity of presentation, task-orientation, enthusiasm, classroom reward structures, and classroom climate (Silvernail, 1979).

Teaching is a complex act, and effective teaching involves a multitude of variables. This, coupled with the limitations of present research methodologies, hinders identification of precise cause-and-effect relationships. To date, an overwhelming amount of the research has been able to establish only correlational relationships between selected teaching styles and behaviors and pupil achievement (Silvernail, 1979).

MATCH VS. MISMATCH-LEARNING STYLES TO TEACHING STYLES

Students in the same class appear to learn in ways that often are dramatically different from each other. The interaction between student and teacher, influenced by the style of teaching and student's style of learning, appears to lead to greater or less success in student learning (Butler, 1983). Studies indicate when students are taught through resources and strategies that complement their individual preferences, significantly increased achievement results (Dunn, Bruno, Gardiner, 1984). It appears that the most successful students tend to possess learning preferences that match the instructional method preferences of the teachers (Cafferty, 1980).

Research studies verify that students can identify their own learning styles accurately (Domino, 1970; Farr, 1971). Matched styles and resources, strategies, or

conditions resulted in significant increase in (a) academic achievement, (b) improved attitudes, and (c) reduced numbers of discipline problems (Dunn, 1982).

Underachievers appear to have learning style characteristics that differ from those of high achievers (Dunn, 1979). Research conducted comparing good and poor readers indicated individuals with low reading achievement had different learning style preferences than those with high reading achievement (Price, Dunn & Sanders, 1981; Murray, 1981). Students whose perceptual strengths were tactual/kinesthetic rather than auditory or visual did not learn well through either phonics or word recognition reading approaches (Carbo, 1980; Urbschat, 1977; Wheeler, 1980). A study by Zenhausern (1982) on good and poor readers demonstrated that, of the good readers, approximately half were left- and half were right-brained, but of the poor readers, 17 out of 19 were right preferred students (Zenhausern, 1982).

In studies where IQ was controlled for and strong style preferences were matched, statistically significant reading achievement improvement was evidenced (Carbo, 1980; Krinsky, 1982; Pizzo, 1981; Shea, 1983; Wheeler, 1980). Likewise, Trautman (1979), in a study of junior high school social studies students found that when global students were taught globally and analytic students were taught analytically,

there was increased productivity, improved attitudes toward learning, and improved self concept.

In various studies, students tested for their learning styles who reported either strong negative or positive preferences for selected elements, were placed into academic situations where they were taught and/or tested in ways that matched and mismatched their self-reported preferences. In every case, students who were matched with methods, resources, or environments that complemented their reported strong preferences achieved statistically higher; they achieved statistically less well when they were mismatched with their preferences (Dunn, 1984).

Mismatch also appears to have an effect upon the teachers. Teachers whose teaching styles closely approximate their major leaning preferences report comfort, ease, and authenticity. Those who consistently instruct via minor styles report feelings of awkwardness, lack of efficiency and authenticity, and pain, mental and physical.

Research studies on matching for achievement outcomes seem to conclude that style matching can be strongly supported for affective reasons, but overall style matching produces inconsistent achievement outcomes. The value of using matching as the most effective means of maximizing individual development and creativity is debatable. Optimal learning conditions vary with the goals of the educational

situations, and obstacles, opposition, contradiction, and conflict are necessary to stimulate flexible and creative thinking (Cornett, 1983).

Gregorc states that periods of mismatch can result in new or varied experiences, the development of new techniques, and an appreciation of how others perceive and process information. On the other hand, great mismatch can lead to frustration, anger, avoidance behaviors, and procrastination. This suggests the necessity for self-knowledge, balance, alignment, and stretching (Gregorc, 1979, 1984).

Apparently, no single element can be isolated and used as the sole vehicle for matching and mismatching because multiple characteristics influence individual achievement, attitudes, and behavior. McCarthy (1987) advocates students should be taught in all (four) ways of learning as identified by Kolb's Learning Style Inventory in order to be comfortable and successful part of the time while being stretched to develop other learning abilities. Having students gradually become more adept at adjusting learning style to teaching style and task is seen as the process of learning to learn.

The goal is to have both teachers and students become knowledgeable about their styles so they can consciously adjust, adapt, or modify them in order to increase learning.

Style is stated to be both stable and flexible. The amount of flexibility depends largely on a person's repertoire of thinking processes. Interviews and observations indicate that some individuals can adjust easily to another style when necessary, while others have difficulty (Cornett, 1983).

While there appear to be no studies on the effect of teaching style on student learning styles, there appears to be reasonable support for the modification of students' cognitive styles in accordance with the cognitive style used by the teacher. Gregorc states learners need to recognize their learning styles and learn how to stretch their learning styles to adapt, cope with, and change themselves along with their environment.

As teachers gain an appreciation of the variety of learning styles, they can respect learning style differences and adapt their teaching styles for different situations. Bruce Joyce (1981) reports success in helping teachers with various teaching styles learn new models of teaching behavior that contribute to student learning.

Wittrock suggests that complementary functioning can be best facilitated by determining the student's preferred modality and then designing instructional strategies and materials which will first challenge the preferred hemisphere directly and then provide secondary instructional

experiences stimulating the other hemisphere to reinforce learning and provide an individual with a wider variety of alternative experiences. Gregorc recommends the use of various techniques and strategies whereby students can reach objectives either by their preferred means or by being stretched and taught how to use the approach and content of another style.

Bernice McCarthy attempts to address all learning styles through the 4MAT System. The 4MAT System moves through a learning cycle in sequence, teaching in all four modes and incorporating the four combinations of characteristics. The sequence is perceived in terms of a natural learning progression. Each of the four learning styles is taught with both right- and left-mode processing techniques. The development and integration of all four styles of learning and the development and integration of both right- and left-mode processing skills are proposed as a major goal of education. Students thereby can come to accept their strengths and learn to capitalize on them, while developing a healthy respect for the uniqueness of others and furthering their ability to learn in alternative modes (McCarthy, 1987).

The teacher develops and integrates all four modes of learning incorporating both right and left brain processing skills. The instructional model enables the teacher to

practice all four teaching styles. His/her role changes in moving through the cycle of learning: from motivator/witness to teacher/information giver to facilitator/coach to evaluator/remediator and resource.

The work on learning styles raises a number of concerns. Authors of learning style display crucial and significant variance regarding the nature of the practical knowledge about the diagnosis and application of learning style. Also, promoting the child's judgments of his/her own needs, is stated to undermine the greater vision of public education. To say that a student differs in learning style means that certain educational approaches are more effective than others for him/her. Students' preferences regarding classroom structure may be quite different from their real educational needs. The view of personalized education suggests that schools exist to teach children in the manner that is most effective and convenient to the students and undermines the greater vision of public education as a vehicle for creating enlightened citizens. Adaptation, it is argued, should be from formal, quantitative, and moderate teacher involvement (Davidman, 1981).

Perhaps, as commented by Cornett (1983), Madeline Hunter's definition of teaching as the process of making and implementing decisions, before, during, and after

instruction, to increase the probability of learning, would indicate that a matching mechanism is already in place in every classroom.

Chapter III

METHODOLOGY

The research study is designed to determine if there is a relationship between the match/mismatch of teaching styles and learning styles to student attendance and achievement. This chapter describes the various components of the research design. The major components discussed are the population and sample, design, instruments and measures, and procedures of the data analysis.

POPULATION AND SAMPLE

The population for this study consisted of all of the adult basic skills/GED students ($N = 365$) and teachers ($N = 23$) at the seven main sites of the Department of Education adult education schools on Oahu in addition to the Kamehameha Schools. The Kamehameha Schools-Windward School for Adults field sites at Kahalu'u and Punalu'u and the Honolulu District field sites at Stevenson Intermediate and Kaumakapili Church were also included in the study. For the purpose of this study, the entire population of 365 adult basic skills/GED students and 23 teachers from both the Kamehameha Schools Continuing Education Program and the

7 Department of Education adult education schools in the 1988 Fall term were included in the beginning sample of students ($N = 365$) and teachers ($N = 23$). Classes selected for the study were (1) level II, 9-12, adult basic skills/GED classes from the seven state Department of Education Adult Community Schools and (2) Basic Skills/GED classes from the Kamehameha Continuing Education Program. These were classes conducted at main school sites and selected field sites on Oahu. The results of this study are intended to be generalized to the population of adult basic skills/GED students and teachers on Oahu.

DATA GATHERING PROCEDURES

Achievement data on the students were gathered using the Tests of Adult Basic Education (TABE) as both a pre- and post measure using separate forms to maintain test validity. At the beginning of the Fall semester, students in all adult basic skills/GED, LII (9-12 grade levels) classes, were given the Tests of Adult Basic Education (TABE) and the Learning Style Inventory (LSI). They then also filled out a profile questionnaire. (See questionnaire, Appendix F)

Teachers were asked to complete the LSI and the Teaching Style Inventory (TSI) at the start of the Fall session. They were to also complete the profile questionnaire.

At the end of the Fall term, the students were post tested on the TABE. Examiners trained in administering the TABE test administered the TABE test according to the standard test procedures and script defined in the Test Examiner's Manual. The TABE testing was conducted as part of the normal placement process conducted within the schools.

Attendance data was recorded by the classroom teachers during the term and the data was compiled by the researcher at the end of the term and analyzed. Attendance data and information were collected on both students completing the semester and those leaving the program before the end of the semester.

Attendance data was examined and identified for the term of the class and for the research period (pretest to post test period) in terms of: (1) rate of attendance (percent of classes attended) and (2) attendance at the post testing session. Students who took both the pretest and post test were included in the group of "completions," having completed the term of the research. Data on these "completions" was analyzed in terms of the learning style-teaching style combination in comparison to those who did not complete the term.

The data for the entire 365 students included in the study was utilized in testing null hypothesis 1: there is no

significant difference in rate of attendance between students whose learning styles are matched with the teaching style of the instructor and students whose learning styles are not matched. Of the 365 students, 290 took the TABE math pretest. Among these 290 students, 125 students who took both the pretest and post test in math were identified as completions. These 125 students were utilized in the testing of hypothesis 2 on achievement and hypothesis 3 on rate of attendance.

Demographic data was gathered using the profile questionnaire. The following data was collected: 1-Ethnicity, 2-Sex, M/F, 3-Age Group. Students were asked to identify their own ethnicity by checking off all ethnic categories that applied to them and listing additional categories in a line space provided. Two of the 365 students did not report their ethnicity. The eight ethnic groups with the largest numbers of students were utilized for the analysis. These were as follows: Chinese, Caucasian, Filipino, Hawaiian, Indochinese, Japanese, Korean, and Pacific Islander. Blacks, Hispanics and 43 different combinations of ethnicities were represented in the group, "other". These are listed in Appendix A. The size of each of these groups was too small to be analyzed meaningfully as a separate category.

INSTRUMENTATION

The instruments used in the study were tests designated for adult learners and teachers. A test to measure math and language skills and a test to measure learning styles were administered to students. A third measure, the Teaching Style Inventory (TSI), was an instrument designed to measure the teaching style of teachers.

Learning Style

The Learning Style Inventory (LSI) was developed by David A. Kolb. The LSI was designed to measure the degree to which individuals display the learning styles derived from experiential learning theory. The purpose of the LSI was to help individuals assess their ability to learn from experience.

The test was a 12-item questionnaire in which respondents attempted to describe their learning style. Each item asked respondents to rank-order four sentence endings that corresponded to the four learning modes-- Concrete Experience (whose characteristic word is feeling), Reflective Observation (watching), Abstract Conceptualization (thinking) and Active Experimentation (doing).

The four basic scales and two combination scores all showed very good internal reliability as measured by

Cronbach's ($n=268$). The combination scores showed almost perfect additivity (1.0) as measured by Tukey's test (Kolb, 1985).

	<u>Cronbach's Standardized Scale Alpha</u>	<u>Tukey's Additivity Power</u>
Concrete Experience (CE)	.82	.91
Reflective Observation (RO)	.73	1.09
Abstract Conceptualization (AC)	.83	1.07
Active Experimentation (AE)	.78	1.03
Abstract-Concrete (AC-CE)	.88	1.00
Active-Reflective (AE-RO)	.81	.99

Assessment of Kolb's LSI (Merritt, Marshall, 1984) indicated that the factor structure supported the construct validity of the LSI items when compared to Kolb's model for learning styles. The structure of the normative form was found to be congruent with that of the theoretical model, with scale reliabilities equal to or higher than those in the original ipsative form. The ipsative measure (Kerlinger, 1973) designed to maximize differences between instrument scales within an individual, compared the relative strength for a particular mode of learning with that of one or more of the other modes defined by the experiential learning model. As a result, the relative

strengths for the various learning modes within an individual could be determined.

Ferrell (1983) conducted a factor analytic comparison of the Kolb Learning Styles Inventory, and three other learning styles instruments: the Grasha-Riechmann Student Learning Style Scales (SLSS; Riechmann and Grasha, 1974), the Dunn Learning Style Inventory (Dunn LSI; Dunn, Dunn, and Price, 1975), and the Johnson Decision Making Inventory (DMI; Coscarelli, 1981). The study reported validation of only the Kolb Learning Style Inventory. Items comprising the four factors extracted matched the four learning abilities as described by Kolb (1976). Results of the factor analysis of the Kolb LSI supported Kolb's conceptualization of learning style.

Teaching Style

The Teaching Styles Inventory (TSI), developed by Bernice McCarthy, was utilized to measure the teaching styles of teachers. Respondents were asked to rate each of four "characteristics" in nine items. The characteristics were rated 1, 2, 3, or 4 and the same rating could not be given to two characteristics in the same item. All the characteristics were keyed to a particular teaching style, 1, 2, 3, or 4, and the characteristics were randomly ordered within each item.

To score the measure, one summed the ratings over the characteristics specific to each teaching style and, of the four scores computed, the maximum corresponded to the respondent's teaching style.

A discriminant analysis was performed using a random half of 265 respondents answer patterns as a calibration sample to calculate discriminant coefficients using the teaching style based on their maximum score. These coefficients or weights were applied to the responses of the other half of the sample to compare their predicted style with actual teaching style. Over 70% of the respondents' styles were correctly predicted with this analysis (Lieberman, 1987).

The item validity data was very strong with every characteristic showing higher proportions of keyed respondents (those of the characteristic-typed style) rating it higher than people of any other style (Lieberman, 1987).

A study of test-retest reliability revealed correlations between scores over two testings.

TEACHING STYLE SCORE	CORRELATION
1	0.87
2	0.82
3	0.84
4	0.72

Cross-tabulation of the two administration of the measure yielded a contingency coefficient of 0.71. Data from the two administrations of the Teaching Style Inventory showed adequate test-retest reliability with acceptable levels of stability over a short period of time (Lieberman, 1987).

Student Achievement

Student achievement was measured according to the Tests of Adult Basic Education (TABE). The TABE test was a standardized measure designed to assess reading, mathematics, and language skills for adults. Level D was used with alternative forms (3 and 4) for pre and post testing. The language and math raw scores were utilized in hypothesis testing.

The test-retest reliability coefficients (Pearson product-moment) for the TABE are reported as follows:

Total Mathematics	.79
Language Mechanics and Expression	.60
Spelling	.67

Interform reliability (the extent to which the alternate forms of TABE at the same level measure the same thing) indicated .76 for total mathematics and .77 for language mechanics and expression with .66 for spelling. Interform correlation coefficients (r) for total battery (including reading) yielded .79.

Validity for the TABE-76 was reported in terms of the validity for the CAT-70 since the TABE-76 was an adaptation of the CAT-70. The selection of content for the development of the CAT-70 was based on examination of state level recommended and approved reading, mathematics, and language texts and curricular objectives and courses of study in states representing all sections of the country (CTB/McGraw-Hill, 1974). These analyses allowed the specification of content that was relevant to current curricular objectives as well as the specification of format that was most typical of that encountered by students in their textbooks.

A study was also conducted to determine the relationship between TABE-76 and the Tests of General Educational Development (GED Tests) and the predictive validity of TABE scores for GED performance. An obtained validity coefficient ($r = .56$) was reported, indicating a substantial relationship between TABE scores and GED scores.

Scoring

The TABE tests were scanned using the standard scanning sheet and optical scanning equipment, i.e. Scantron. Results of the TABE were summarized in terms of raw scores.

The LSI and the TSI were entered into the computer and scored. Learning styles were determined by Kolb's

multidimensional Learning-Style Type Grid. Teaching styles were identified using the 4MAT Teaching Style Inventory Scoring Data chart.

The attendance data was summarized accordingly for groups, matched and mismatched.

TOPIC RESEARCH DESIGN

An ex post facto design was employed to determine the relationship of learning style-teaching style match/mismatch to student achievement and attendance. The following variables were identified.

Independent Variable:

Match/mismatch

Teaching style as measured by the TSI

Teaching Style Inventory (TSI);

Learning style of students as measured by the

Learning Style Inventory (LSI).

Dependent Variables:

- (1) Student achievement as measured by the math test of the Tests of Adult Basic Education.
- (2) Student rate of attendance.

Moderator Variables:

- (1) Ethnic background: Hawaiian, Japanese, Filipino, Caucasian, Chinese, Indochinese, Korean, Pacific Islander and Other.

("Other" consisted of Blacks, Hispanics, and 43 ethnic group combinations.) Students were asked to list all that applied to them.

(2) Sex: Male, Female.

(3) Age: 17-24, 25-34, 35-44, 45-54, 55-64, 65+.

STATISTICAL ANALYSIS

Procedures for Analysis of Data

Demographic analysis of the sample was conducted using the Statistical Analysis System (SAS) program and PROC FREQ procedure. Frequency distributions were reported for the sample on age, ethnicity and sex for the overall sample ($N = 365$) and for the matched group ($n = 157$) and mismatched group ($n = 208$). A chi square was then conducted to identify statistically significant differences, if any, between matched and mismatched groups on age, ethnicity, and sex.

Analysis of variance using the SAS General Linear Models (GLM) procedure was conducted to test null hypothesis 1 of no significant difference between matched and mismatched groups ($N = 365$) on the dependent variable, rate of attendance. Ethnicity, sex, and age were also included for the analysis to determine their moderating effects on the rate of attendance.

A chi-square was conducted to answer the ancillary question of no significant difference between matched and mismatched groups ($N = 365$) on the number of completions and noncompletions. Completions were defined as students who completed the research term and took both the pretest and post test of the math TABE (Tests of Adult Basic Education).

As a preliminary step, the data were descriptively analyzed using the SAS subcommand PROC FREQ DATA. Frequency distribution of the sample ($n = 125$) and matched and mismatched groups were reported for the variables age, ethnicity, and sex.

The achievement test data was also descriptively analyzed to determine the variability of the matched and mismatched groups. The data was adjusted for outliers, rare events and missing values. A t-test for differences between matched and mismatched group mean, math pretest scores was conducted to determine group equivalency on math achievement at the beginning of the study. Chi square analysis was performed to determine differences between matched and mismatched group on sex, ethnicity, and age. These tests for homogeneity of regression and variance-covariance matrices served as preliminary steps to the major analysis using the multivariate analysis of variance that followed (EDA J.W. Tukey, 1977, Exploratory Data Analysis).

Univariate analysis of variance tests were conducted to analyze the data in testing null hypothesis 2 of no significant difference between matched and mismatched groups on achievement and null hypothesis 3 of no significant difference between matched and mismatched groups on rate of attendance.

The SAS software system for data analysis General Linear Models Procedure with MANOVA statement was utilized to analyze the joint distribution of the two dependent variables, achievement and rate of attendance between matched and mismatched groups among students completing the term ($n = 125$). The MANOVA program is a generalized multivariate analysis of analysis of variance and covariate program. Both dependent variables, achievement, and rate of attendance were analyzed simultaneously and partitioned into systematic (main effects and interactions) and unsystematic (error) sources. Ratios of systematic variance to error variance were examined to determine the significance of main effects and interactions.

Chapter IV

FINDINGS

This chapter presents selected descriptive statistics for the variables involved and the findings for the results of tests used to confirm the null hypotheses. For each hypothesis, the findings are presented. A summary of the findings concludes this chapter.

The purpose of this study was to determine whether the match (or mismatch) of learning styles with teaching styles resulted in differences in attendance rates and achievement. Achievement was based on assessment in math as measured by the Tests of Adult Basic Education. Matching was based on David Kolb's Learning Style Inventory and Bernice McCarthy's Teaching Style Inventory. Age, ethnicity and sex were moderator variables.

DESCRIPTIVE STATISTICS

The data in Table 1 are frequency and percent distributions for the sample group attending the Basic Skills/GED programs in Fall, 1988. The sample consisted of 365 students in adult basic skills/GED classes from the seven DOE adult education schools on Oahu and the Kamehameha

Schools Continuing Education Program. Table 1 shows the frequency distribution for age, ethnicity, and sex of the total sample of students included in the study ($N = 365$). Two of the 365 students did not list their ethnicity on the survey.

Table 1

Number and Percent of Sample Population Students in the Basic Skills/GED Program by Age, Ethnicity, and Sex During the Fall of 1988 ($N = 365$)

Characteristics	Number	Percent
<u>Age Group</u>		
17-24	184	50.4
25-34	105	28.8
35-44	46	12.6
45-54	13	3.6
55-64	11	3.0
65+	6	1.6
	365	100.0
<u>Ethnicity</u>		
Chinese	20	5.5
Caucasian	63	17.3
Filipino	72	19.7
Hawaiian	22	6.0
Indochinese	8	2.2
Japanese	23	6.3
Korean	12	3.3
Pacific Islander	24	6.6
Other	119	32.6
Ethnicity unknown	2	.5
	365	100.0
<u>Sex</u>		
Female	224	61.4
Male	141	38.6
	365	100.0

Students ranged in ages between 17 and 65+ years, with the majority of students falling within the younger age group (17-34). Students' ethnicity was recorded in nine categories. Filipinos constituted the largest single group (20.5 percent), with Caucasians second (18.4 percent). The group "other" consisted of Blacks, Hispanics, and various combinations (47 combinations) of the ethnic groups used in this study. These are listed in Appendix A. The N of each combinant or singleton in the group "other" was of a size too small to be analyzed meaningfully as a separate category.

Of the 365 students, a greater proportion were females (61.4 percent). Males comprised 38.6 percent of the total population.

HYPOTHESIS TESTING

The match/mismatch of student learning style to teacher teaching style was examined in relation to: (1) rate of attendance for the total Basic Skills/GED group included in the study, (2) math achievement as measured by the Tests of Adult Basic Education (TABE) for the Basic Skills/GED group who completed the term having taken both pre- and post tests and (3) rate of attendance for the Basic Skills/GED group who completed the term having taken both pre- and post tests.

The problem studied was whether matching of styles affected student rate of attendance and/or achievement. The study also examined whether or not matching resulted in a higher number of completions. The matching of styles was viewed as a possible reason for students rate of attendance, completion, and/or achievement in adult education programs.

Analysis of variance was used to test null hypothesis 1 on differences between groups on attendance for the total sample ($N = 365$). Chi square was then used to answer the ancillary question on differences between matched and mismatched groups in terms of the number of students completing the term and the number of students who dropped out before the end of the term. A multivariate analysis of variance was conducted using the pre-post test group ($n = 125$). Univariate tests were used to test null hypothesis 2 on differences in achievement and null hypothesis 3 on differences in rates of attendance. Preliminary analysis of the matched and mismatched groups was initially conducted to satisfy the assumption of equal variances.

The following is a presentation of the findings for null hypothesis 1 and ancillary question.

Null Hypothesis 1

There is no significant difference ($p < .05$) in attendance between students ($N = 365$) whose learning styles are matched with the teaching style of the instructor and students whose learning styles are not matched. There is no significant difference ($p < .05$) in attendance among students by sex, ethnicity, and age.

Demographic comparison of the matched and mismatched groups. Matched and mismatched learning style to teaching style groups were initially compared for demographic differences. Both groups appeared to be similar in terms of sex, ethnicity, and age. Of the total sample of 365, 157 were matched teaching and learning styles and 208 were mismatched. Table 2 describes the frequency distribution of the matched and mismatched groups in terms of age, ethnicity, and sex.

Table 2

Number and Percent of Matched and Mismatched Students
Regarding Learning Style to Teaching Style
by Age, Ethnicity, Sex

Characteristic	<u>Matched</u>		<u>Mismatched</u>	
	Number	Percent	Number	Percent
<u>Age</u>				
17-24	65	41.4	119	57.2
25-34	51	32.5	54	26.0
35-44	25	15.9	21	10.1
45-54	6	3.8	7	3.4
55-64	5	3.2	6	2.9
65+	5	3.2	1	.5
	<u>157</u>	<u>100.0</u>	<u>208</u>	<u>100.0</u>
<u>Ethnicity</u>				
Chinese	9	5.7	11	5.3
Caucasian	27	17.2	36	17.3
Filipino	30	19.1	42	20.2
Hawaiian	9	5.7	13	6.3
Indochinese	3	1.9	5	2.4
Japanese	9	5.7	14	6.7
Korean	8	5.1	4	1.9
Pacific Islander	9	5.7	15	7.2
Other	53	33.8	66	31.7
Unknown			2	1.0
	<u>157</u>	<u>100.0</u>	<u>208</u>	<u>100.0</u>
<u>Sex</u>				
Female	103	65.6	121	58.2
Male	54	34.4	87	41.8
	<u>157</u>	<u>100.0</u>	<u>208</u>	<u>100.0</u>

Within the matched group the largest age groups were 17-24 (41.4 percent) and 25-34 (32.5 percent). The largest ethnic groups were Filipino (19.1 percent) and Caucasian (17.2 percent). The group of "other" was comprised of various other ethnic groups and mixtures of ethnic groups. There was a greater number of females (103) to males (54).

The mismatched group was larger than the matched group with a total of 208 students. Within the matched group there was a greater number of females (121) than males (87). Similar patterns in terms of age and ethnicity predominated the mismatched group data. The largest age groups were the 17-24 age group (57.2 percent) and 25-34 age group (26.0). The highest numbers were among the Filipino (20.4 percent) and the Caucasian (17.5 percent) ethnic groups.

A chi square was conducted to identify statistically significant differences, if any, between matched and mismatched groups on age, ethnicity, and sex. Chi square values were calculated on the frequency distributions of matched and mismatched groups on age, ethnicity, and sex. The results indicated significant differences ($p < .05$) only on age levels (chi square = 12.229, $df = 5$, $p = 0.032$). Table 3 describes the chi square value and level of significance for the matched and mismatched students on sex, ethnicity, and age.

Table 3

Chi Square Value and Level of Significance for
Matched and Mismatched Students Regarding
Learning Style to Teaching Style
By Sex, Ethnicity, and Age

	Number	DF	Chi Square	p
Match/Mismatch with				
Sex	365	1	2.08	0.14
Ethnicity	363	8	3.50	0.89
Age	365	5	12.22	0.03*

* $p < .05$.

The major difference existed in a larger number of mismatched students (119 students) in the 17-24 age group as compared to the number of matched students (65 students). No significant differences were found for sex (chi square = 2.085, $df = 1$) or ethnicity (chi square = 3.503, $df = 8$).

Thus, except for some age differences, the matched and mismatched groups were demographically comparable.

Finding for Null Hypothesis 1

Analysis of variance using the SAS General Linear Models (GLM) procedure was conducted to test the null hypothesis of no significant difference between matched and mismatched groups ($N = 365$) on the dependent variable, rate of attendance. Ethnicity, sex, and age were also included

for analysis to determine their moderating effects on rate of attendance. Table 4 shows the results of the analysis of variance conducted on the rate of attendance. The group was analyzed in terms of matched/mismatched learning style to teaching style, sex, ethnicity, and age.

Table 4

F-Ratio and Critical Values of Attendance Rates on Matched/Mismatched Students Regarding Learning Style to Teaching Style by Age, Ethnicity and Sex

Variable	df	F	p
Match/Mismatch (M/M) Learning style to Teaching style	1	0.68	0.409
Sex	1	0.01	0.928
Ethn.	8	1.43	0.185
Age	5	3.58	0.003*
M/M x Sex	1	0.00	0.921
M/M x Ethn.	8	0.71	0.680
M/M x Age	5	0.90	0.479
Sex x Ethn.	8	1.76	0.084
Sex x Age	5	0.86	0.511
Ethn. x Age	26	1.05	0.408
M/M x Sex x Ethn.	7	1.23	0.283
M/M x Sex x Age	2	1.20	0.302
M/M x Ethn. x Age	14	1.23	0.252
Sex x Age x Ethn.	9	1.07	0.387
M/M x Sex x Ethn. x Age	2	3.77	0.024*
Error	260		
Total	362		

* p < .05.

The overall test for significance of matched/mismatched student learning style to teaching style on the dependent variable attendance resulted in an F value of 0.68. While the critical values indicated no significant difference in attendance between matched and mismatched groups, the groups were significantly different on the variable age ($F = 3.58$, $df = 5$, $p < 0.003$). In addition, the interaction of matched/mismatched variable with sex, ethnicity, and age was significant ($F = 3.77$, $df = 2$, $p = .02$). These findings, however, must be interpreted with caution. As a result of the small sample size and the number of variables included in the analysis, the row and column cell sizes were insufficient for proper interpretation.

The follow up analysis conducted with univariate tests (Scheffe) did not identify significant differences between the group means. The group means and standard deviations for rate of attendance by student age groups and for the interactive effects of sex, age, and ethnicity are reported in Appendix B and C. The Scheffe uses a single range value for all comparisons, which is appropriate for examining all possible linear combinations of group means and is therefore stricter than the other test. Consequently, the small sample size and insufficient cell sizes may not have been adequate to support the conservative Scheffe's Test in identifying significant differences between the means.

Examination of the group means indicated the matched group had a higher rate of attendance (Mean = 0.58) than the mismatched group (Mean = 0.56), although the difference was not significant. The attendance rate for males (Mean = 0.57) was the same for females. In terms of ethnicity, the highest rates of attendance were found among Koreans (Mean = 0.69) and Chinese (Mean = 0.67). The lowest rates were found among Hawaiians (Mean = 0.43) and Japanese (Mean = 0.52). In terms of age, higher attendance was found among the older age groups. The highest attendance was found among the group 65 years and older (Mean = 0.81), followed by the age groups 45-54 (Mean = 0.75), and 55-64 (Mean = 0.66). The lowest attendance were found among the 17-24 (Mean = 0.52) and the 35-44 age groups (0.58). Due to the small sample size and insufficient cell sizes, the results must be interpreted with caution.

Ancillary Research Question

There is no significant difference ($p < .05$) between matched and mismatched students in the number of students completing the term and students leaving before the end of the term.

Findings for the Ancillary Research Question

Chi square was used to test the null hypothesis of no significant matched and mismatched groups ($N = 365$) in terms

of the number of completions and noncompletions (those who dropped out before the end of the term). The obtained chi square = 0.232, df = 1, was not significant at the .05 level.

Comparison of completions and noncompletions using chi square analyses indicated no significant differences in terms of sex (chi square = 0.119, df = 1), ethnicity (chi square = 13.085, df = 8), and age (chi square = 9.736, df = 5).

The next research question dealt with analyzing the relationship between teaching style/learning style match and mismatch and achievement of students completing the term (n = 125). Match and mismatch was also examined in relation to the attendance of students who completed the term. Preliminary tests for group equivalency were initially conducted. The null hypothesis and findings are reported in the following presentation.

Preliminary tests for group equivalency. Tests for variances within the population samples were conducted to provide assurance that the matched and mismatched groups were not significantly different both demographically and on achievement. Subjects were those with both pre- and post test scores (n = 125). Table 5 shows the frequency distribution of the students who completed the term. These

were students who attended the last quarter and who took both the pre- and post TABE test.

Table 5
 Number and Percent of the Population Sample
 of Students Completing the Term (N - 125)

Variable	Number	Percent
<u>Age</u>		
17-24	51	40.8
25-34	46	36.8
35-44	15	12.0
45-54	6	4.8
55-64	3	2.4
65+	4	3.2
	125	100.0
<u>Ethnicity</u>		
Chinese	7	5.6
Caucasian	24	19.2
Filipino	25	20.0
Hawaiian	2	1.6
Indochinese	3	2.4
Japanese	5	4.0
Korean	6	4.8
Pacific Islander	10	8.0
Other	41	32.8
Unknown	2	1.6
	125	100.0
<u>Sex</u>		
Female	71	56.8
Male	54	43.2
	125	100.0

Table 6

Number and Percent of Matched and Mismatched Students
 Regarding Learning Styles to Teaching Style
 Completing the Term by Age, Ethnicity, and Sex
 (N = 125)

Variable	<u>Matched</u>		<u>Mismatched</u>	
	Number	Percent	Number	Percent
<u>Age</u>				
17-24	17	35.4	34	44.1
25-34	18	37.5	28	36.4
35-44	6	12.5	9	11.7
45-54	2	4.2	4	5.2
55-64	1	2.1	2	2.6
65+	4	8.3		
	<u>48</u>	<u>100.0</u>	<u>77</u>	<u>100.0</u>
<u>Ethnicity</u>				
Chinese	2	4.2	5	6.5
Caucasian	8	16.7	16	20.7
Filipino	10	20.8	15	19.5
Hawaiian	0	00.0	2	2.6
Indochinese	1	2.1	2	2.6
Japanese	1	2.1	4	5.2
Korean	3	6.2	3	3.9
Pacific Islander	6	12.5	4	5.2
Other	17	35.4	24	31.2
Unknown			2	2.6
	<u>48</u>	<u>100.0</u>	<u>77</u>	<u>100.0</u>
<u>Sex</u>				
Female	26	54.2	45	58.4
Male	22	45.8	32	41.6
	<u>48</u>	<u>100.0</u>	<u>77</u>	<u>100.0</u>

A t-test for statistical differences between matched and mismatched group mean math pretest scores was conducted. The findings indicated no significant difference between the matched and mismatched group mean scores, thus showing that the two groups were equivalent on math achievement at the beginning of the study.

Table 7

"t"-Ratio Between Matched and Mismatched Students Regarding Learning Style to Teaching Style on the Math Pretest by Number, Mean, and Standard Deviation

Groups	<u>N</u>	Mean	<u>SD</u>	<u>t</u>	<u>p</u>
Matched	115	49.2	16.9	0.41	NS
Mismatched	175	48.4	15.9	0.42	NS

Chi square analysis was performed to determine difference between matched and mismatched group on moderator variables: sex, age, ethnicity. Results indicated no significant difference on either age (chi square = 7.094, df = 5), sex (chi square = 0.220, df = 1), or ethnicity (chi square = 4.995, df = 8). Due to low expected counts within a percentage of the cells for ethnicity and age, it was noted that chi square may not have been a valid test for these two characteristics. Chi square analysis of matched and mismatched groups on age resulted in 50 percent of the cells having expected counts of less than 5, and on

ethnicity, 61 percent of the cells had expected counts less than 5.

The data was also examined to determine the variability of the matched and mismatched group. Distribution of the total sample of students in the math classes ($n = 290$) resulted in a mean of 48.7 and standard deviation of 16.29. Comparison of the group means and standard deviations of both the matched and mismatched groups to the total sample indicated close similarity of the matched and mismatched groups to the total sample.

Null Hypothesis 2

There is no significant difference ($p < .05$) in achievement between students whose learning styles are matched with the teaching style of the instructor and students whose learning styles are not matched as measured by the Tests of Adult Basic Education (TABE).

Null Hypothesis 3

There is no significant difference ($p < .05$) in rate of attendance between pre- and post testing between matched and mismatched groups among students completing the term (those having both pre- and post tests).

Multivariate analysis of variance (MANOVA). A multivariate analysis of variance (MANOVA) was conducted using the Statistical Analysis System (SAS) General Linear

Models Procedure (PROC GLM) to analyze the data for both hypothesis 2 and 3. Wilks' Criterion was used to examine the overall effect of match/mismatch on the dependent variables, math post test scores and rate of attendance between pre and post TABE tests. Age, ethnicity, and sex were included as moderator variables.

The actual calculated value yielded by applying the Wilks' lambda test was then transformed into F values through a procedure known as Rao's approximation (Bock, 1975). The F provides evidence of departure from the linear model greater than what would be attributed to the error variation.

The results of the MANOVA test indicated no significant difference for overall match/mismatch effect, $F(2,60) = 0.43$, and overall age effect $F(10,120) = 1.19$, overall effects for ethnicity, $F(16,120) = 1.08$, and overall effects for sex, $F(2,60) = 0.06$.

Univariate tests were systematically conducted for the individual dependent variables. Univariate F -ratios for the dependent variables, math TABE achievement and rate of attendance of students completing the term, are reported in Table 8. These results are reported in the findings for null hypotheses 2 and 3.

Finding for Null Hypothesis 2

Analysis of post test TABE scores indicated no significant differences between groups on matching. Significant differences however, were found on the interaction between sex and age ($F = 6.82$; $df = 4$; $p = .0001$) and ethnicity and age ($F = 2.51$; $df = 14$; $p = .006$).

Findings for Null Hypothesis 3

The univariate F -ratio of student rate of attendance between pre- to post test showed no significant difference between the matched and mismatched groups on the rate of attendance from pre- to post test for the group who completed the courses ($n = 125$).

Table 8 shows the analysis of variance on the rate of attendance between pre- to post test in terms of the matched/mismatched learning style to teaching style, sex, ethnicity, and age.

Table 8

Multi- and Univariate F-Ratio and Critical Values
of Attendance Rates (Pre-Post) and Post Math Test
Scores on Matched/Mismatched Students Regarding
Learning Styles to Teaching Styles by
Age, Ethnicity, and Sex

Variable	df	Multi- variate F ratio	Univariate F ratio	
			Attendance Rate	Post Test Score
M/M	1	0.43	1.95	0.01
Sex	1	0.06	0.06	0.67
Ethn.	8	1.08	0.50	1.64
Age	5	1.19	1.30	1.16
M/M x Sex	1		0.47	0.62
M/M x Ethn.	7		0.98	0.96
M/M x Age	4		0.18	0.26
Sex x Ethn.	6		0.81	0.96
Sex x Age	4		0.37	6.82*
Ethn. x Age	14		0.48	2.51*
M/M x Sex x Ethn.	3		0.40	0.54
M/M x Sex x Age	2		0.71	1.45
M/M x Ethn. x Age	3		2.56	1.34
Sex x Age x Ethn.	1		0.11	0.01
M/M x Sex x Ethn. x Age	1		0.59	0.20

Note: M/M represent match/mismatch of teacher teaching style to student learning style.

* $p < .05$.

Follow up tests using Scheffe's Test did not identify specific levels of differences. The interactive effects of sex and age and ethnicity and age upon post math test scores of students are reported in Appendix D and E. Due to the small sample size and consequent small group sizes, the

group means may have been too unstable to be reflected in the Scheffe.

SUMMARY OF FINDINGS

The match/mismatch of student learning style to teacher teaching style was examined in relation to attendance and achievement. Analysis of variance was used to test the null hypothesis 1 on differences between matched and mismatched groups on attendance. Chi square was then used to answer the ancillary question on differences between matched and mismatched groups in the number of attendance completions and noncompletions. A multivariate analysis of variance was conducted using the pre-post math test group to test the null hypotheses 2 and 3. The analysis was conducted using achievement and attendance rate between pre- to post test.

In testing null hypothesis 1: there is no significant difference in rate of attendance between students whose learning styles are matched with the teaching style of the instructor and students whose learning styles are not matched, findings failed to reject the null hypothesis. No significant differences were found between matched and mismatched groups on rate of attendance for the total sample ($N = 365$). However, significant differences were found on

the interaction of the combined variables: match/mismatch learning style to teaching style, sex, ethnicity and age ($p = .02$). Age was also found to be a variable that showed significance ($p = .003$).

The matched and mismatched groups were also compared in terms of the number of completions. Chi square test reported no significant difference between matched and mismatched groups on the number of completions and noncompletions.

Multivariate analysis of variance was conducted to determine differences between matched and mismatched groups on rate of achievement and rate of attendance between pre- and post test. A subset of the total sample consisting of subjects with both pre- and post test scores was used for this analysis ($n = 125$). Results indicated no overall significant difference in match/mismatch.

Results of the univariate test for null hypothesis 2 indicated no significant difference on the variable, rate of achievement between matched and mismatched groups. However, differences in rate of achievement were found for the interaction of sex and ethnicity, and sex and age.

Results of the univariate test for the null hypothesis 3 indicated no significant difference on the variable rate of attendance between pre- to post test for matched and mismatched groups, sex, ethnicity, and age.

The interaction of match/mismatch, ethnicity, and age approached significance ($p = .06$), but did not meet the level of significance needed to reject the null hypothesis.

Chapter V

SUMMARY, DISCUSSION, RECOMMENDATIONS, AND IMPLICATIONS

This chapter provides a summary of the study followed by the conclusions, a discussion, and recommendations. The summary includes: (1) the conceptual framework as the basis for the study, (2) a review of the literature, (3) a review of the methodology, and (4) the findings. The conclusions are derived from the findings and are followed by a discussion which forms the basis for the recommendations.

The purpose of this study was to determine whether the match (or mismatch) of learning styles with teaching styles resulted in differences in attendance rates and achievement. Matching was based on David Kolb's Learning Style Inventory and Bernice McCarthy's Teaching Style Inventory. Age, ethnicity, and sex were moderator variables.

SUMMARY

Conceptual Framework

David Kolb (1978, 1981) proposed a model for examining individual learning style. His conceptualization of the learning process which is based on experiential learning

theory defines learning style as the individual's characteristic means of perceiving and processing information.

Based on the dualities of Kolb, Bernice McCarthy (1979, 1980) identified four basic learning style preferences and formulated learning style descriptions. McCarthy also identified characteristics of teachers according to the four types of style categories.

The research literature on learning styles indicates that the four basic modes of perceiving and processing information, or learning styles, can be identified and substantiated. Learning styles and brain research strongly suggest that students differ significantly in the ways they perceive, process, remember, and organize information. Studies report that students matched with methods, resources, or environments that complement their strong preferences achieve statistically higher; they achieve statistically less well when they are mismatched with their preferences (Dunn, 1984). However, research studies examining relationships between the matching of styles and achievement outcomes have demonstrated that style matching produces inconsistent achievement outcomes.

Background of the Study

A persistent problem in adult education has been the high drop out rate in Hawaii programs. Achievement,

attendance, and attrition in adult learning programs are major administrative concerns in the curriculum and instructional design of adult education programs.

The literature on adult learners suggests that there are differences in learning styles between persisters and dropouts (Plummer, 1981) with attendance positively correlated with academic progress. Studies also indicate differences in student learning style preferences (Merritt, 1982, Kolb, 1984) and relationship of student learning style to student preferences for teaching style (Dorf, 1985). Increased achievement is said to result when students are taught through resources and strategies that are congruous with their individual learning style preferences (Dunn, 1984). However, there has been no evidence of the relationship of learning styles (cognitive) to teaching styles in terms of its impact on learning and achievement. Studies on matching for achievement outcomes seem to conclude that style matching can be strongly supported for affective reasons, but overall style matching produces inconsistent achievement outcomes. Much of the research has been done with children, and it is unclear how or whether the findings extrapolate to adults.

Context of the Problem

Student attendance, drop out, and achievement are continuing concerns that plague administrators in

establishing cost effective programs in adult education. No significant research findings have been advanced which would provide guidance for improving the persistence rate and achievement of students in adult education programs.

Curriculum and instructional effectiveness is a major responsibility in school administration. Within adult education programs where classes are short term and attendance is voluntary, attendance, drop out, and achievement are critical factors that define school success and viability.

Purpose of the Study

This study examined the relationship between match/mismatch of teaching style to learning style with regard to student achievement and attendance in Hawaii adult education basic skills/GED programs. Findings provide informational support based on rational research for administrative decisions regarding curriculum design, staffing, and instruction in administering adult education programs.

Statement of the Problem

The problem addressed in this study was to identify selected in-class factors related to attendance and achievement in adult education basic skills/GED programs.

While studies of drop out have repeatedly shown a variety of nonschool related reasons for not persisting in the formal learning setting, few studies have addressed the teaching-learning process and the learning environment of the class. No studies addressing the relationship of match/mismatch in learning styles to teaching styles with regard to attendance, drop out, and learning achievement within adult education have been reported.

The problem examined in this study sought to determine whether students whose learning style preference is the same as the teacher's teaching style preference differ in rate of attendance and achievement from those whose learning style preference is different from the teacher's teaching style preference.

Population and Sample

The population for this study is all of the adult basic skills/GED students at all of the main adult education school sites (seven adult education schools, covering all the school districts on Oahu) and selected field sites of the Department of Education in addition to the Kamehameha Schools Continuing Education Basic Skills Program on Oahu. The sample consisted of 365 students in adult basic skills/GED classes from the seven DOE adult education schools on Oahu and the Kamehameha Schools Continuing Education Program who attended the 1988 Fall term.

Students included in the study were those who had completed the Learning Style Inventory and had attended at least one non-testing class period. These students were selected in testing null hypothesis 1 and answering the ancillary question on match/mismatch and attendance ($N = 365$). A subset ($n = 125$) of the total sample was used to test null hypotheses 2 and 3. These were students who had taken the Learning Style Inventory and the pre- and post math TABE test.

Procedures

An ex post facto factorial design was used to determine the relationship of learning style-teaching style match/mismatch to student achievement and rate of attendance. The independent variables used were match/mismatch student learning style to teacher teaching style, sex, ethnicity, and age.

The Learning Style Inventory (LSI), developed by David Kolb, was used to assess learning styles of the basic skills/GED adult learners. Based upon the response of learners to the learning modes of (a) concrete experiencing of a learning situation, (b) reflective observation of relevant phenomena, (c) abstract conceptualization about the meaning of what has been observed, and (d) the active testing of hypotheses relative to what has been experienced, the learning style of students were then identified

according to Kolb's four learning styles which Bernice McCarthy labels as Learning Styles 1, 2, 3, and 4.

The Teaching Style Inventory (TSI), developed by Bernice McCarthy, was utilized to measure the teaching styles of the teachers. Respondents rated characteristics keyed to a particular teaching style, 1, 2, 3, or 4.

One dependent variable selected was student achievement as measured by the Tests of Adult Basic Education (TABE). The TABE, a form of the California Achievement Test, was designed for the adult learner. Both the TABE and the California Achievement Test are instruments frequently used in adult education programs to assess development of basic skills among adult learners as well as to determine success on the GED.

A second dependent variable was student attendance. Data was examined in terms of the number of days that students attended during the entire term, as well as, during the period between the pretest on the math TABE at the beginning of the term to the post test on the TABE in the last quarter of the term.

The match/mismatch of student learning style to teacher teaching style was examined in relation to rate of attendance and achievement. Analysis of variance was used to test null hypothesis 1 on differences between groups on attendance. Chi square was then used to answer the

ancillary question on differences between matched and mismatched groups in terms of the number of attendance completions and noncompletions. A multivariate analysis of variance was conducted using the pre-post test group to test the null hypotheses 2 and 3. The analysis was conducted using achievement and attendance rate between pre- to post test.

FINDINGS

Null Hypothesis 1

There is no significant difference ($p < .05$) in attendance between students ($N = 365$) whose learning styles are matched with the teaching style of the instructor and students whose learning styles are not matched.

Findings for Null Hypothesis 1

Findings failed to support rejection of the null hypothesis. No significant differences were found between matched and mismatched groups on rate of attendance for the total sample ($N = 365$).

Ancillary Question 1

There is no significant difference ($p < .05$) between matched and mismatched students ($N = 365$) in the number of students completing the term and the students not completing the term (leaving before the end of the term).

Findings for the Ancillary Question

No significant difference was found between matched and mismatched groups in terms of the number of completions and noncompletions.

Null Hypothesis 2

There is no significant difference ($p < .05$) in achievement between students whose learning styles are matched with the teaching style of the instructor and students whose learning styles are not matched as measured by the math portion of the Tests of Adult Basic Education (TABE).

Finding for Null Hypothesis 2

Analysis of the post test math TABE scores indicated no significant differences between groups on matching. Significant differences however, were found on the interaction between sex and age, and ethnicity and age.

Null Hypothesis 3

There is no significant difference ($p < .05$) in rate of attendance between pre- and post testing for matched and mismatched groups among students completing the term (those having taken both pre- and post tests).

Findings for Null Hypothesis 3

No significant difference was found between the matched and mismatched groups on the rate of attendance from pre- to post test for the group who completed the courses ($n = 125$). Thus, null hypothesis 3 was not rejected.

Summary of Findings

Findings indicated no significant differences between students whose learning styles were matched with the teacher teaching styles and students whose learning styles were not matched with the teaching style of the instructor.

Age rather than the match/mismatch of learning style to teaching style appeared to have an effect on attendance. Higher attendance was found among the older age groups, while the lowest attendance was found among the youngest age group, 17-24.

The interaction of match/mismatch, sex, ethnicity, and age rather than match/mismatch alone appeared to have an effect on attendance, however, due to the small sample size, the resulting cell sizes were too small to allow meaningful interpretation.

Matching as an isolated variable also did not lead to more students completing the term. Results showed no significant differences between matched and mismatched groups in terms of the number of completions (those who attended until the end of the session and took both the

pre- and post test) and noncompletions (students who dropped out before the end of the term and did not take the post test). Thus, matching did not lead to more students completing the term.

Matching was also found not to affect achievement. There was no difference in the achievement between the matched group and the mismatched group. Students who were not matched with their teacher's teaching style achieved as well as those who were matched. The adult education students in this study were able to achieve regardless of whether they were matched or mismatched.

Situational Factors Pertinent to the Study

1. The time frame of the study was limited by the length of the 1988 Fall academic term. Participation was limited to students who were present to take the LSI during the scheduled period.
2. Due to the small sample size resulting from the small number of students post testing, the results must be interpreted with caution. Also, ethnicity was limited to the eight largest categories of self-reported ethnicity. All others and combinations were grouped under "other" because the individual categories were each too small to be analyzed meaningfully as a separate category.

3. Reliability of response was dependent upon student understanding of the terminologies and statements presented in the LSI. Immigrant students in particular may have encountered difficulty in understanding the terminologies and statements within the LSI.
4. Teaching style was defined according to Bernice McCarthy's Teaching Style Inventory which essentially identifies four basic styles of teaching. Some teachers who taught both general education (grades kindergarten through grade 12) and adult education courses expressed ambivalence in knowing which perspective to take in characterizing themselves and their classroom.

DISCUSSION

This study has shown that matching student learning style and teacher teaching style did not affect student attendance or achievement. Findings indicated no significant differences between students whose learning styles were matched with the teacher teaching styles and students whose learning style preferences were not matched with the teaching style of the instructor. Matching was based on David Kolb's Learning Style Inventory (LSI) which identified four basic modes of perceiving and processing

information and Bernice McCarthy's Teaching Style Inventory, which is based on Kolb's four style constructs.

One possible explanation for these findings is that adult learners may be more flexible in their learning style and able to adapt more readily to different teaching styles. Adults have had years of experience in learning in different school settings and may be more tolerant of differences in teaching approaches. They may also have learned how to learn in accordance with the different styles of teaching. This may suggest that learning styles may be more easily changed than teaching styles.

Another possibility lies in the characteristic of the adult learner as a self-directed learner. Self-directed learning (Cross, 1982) is deliberate learning in which the person's primary intention is to gain certain definite knowledge or skills. The adult motivated by external requirements of changing work and/or social roles may persevere in order to acquire the necessary knowledge and skills to satisfy his/her educational needs. This strong motivation may override the match/mismatch of teaching style to learning style.

In addition, adult learners as self-directed learners may rely upon their own capability to learn and may not be dependent upon the teacher as the main source of learning. Adults tend to want to set their own learning pace, use

their own style of learning and put their own structure on the learning project (Penland, 1979). Therefore, delivery modes geared to self-directed learning (eg. unit mastery) may be a more fruitful area of research than learning style.

The importance of goals and the expectation that goals will be met may also be a prime motivator for learning and attendance. If the student does not perceive him or herself as able to participate successfully, or if the goal is not especially important, then there is no motivation to participate. Expectancy scores are suggested to be directly related to student achievement (Conti and Welborn, 1986). Students who expect to do well achieve higher than those who anticipate performing at an unsatisfactory level.

The findings also appear to indicate that regular attendance and course completion may not be important to the adult learner. Adult education as a cooperative rather than an operative art, is characterized by voluntary participation. Adults as self-directed learners choose to attend as the educational need arises. These needs vary from person to person and from time to time.

Educational interests may be based on levels of needs at various stages of life. These needs range from the basic physiological needs to those of security, social, self-esteem, and self-actualization. Motivation may explain the differences in attendance among age groups.

Situational barriers (i.e. trouble getting to class, childcare problems, job responsibilities) also tend to affect attendance and attrition.

RECOMMENDATIONS FOR FUTURE RESEARCH

The results of this study can only be generalized to this population but may be suggestive of research for or in other populations.

1. The results of this study appear to point out that learning styles may be more flexible than teaching styles. In essence it may be easier to have students develop flexibility in adjusting to different teaching styles than for teachers to adjust to meet the different learning styles of the students within his/her class. Secondly, adult learners may be able to adjust their learning styles to meet teaching styles more readily than younger students who have not had as much learning experience.

Further research would need to be done to test the relative flexibility of learning styles and teaching styles. Such research should also be conducted with different age groups.

2. Further research using a larger sample size and a number of different instruments to assess

cognitive learning style and teaching style is recommended to determine the effects of matching on achievement and attendance. The literature on learning styles offers a range of definitions that has been adopted to describe this construct and these should be further explored in terms of their impact on attendance and achievement, and other dimensions of cognitive skill development (i.e. creativity and problem solving skills).

This research should also be conducted with different age groups. Matching may be an important factor among lower level and younger students where students are more dependent upon the teacher than adult learners who are more independent in their learning.

3. The lack of significant differences between matched/mismatched teaching style to learning style and the concept of adult education as a 'do-it-yourself' activity wherein adult learners with a problem-centered orientation to learning rely upon their own capability to learn, put their own structure on the learning, and attend to the extent of meeting their educational objectives, would suggest that mastery learning and computer assisted instruction might be feasible approaches to instruction.

Further research in examining these approaches with adult learners is recommended.

4. The lack of significant differences between matched/mismatched teaching style to learning style raises the question of whether teaching style rather than the match/mismatch of learning style to teaching style may be a factor. Conti and Welborn found that teaching style was a major influence on student achievement, while learning style was not. Further research on adult learner populations is recommended to address this question.
5. Cross-cultural differences in learning styles have been reported by several authors in the literature. While this study examined ethnicity as a moderating factor, the cell sizes were too small to yield conclusive results or to offer meaningful interpretation. Cross-cultural research using a larger sample size is recommended to examine (1) differences in achievement among ethnic and/or cultural groups in terms of learning styles and (2) whether or not matching is a significant factor within and among different ethnic groups.
6. It is recommended that the relationship of sex, ethnicity, and age to attendance be studied

further and reasons for non-attendance be explored.

7. Brain research on hemispheric processing indicates differences in the learning processes and patterns among groups of different ethnicity, sex, and age. Research in this area may provide insight into the interactive effects of ethnicity, sex, and age on achievement.

ADMINISTRATIVE IMPLICATIONS AND RECOMMENDATIONS

1. In this population, the matching of learning styles to teaching styles does not appear to affect student attendance and achievement. These adult learners, it appears, may have learned to adapt to a wide range of teaching styles.

Thus, it is recommended that resources and effort to match learning style to teaching style not be expended on this population.

2. Based upon the findings of this study with this population of adult learners, it appears that while attendance may be important administratively for schools to maintain adequate enrollment to sustain programs, attendance may not be as important as performance to the adult learner. As priorities arise adult learners may continually

chose to attend, not attend, or simply not continue based upon personal goals and the perceived relative importance of attendance to achievement. Attendance is voluntary and may thus be perceived as a personal choice. Adult education may be perceived as a 'do-it-yourself' activity, whereby adult learners with a problem-centered orientation to learning, rely upon their own capability to learn, put their own structure on the learning, and attend to the extent of meeting their educational objectives.

It is recommended that schools recognize and consider ways to accommodate the nature of voluntary attendance and (1) provide curricula that can accommodate flexible attendance (eg. mastery learning and computer assisted instruction) and (2) structure programs and/or enrollment to accommodate fluctuations in attendance due to sporadic attendance patterns and leaving of programs before the end of the term.

It is also recommended that schools become familiar with the educational needs, motivations, and barriers to participation of the adult learners within the school and community.

3. The value of using matching as the most effective means of maximizing individual academic development was not supported in this study. Gregorc contends that mismatch to some degree stimulates flexible and creative thinking and that balance and stretching can lead to greater learning achievement.

It is recommended that schools serving this population consider instructional models that enable students to develop flexibility in learning to different teaching styles. This would be one approach in helping students adapt to different learning settings.

4. Fostering achievement through effective teaching skills is perhaps a more meaningful approach than matching teaching style to learning style.

It is recommended for this population that time would be better spent focusing on effective teaching practice rather than teaching style preference or matching teaching style to learning style.

5. Based on the finding attendance and achievement were not affected by the matching of learning style to teaching style.

It is therefore recommended that schools examine other factors affecting attendance and learning, such as, delivery mode, motivational factors, and external barriers (childcare), etc.

APPENDIX A

Ethnic Groups That Comprise the Category "Other"

Black
Hispanic
American Indian, Filipino, Hawaiian
Black, Hawaiian
Black, Indochinese
Chinese, Hispanic, Hawaiian
Chinese, Samoan, Hawaiian
American Indian, Caucasian
Chinese, Caucasian, Hispanic, Hawaiian, Portuguese
Chinese, Caucasian, Hawaiian
Chinese, Hawaiian
Caucasian, American Indian, Hawaiian, Japanese
Caucasian, Hispanic
Caucasian, Filipino
Hispanic, Hawaiian
Filipino, Hawaiian, Portuguese
Caucasian, Filipino, Hawaiian
Caucasian, Samoan
Caucasian, Hawaiian
Caucasian, Japanese
Caucasian, Korean
Hispanic, Filipino, Japanese
Hispanic, Filipino, Portuguese
Hispanic, Filipino, Micronesian
Hispanic, Micronesian
Filipino, Hawaiian
Hispanic, Portuguese
American Indian, Black, Caucasian
Black, Caucasian
Chinese, Caucasian
Caucasian, Chinese, Hawaiian, Portuguese
Chinese, Hispanic, Hawaiian, Portuguese
Caucasian, Samoan, Hawaiian
Caucasian, Hawaiian, Japanese
Caucasian, Hawaiian, Other
Hispanic, Filipino
Filipino, Chinese, Hawaiian, Japanese
Filipino, Caucasian, Hispanic, Hawaiian, Japanese
Filipino, Caucasian, Hawaiian, Japanese
Filipino, Japanese
Filipino, Other
Hawaiian, Portuguese
Filipino, Hawaiian, Japanese
Hawaiian, Japanese
Korean, Portuguese

APPENDIX B

Table 9

Number, Mean, and Standard Deviation
of Age Groups on Rate of Attendance
(N = 365)

Age Group	<u>N</u>	Mean	<u>SD</u>
17 - 24	184	0.52	0.29
25 - 34	105	0.61	0.30
35 - 44	46	0.58	0.32
45 - 54	13	0.75	0.26
55 - 64	11	0.66	0.38
65+	6	0.81	0.25

APPENDIX C

Table 10

Number, Mean, and Standard Deviation of Matched/Mismatched Students on Rate of Attendance by Sex, Age, and Ethnicity (N = 365)

Matched					
Sex	Age Group	Ethnicity	N	Mean	SD
Female	17-24	Caucasian	13	0.54	0.23
Female	17-24	Filipino	10	0.50	0.36
Female	17-24	Hawaiian	1	0.67	.
Female	17-24	Indochinese	1	0.60	.
Female	17-24	Japanese	1	0.17	.
Female	17-24	Pacific Island.	3	0.57	0.34
Female	17-24	Other	15	0.53	0.28
Female	25-34	Chinese	1	1.00	.
Female	25-34	Caucasian	3	0.46	0.23
Female	25-34	Filipino	4	0.61	0.31
Female	25-34	Hawaiian	2	0.79	0.15
Female	25-34	Japanese	2	0.40	0.27
Female	25-34	Korean	4	0.68	0.4
Female	25-34	Pacific Island.	1	0.78	.
Female	25-34	Other	12	0.52	0.33
Female	35-44	Chinese	3	0.66	0.33
Female	35-44	Caucasian	2	0.81	0.09
Female	35-44	Filipino	4	0.55	0.41
Female	35-44	Hawaiian	1	0.05	.
Female	35-44	Japanese	1	0.25	.
Female	35-44	Korean	4	0.66	0.28
Female	35-44	Pacific Island.	2	0.90	0.14
Female	35-44	Other	4	0.58	0.26
Female	45-54	Caucasian	2	0.71	0.15
Female	45-54	Other	3	0.77	0.24
Female	55-64	Caucasian	1	0.88	.
Female	55-64	Filipino	1	1.00	.
Female	55-64	Hawaiian	1	0.16	.
Female	65+	Chinese	1	0.95	.
Male	17-24	Chinese	1	0.29	.
Male	17-24	Caucasian	2	0.23	0.17
Male	17-24	Filipino	6	0.83	0.12
Male	17-24	Hawaiian	3	0.49	0.27
Male	17-24	Other	9	0.52	0.35

Table 10 (Continued)

Number, Mean, and Standard Deviation of Matched/Mismatched Students on Rate of Attendance by Sex, Age, and Ethnicity

Matched					
Sex	Age Group	Ethnicity	N	Mean	SD
Male	25-34	Chinese	2	0.69	0.27
Male	25-34	Caucasian	4	0.80	0.15
Male	25-34	Filipino	4	0.48	0.18
Male	25-34	Indochinese	1	0.19	.
Male	25-34	Japanese	2	0.53	0.57
Male	25-34	Pacific Island.	1	0.75	.
Male	25-34	Other	8	0.51	0.3
Male	35-44	Chinese	1	0.71	.
Male	35-44	Filipino	1	0.90	.
Male	35-44	Japanese	1	0.81	.
Male	35-44	Pacific Island.	1	0.15	.
Male	45-54	Pacific Island.	1	1.00	.
Male	55-64	Hawaiian	1	0.50	.
Male	55-64	Japanese	1	0.31	.
Male	65+	Indochinese	1	0.97	.
Male	65+	Japanese	1	0.33	.
Male	65+	Other	2	0.94	0.08
Mismatched					
Female	17-24	Chinese	1	0.96	.
Female	17-24	Caucasian	14	0.60	0.2
Female	17-24	Filipino	12	0.53	0.31
Female	17-24	Hawaiian	3	0.27	0.16
Female	17-24	Japanese	2	0.49	0.28
Female	17-24	Korean	1	0.75	.
Female	17-24	Pacific Island.	5	0.65	0.22
Female	17-24	Other	23	0.39	0.28
Female	25-34	Chinese	1	1.00	.
Female	25-34	Caucasian	6	0.80	0.26
Female	25-34	Filipino	6	0.58	0.33
Female	25-34	Hawaiian	2	0.12	0.06
Female	25-34	Indochinese	1	0.13	.
Female	25-34	Japanese	2	0.82	0.02
Female	25-34	Korean	1	0.46	.
Female	25-34	Other	17	0.73	0.26

Table 10 (Continued)

Number, Mean, and Standard Deviation of Matched/Mismatched Students on Rate of Attendance by Sex, Age, and Ethnicity

Matched Students					
Sex	Age Group	Ethnicity	N	Mean	SD
Female	35-44	Unknown	2	0.85	0.15
Female	35-44	Chinese	1	0.08	.
Female	35-44	Caucasian	1	0.95	.
Female	35-44	Filipino	4	0.33	0.41
Female	35-44	Hawaiian	1	0.38	.
Female	35-44	Korean	1	0.83	.
Female	35-44	Other	4	0.39	0.20
Female	45-54	Caucasian	1	0.35	.
Female	45-54	Filipino	1	1.00	.
Female	45-54	Other	2	0.63	0.53
Female	55-64	Chinese	2	0.97	0.02
Female	55-64	Caucasian	1	0.38	.
Female	55-64	Japanese	3	0.69	0.54
Male	17-24	Chinese	3	0.47	0.40
Male	17-24	Caucasian	8	0.55	0.34
Male	17-24	Filipino	17	0.64	0.24
Male	17-24	Hawaiian	3	0.30	0.17
Male	17-24	Indochinese	2	0.67	0.29
Male	17-24	Japanese	5	0.43	0.34
Male	17-24	Pacific Island.	8	0.30	0.19
Male	17-24	Other	12	0.55	0.31
Male	25-34	Chinese	1	0.27	.
Male	25-34	Caucasian	3	0.27	0.16
Male	25-34	Filipino	2	0.58	0.60
Male	25-34	Hawaiian	4	0.70	0.25
Male	25-34	Indochinese	1	1.00	.
Male	25-34	Japanese	2	0.65	0.44
Male	25-34	Pacific Island.	1	0.88	.
Male	25-34	Other	4	0.66	0.23
Male	35-44	Caucasian	1	0.46	.
Male	35-44	Korean	1	0.80	.
Male	35-44	Pacific Island.	1	0.80	.
Male	35-44	Other	4	0.56	0.39
Male	45-54	Chinese	1	0.62	.
Male	45-54	Caucasian	1	1.00	.
Male	45-54	Indochinese	1	0.75	.
Male	65+	Chinese	1	0.73	.

APPENDIX D

Table 11

Number, Mean, and Standard Deviation
of Post Math Test Scores of Students
by Sex and Age (N = 125)

Sex	Age	N	Mean	SD
Female	17-24	25	56.52	12.90
	25-34	28	54.68	21.26
	35-44	11	59.18	17.37
	45-54	3	62.00	13.00
	55-64	3	41.33	11.59
	65+	1	15.00	.
Male	17-24	26	53.96	19.91
	25-34	18	63.44	14.86
	35-44	4	58.00	29.99
	45-54	3	56.00	30.27
	65+	2	65.00	18.19

APPENDIX E

Table 12

Number, Mean, and Standard Deviation
of Post Math Test Scores of Students
by Ethnicity and Age (N = 125)

Ethnicity	Age	N	Mean	SD
Unknown	35-44	2	35.00	18.38
Chinese	17-24	2	52.50	21.92
Chinese	25-34	2	90.00	1.41
Chinese	45-54	1	22.00	.
Chinese	55-64	1	52.00	.
Chinese	65+	1	15.00	.
Caucasian	17-24	14	62.71	17.09
Caucasian	25-34	7	56.00	20.53
Caucasian	35-44	2	77.50	6.36
Caucasian	45-54	1	80.00	.
Filipino	17-24	13	61.00	15.66
Filipino	25-34	6	47.67	20.60
Filipino	35-44	4	45.25	22.87
Filipino	45-54	1	77.00	.
Filipino	55-64	1	29.00	.
Hawaiian	25-34	2	40.00	2.83
Indochinese	17-24	1	67.00	.
Indochinese	25-34	1	55.00	.
Indochinese	65+	1	54.00	.
Japanese	17-24	1	57.00	.
Japanese	25-34	3	67.67	25.77
Japanese	55-64	1	43.00	.
Korean	17-24	1	46.00	.
Korean	25-34	3	72.67	12.58
Korean	35-44	2	77.00	0
Pacific Islander	17-24	3	50.67	2.52
Pacific Islander	25-34	3	49.00	26.91
Pacific Islander	35-44	3	62.33	4.93
Pacific Islander	45-54	1	66.00	.
Other	17-24	16	44.88	15.32
Other	25-34	19	58.53	15.81
Other	35-44	2	68.00	16.97
Other	45-54	2	54.50	0.71
Other	65+	2	70.50	21.92

APPENDIX F

THE DEMOGRAPHICS SURVEY QUESTIONNAIRE

To the Survey Participant:

This survey is being conducted as part of a Doctoral candidate's project in Educational Administration at the University of Hawaii. The purpose of the study is to examine learning styles and teaching styles of individuals in Hawaii adult education programs.

The research will result in mutual benefit to all individuals involved in adult education.

Before you begin, please fill out the following information.

Name _____ Soc. Security # _____

School: _____ Aiea Community School
_____ Kaimuki Community School
_____ Farrington Community School
_____ McKinley Community School
_____ Waipahu Community School
_____ Wahiawa Community School
_____ Windward Community School

Class Enrolled or Teaching:
_____ High School English
_____ High School Math
_____ GED
_____ PreGED
_____ Other: _____ (Name of Class)

Sex: _____ Male _____ Female

Age: _____ 17-24 _____ 25-34 _____ 35-44 _____ 45-54
_____ 55-64 _____ 65+

Ethnicity (Check all that apply):

_____ Hawaiian
_____ Japanese
_____ Filipino
_____ Caucasian
_____ Other Please List: _____

(Teachers) Years in Teaching: _____ Years

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