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Environmental learning style preferences of limited-resource women in adult education programs

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ENVIRONMENTAL LEARNING STYLE PREFERENCES OF LIMITED-RESOURCE WOMEN IN ADULT EDUCATION PROGRAMS

by

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Approved by

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The purpose of this research was to identify learning style preferences of the limited-resource women who participate in educational programs with the Cooperative Extension Service in six counties of North Carolina. Five Extension Agents and three Extension paraprofessionals were trained in learning style theories and application, assessment of learning style preferences, and development of curriculum materials based on learning style preferences as well as educational needs.

After a thorough review of the literature and a study of existing learning style assessments the researcher, in collaboration with the authors modified the Learning Style Survey (Griffin & O'Sullivan, 1993). The modified Learning Style Survey included a total of 15 items built around four stimuli, similar to elements contained in the Productivity Environmental Preference Survey (PEPS) developed by Dunn & Dunn (1979).

In addition to identifying learning style preferences, the study evaluated the extent to which those preferences were met. The five Extension agents and three paraprofessionals presented the Learning Style Survey, conducted an educational program, and evaluated the programs. One-hundred sixty women participated in a total of 24

educational programs in the six counties involved in the study. Participants in four of the six counties participating in the study completed the evaluations.

Chi-square analysis and tests of the medians were conducted to determine the significance of each of the elements based on educational attainment, race/ethnic origin, age, and county. Means, medians, and standard deviations were used to assess the evaluations.

Five hypotheses were tested. The first hypothesis stated that there were differences in learning styles between limited-resource adult women and the general population of adult women. Analysis of the data indicated that there were differences in learning style preference in the elements of temperature, routine/variety, motivation, persistence, alone versus peers, time of day, and intake. The second hypothesis stated that there were significant differences in learning styles between limited-resource adult women who completed high school and those who did not. Analysis of the data showed that educational attainment was significant in relation to the elements of light, design, motivation, persistence, structure, time of day, mobility, and tactile/kinesthetic. The third hypothesis stated that there were significant differences in learning styles between African American, Caucasian, and Native American limited-resource adult women. Analysis of the data showed that race/ethnic origin was significant in relation to the

elements of design, motivation, persistence, structure, alone/peer, time of day, intake, mobility, and auditory. The fourth hypothesis stated that there were significant differences in learning styles between younger and older limited-resource adult women. Data analysis showed that age was significant in relation to the elements of light, motivation, structure, time of day, intake, and auditory. The fifth hypothesis stated that there were differences between learning style preferences and preferences that were met. Evaluations indicated that of the 15 elements 8 of them were not met by at least one county. These were noise level, design, persistence, structure, alone/peer, time of day, intake, and mobility.

Interaction with county Extension field staff regarding the results of the Learning Style Survey and evaluations were favorable. Agents and paraprofessionals alike are constantly seeking ways to improve the educational approaches taken with their clientele. They unanimously agreed that incorporating assessment of learning styles was a logical progression in their efforts to develop curriculum that meets the needs of the people in their counties.

APPROVAL PAGE

This dissertation has been approved by the following committee of the Faculty of the Graduate School of the University of North Carolina at Greensboro.

Dissertation Advisor Sarah M. Shoffner

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Special thanks belong to the women in the East White Oak and Warnersville Communities in Greensboro for their willingness to participate in the pilot study. Their suggestions and comments helped strengthen the study.

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I am especially indebted to the nearly 200 limited resource people in North Carolina who participated in this study. Their willingness to complete the surveys and evaluations is indicative of their personal desires to absorb knowledge in a way that is comfortable to them.

Tom Lassiter made the development of the Learning Style Survey an easier task. His ability to capture and depict the ideas graphically enhanced the understanding of the survey.

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INTRODUCTION

Learning style has been defined as "the way each person absorbs and retains information and/or skills" (Dunn, 1984, p. 12). Kuznar, Falciglia, Wood, and Frankel (1991) defined learning style as "an individual's characteristic way of processing information, feeling, and behaving in a learning situation" (p. 29). Lawrence (1984) and Willing (1988) defined learning style as a person's "preferred or habitual patterns of mental functioning and dealing with new information" (in Ehrman & Oxford, 1990). Nisbet and Shucksmith (1986) took these definitions one step further, adding that the learner integrates a logical sequence of procedures that have been selected with a purpose clearly in view.

Regardless of any clear-cut definition of learning style, learning is more effective when the student is motivated to learn. Successful learners have developed a range of strategies that allow them to make appropriate selections and flexible adaptations to meet the needs of specific situations. In order for this to happen, it is necessary for them to be aware of what they are doing and of their own learning preference. In addition, they must be able to monitor their learning in order to be able to make appropri-

ate decisions, making changes in the process if necessary (Nisbet & Shucksmith, 1986).

All learners use a variety of learning styles to some degree, depending on the situation, but according to Ehrman and Oxford (1990), they generally have a specific learning preference. Although all persons have certain preferences, most people are unaware of what their preferred learning style is (Galbraith & James, 1986). Even though differences in learning style are more than variations in behavior, Cross (1976) believed that, as individuals, people observe and interpret the world in different ways. Learning style has an influence on aspects of personality and behavior, perception, memory, problem-solving, interests, social behavior, and self concepts. As learners, people vary in the attention they give to different aspects of the environment; problem solving methods differ; and information is processed in differing, but individually consistent ways.

A challenge to all learners is to fine-tune the complexities of their learning styles, to become perceptive to their specific learning requirements, and to work toward developing a range of learning strategies which can be applied to their individual style. This is accomplished by learning to manage the process of learning through development of an awareness of what one is doing, which results in greater control of one's mental processes. These mental

processes must be under conscious scrutiny (Nisbet & Shucksmith, 1986). In order to increase their skills appropriately to utilize methodologies for both self-directed and group learning, learners must concentrate on their dominant learning style (Galbraith & James, 1986).

There is no age limit on learning. Children and adults alike are perpetually involved in some form of learning. But, while children are in the process of developing and perfecting their preferred styles of learning, adults, on the other hand, come to the learning process with their preferred styles, their individual choices and preferences, and their own patterns firmly in place (Gillen, 1982). With adults, individual differences increase and become more diverse with age (Maddox & Douglas, 1974). The lifelong process of cognitive development is a process with dramatic changes from childhood to adulthood (Kendall & Sproles, 1986). Because of their lifelong experiences, adults represent a diverse group of learners.

Blustein (1986) reported that students who are unfocused in their career goals over an extended period of time have difficulty with the educational process. This results in less involvement in their education as well as the institution, often causing difficulty in effective academic performance. This low level of academic achievement often results in a high risk of dropping out of the educational system

(Lunneborg, 1975). These are the students who grow into adulthood with a major educational disadvantage. Their undereducation often leads to a life of poverty and lack of adequate resources to function comfortably in society.

In addition to suffering from academic failure leading to low-income status, this group also suffers from a perceived societal rejection. They have feelings of resignation -- whatever happens is accepted; they feel they have little control over their destiny. One research study revealed that parents of disadvantaged students perceive favoritism and discrimination in the public schools (Brantlinger, 1985). Such feelings and perceptions add to lack of success in the educational setting.

Successful educational programs depend on the educator understanding how a person learns and helping people understand how to learn (Knowles, 1983). Prior frustrations in learning can inhibit an adult's desire to pursue knowledge, blocking any chance of overcoming barriers to educational attainment of any type. The educator plays a key role in the acceptance of an adult's decision to pursue knowledge, especially if there has been a lapse of time since the last pursuit. Because education is usually associated with growth needs, basic educational needs of adults must be met if they are to be actualized; otherwise, deficit motivation will occur (Phipps, 1988). What the teacher encourages the stu-

dent to do, not what the teacher does, is the determinant in what is learned (Jernstedt, 1980).

To help promote success in adult learning, a knowledge of learning styles is essential. Diagnosis of learning style should be a primary consideration for the educator who is involved in program planning and implementation. The knowledge of learning styles provides a framework for motivation and accomplishment and it allows the educator to address learning resources, procedures, strategies, and overall program philosophy (Galbraith & James, 1986).

At present, most of the learning style research that has been conducted has focused on learning preferences of children at varying grade levels. Of the research centering on adults, no research has been identified that investigates learning styles of low-income, ethnic minority adults. Instead, learning style research has been focused primarily on white adults at differing age groupings.

Description of the Target Audience

The Family Education Outreach Program is the home economics segment of the Cooperative Extension Program at North Carolina A & T State University. With a focus on the family unit, the goal of this outreach program is to help families learn to live and function comfortably and independently in society and to appropriately utilize social services that are available to them. On a practical level, home economics

Extension agents and paraprofessionals teach families and individuals such things as money management, nutrition and food preparation/handling techniques, laundry care, wardrobe planning, child development, and parenting.

Educational programs are taught in a variety of ways. Extension staff, particularly the paraprofessional staff, visit with families or family members in their homes or in small groups of 2-4 people in a familiar neighborhood setting. Extension agents most often deliver educational information in larger group or workshop-type settings. Each of the six counties in the North Carolina A & T State University Family Education outreach program publish a monthly or bi-monthly newsletter geared specifically to this limited-resource audience. The newsletters, which contain educational information, serve as a link between the county Extension staff and the clientele.

The limited-resource audience involved in educational programs through the Cooperative Extension system in North Carolina are those individuals and families with a household income below 80 percent of the median income for the county or U.S. Census Statistical Metropolitan Area (SMA) in which they live, whose educational level is below the median educational level for the county or SMA in which they live, who live in substandard housing, and are welfare-dependent, unemployed, or are negatively influenced by other social

stigmas associated with poverty. By this criteria, 47 percent of all households in North Carolina qualify as limited-resource (Blueprint for the Future: An Agenda for Change, 1993). They seek assistance from county Extension staff through such referrals as county service agencies, word-of-mouth programming, and direct assistance requests. Statewide, the audience consists primarily of African Americans, Caucasians, Native Americans, and Hispanics.

Extension Home Economics Specialists develop educational curriculum in specific subject areas for this limited-resource audience. The curriculum package includes activities, programming suggestions, ideas for small group or individual settings, and evaluation methods. To date, there has been no investigation into the learning style preferences of this audience; therefore, most curriculum follows a standard format developed by each specialist. Most of the adaptation of the curriculum takes place at the county level by the agents and paraprofessionals.

As Extension agents and paraprofessionals deliver program information to this clientele, they have become acutely aware of the diversity of the audience as well as of cultural differences. Various studies have shown that not only are learning styles individual in preference, but that learning preference can be influenced by cultural differences (Griggs & Dunn, 1989). Other factors that may affect learning style

preference of adults include age, gender, race, socio-economic status, and prior educational experience, to name a few.

Because the educational attainment of this audience is generally low, it is reasonable to believe that school experiences prior to dropping out of the educational system were negative. Thoughts of school, or any learning environment, no matter how formal or informal, may conjure up feelings of despair and lack of self-worth. These feelings combined with such factors typically associated with poverty as low-level employment, unemployment, substandard housing, or welfare dependence make it difficult for a person to determine a way out of a situation that seems hopeless. Fear and lack of trust in a system that they perceive to have failed them can keep such adults away from any type of educational pursuit.

Through educational outreaches, the mission of the Extension Program at North Carolina A & T State University is to "improve the quality of life of limited-resource audiences." The challenge to this audience is not the availability of the information, but the ability to process, store, and apply information (Blueprint for the Future: An Agenda for Change, 1993, pp. 6, 10). By developing an awareness and understanding of learning styles, Extension professionals and paraprofessionals are better able to deliver appropriate education to this target audience thereby facilitating their

learning. The ultimate goal would be to help them improve the quality of their lives.

Purpose of the Study

The purpose of this study was to identify learning style preferences of the limited-resource women who participate in educational programs with the Cooperative Extension Service in six counties of North Carolina. In the process, Extension agents and paraprofessionals were trained in learning style theories and application, how to assess learning style preferences, and how to develop curriculum materials based not only on educational needs, but also on the incorporation of a variety of learning style techniques into the content areas.

Objectives of the Study

The objectives of this study were (a) to determine if there were differences in learning style preferences between limited-resource adult women and the general population of adult women; (b) to determine if there were differences in learning style preferences between limited-resource adult women who completed high school and those who did not; (c) to determine if there were differences in learning style preferences between limited-resource adult African American, Caucasian, and Native American adult women; (d) to determine if there were differences in learning style preferences between younger and older limited-resource adult women; and (e)

to determine the extent to which limited-resource adult women had their learning style preferences met during an educational setting.

Hypotheses

In order to meet the objectives of this study, the following hypotheses were proposed:

H_1: There are significant differences in learning styles between limited-resource women and the general population of women.

H_2: There are significant differences in learning styles between limited-resource women who completed high school and those who did not.

H_3: There are significant differences in learning styles between African American, Caucasian, and Native American limited-resource women.

H_4: There are significant differences in learning styles between limited-resource women ages 14-22, 23-42, 43-62, and 63-82.

H_5: There are differences among limited-resource women in identified learning style preferences and learning style preferences that are met during an educational program.

Significance of the Study

Knowledge of learning style preference is important to anyone who is involved in the education of people. This

study establishes baseline information regarding the learning style preferences of limited-resource African American, Caucasian, and Native Americans who are participants in the educational outreach efforts of the North Carolina Cooperative Extension Program in selected counties. No such information currently exists. Results of the study will be available to Extension specialists, agents, and paraprofessionals as they develop and present educational programs to this target audience.

CHAPTER II

REVIEW OF RELATED LITERATURE

Although much research has been conducted with adults regarding learning style preference, virtually no studies have been found that look specifically at a low-income or limited-resource audience. The studies that have been conducted have done so with children and adults. Most of these studies compare and contrast gender, racial, and age differences. It is from this base that this researcher will review current literature and research regarding learning style preference.

History of Learning Style Development

Guild and Garger (1985) offer a synopsis of the development of learning style. In 1921, German psychologist Carl Jung began to look at the relationship between cognitive style differences and psychological types. He observed that as individuals, we develop and adapt patterns that are comfortable to us and allow us to behave in predictable ways. Jung called these styles of personality "types."

Gordon Allport used the word "style" to define the consistent behavior patterns exhibited by individuals. By the early 1930's the emphasis and early theories of learning style were based on the idea that people behave and learn

based on their perceptions of their environment. Toward the end of the 1930's, George Klein called perception "the point of reality contact," equating perception to style.

A distinction between visual and haptic types of learners was reported by Lowenfeld in 1945. The results of his early work showed that one person in four depends on touch (haptic) and movement (kinesthesis) rather than observation (visual) for learning.

Herman Witkin was quite influential with his views on learning style. His work, beginning in the late 1940's, focused on the idea that people have different perceptual tendencies depending on how they view and use their surroundings. He categorized people into two groups: field dependent or field independent. If the perception is dominated by the immediate environment, or if the feelings or opinions of others affects perception, a person is "field dependent." If the person can experience and perceive items, situations, or activities separately from the immediate environment, or if she is task-oriented and inattentive to the environment, she is "field independent." Many theorists and researchers have been influenced by Witkin's pioneering work on this cognitive style concept.

Allport (1961) updated his earlier definition of style to include cognition. He now defines cognitive style as "distinctive ways of living in the world" (p. 271). This

nebulous definition was indicative of the direction learning style was taking.

Up to this time, cognitive, or learning style theory was dominated by the field of psychology. Psychologists attempted to show that there was some type of relationship between cognitive style and intellectual ability. However, during the early 1960's research into individual style differences diminished so that Leona Tyler (1965) reasoned that tests to determine style differences showed little relationship to school success. Instead, IQ tests could better predict a students' school success than determination of a specific perceptual preference.

Resurgence in learning style theory as important to the educational process began in the 1970's. Kolb introduced his Experiential Learning Model, which views learning as a process with experience as the foundation (Stewart, 1990). Dunn and Dunn (1978) proposed a learning style model that is multidimensional and incorporates five stimulus categories: environmental, emotional, sociological, physical, and psychological. (Both the Kolb and Dunn and Dunn models will be discussed in detail). The current view of learning style was verbalized by Kiernan in 1979: learning style assessment is one of the major components of understanding student learning.

Educators and psychologists view perceptual sensitivity differently, with different meanings and intentions. Educators are now attempting to expand awareness of individual differences by looking at the connections between these differences and psychology and neurobiology.

Learning Style Theories

No one theory of learning style is acknowledged as the appropriate approach. A variety of theories exist, some building on previous work, others developing in a new and different direction. In this review of learning style theories, those that appear to the researcher to be most illustrative of the limited-resource audience are included. The theories are Jung's Personality Types, Witkin's Field Dependence/Independence, The Kolb Experiential Model, and the Dunn and Dunn Learning Style Model. Each of these four theories will be discussed in detail with special emphasis on the Dunn and Dunn model.

Jung's Personality Types

Carl Jung set the stage for looking at the possibility of a relationship between psychological types and cognitive style differences with his research which began in 1921. Believing that individuals settle into patterns of behavior that are comfortable to them, they behave in predictable ways. In order to understand different behaviors among people, Jung believed that we must focus on the basic

functions people perform in their lives and the way these functions are performed. Depending on people, circumstances, or situations, each person operates in a variety of ways. Jung called these styles of personality "types" (Guild & Garger, 1985, p. 17).

All humans who are psychologically healthy are capable of understanding what has been experienced. The two ways Jung identified that people use to internalize or view people and situations are through the senses, such as touch or smell, and through intuition. Those who use their senses observe the actual happening. To them, seeing is believing, and they stick to what they see. By using this function of sensation an individual is able to observe, gather facts, and focus on practical actions. Those persons who rely on intuition are able to gain a different understanding of possibilities and relationships. These individuals read between the lines to interpret meaning and are able to focus on what is or what might be. Intuition allows for a clearer interpretation of the sensual experiences by helping us to read subtleties, body language, and tone of voice. When people use intuition, they can focus on and react to images that are created in the mind, allowing for the observation of problems in original and creative ways (Guild & Garger, 1985).

Although everyone uses both the senses and intuition when dealing with people and situations, we all have a preference for the ways in which we look at the world. The perceptual preference we rely on the most becomes our window for observing life. We associate more with people who approach life with the same perception and we are confused by those who do not view and understand the way we do. Because our experiences and the way we view them reinforce the way we see the world, we may distrust an approach that is different from ours. If we are more likely to use our senses to search for reality and facts we are less likely to trust and depend on possibilities, imagination, and intuition. Conversely, because the use of intuition leads us to search beneath and beyond the surface for understanding, we distrust surface information (Guild & Garger, 1985).

Jung also recognized that within sensing and intuition, people approach the decision-making process in different ways. He described the two functions as thinking and feeling. Thinking involves analyzing information, data, situations, and people through application of a logical, rational process. The thinker takes pride in remaining cool, calm, and collected, and will search deeper if a decision is difficult. Accuracy and thoroughness are important to the thinker and this person is cautious in the analysis of data. Careful thinking allows a person to trust objectivity, data,

logic, and rationality. When the thinker reaches a conclusion, he can be confident that all alternatives have been considered and weighed against each other, and the final decision has been reached carefully (Guild & Garger, 1985).

Whereas thinkers use an objective method of decision-making and understanding, another group uses the more subjective method called feeling. Feelers use a more empathetic and emotional approach and are searching for the effect the decision has on self and others. Circumstantial evidence is important as alternatives are considered and evidence is scrutinized to develop a personal reaction and commitment. The decision-making process is complex. It is not uncommon for personal perception about a person or situation to override rational evidence as the final decision is being reached (Guild & Garger, 1985).

As with sensation and intuition, all psychologically healthy human beings use both thinking and feeling in the decision-making process, with one function being more comfortable than the other. Also, because each of these functions is on the opposite end of a continuum, it is not uncommon for persons on one end to lack understanding and trust for persons on the other end.

Perhaps one of the most important points Jung made regarding these four basic human functions - sensing, intuition, thinking, and feeling - is that no value is placed

on any of the approaches to perception or decision-making. Sensing and intuition can lead equally to logical perception, and effective decisions can be made equally through thinking or feeling (Guild & Garger, 1985). We must recognize the fact that we need to use both types of perception functions and both types of decision-making functions, acknowledging that each human being has strengths in their modes of operation.

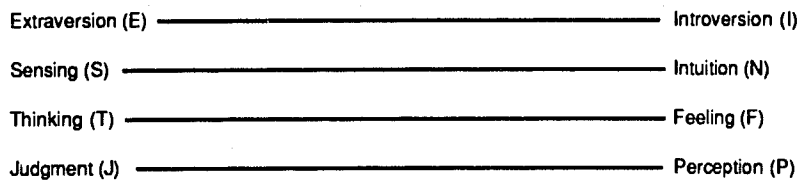
Jung further described people as either extraverts or introverts. Someone who is extraverted is comfortable interacting with things external to us such as people, situations, or experiences. Those who are introverted are more comfortable with the internal world of their own minds, hearts, and souls. Everyone functions in both extraverted and introverted ways, with one pattern becoming typical for each individual. Extraverts tend to explore their thoughts and ideas through talking or doing and thinking aloud. Introverts are more likely to reflect upon thoughts and actions, and are slower to act because they will not translate their internal thoughts to an external world until ready to do so. As with those who are intuitive versus those who are sensors, and thinkers versus feelers, introverts and extraverts usually do not understand each other, resulting in problems when they try to work together (Guild & Garger, 1985).

Perhaps the most well-known adaptation of Jung's theories was developed by Katherine Briggs and her daughter Isabel Briggs Myers. Interested in Jung's concepts, they explored his theories and concluded that his work had potential for increasing human understanding. They developed the Myers-Briggs Type Indicator, known as the MBTI, which is a psychological instrument designed to help people learn their personality type. Designed for an adult population, the instrument is a forced-choice questionnaire which allows people to measure their own balance of intuitions versus sensation, of thinking versus feeling, and of extraversion versus introversion (Guild & Garger, 1985; Golay, 1982).

Myers and Briggs added another dimension to Jung's theories. As they perfected their instrument, they began to be aware that individuals have a preference for either judging or perception. Those who prefer to bring closure or regulate life are judgers, those who are open-ended and desire to understand life are perceivers. This addition of judging and perceiving allows the MBTI to produce 16 different personality types (see Figure 1) (Guild & Garger, 1985, p. 21).

Witkin's Field-Dependence/Independence

Toward the end of the 1940's, Herman Witkin began to explore the idea that people have distinctive perceptual



ISTJ	ISFJ	INFJ	INTJ
ISTP	ISFP	INFP	INTP
ESTP	ESFP	ENFP	ENTP
ESTJ	ESFJ	ENFJ	ENTJ

Figure 1. Myers-Briggs Dimensions and Types

characteristics and that they vary in their abilities to differentiate objects from their backgrounds. He described these differences as field-dependent or field-independent. A field-dependent person needs to have the situation clarified and every component spelled out prior to action or reaction. A field-independent person, on the other hand, will respond quickly as her perceptual ability is not dependent on anyone or anything else. Knowing that these differences exist, Witkin was interested in determining to what extent a person's perception was influenced by the context or "field" in which it appeared (Guild & Garger, 1985).

Initially, Witkin attempted to determine what caused airplane pilots to become disoriented and fly upside down if they lost sight of the ground. To do this, he placed his subjects in a moving chair, which was brought to a true upright position, regardless of the slant of the "room"

surrounding the chair. In another experiment, he had the subjects to locate a rod upright in the space of a frame. Both the rod and the frame, which were both lighted to eliminate other visual distractions, could be tilted independently. All other surroundings were dark.

Based on these and other experiments, Witkin and his associates were able to define the two extreme indicators of perception and the extent to which the surrounding field influences perception. He concluded that the person who is field-dependent is strongly influenced by the prevailing field, and the person who is field-independent is able to perceive experiences separate from the surrounding field. Looking at placement of field-independent and field-dependent persons along a continuum, most people tend to score toward one or the other pole (Guild & Garger, 1985).

As Witkin expanded his studies into different aspects of personality, he looked at commonalities people have at each end of the continuum. Through his research, he became convinced that field-dependence or field-independence influences not only a person's perceptual and intellectual domains, but such personality traits as social behavior, body concept, and defenses.

It is now possible to diagnose adults and children for field-dependence or field-independence with the Embedded Figures Test developed by Witkin. Through this and other

measures, Witkin has clearly shown that cognitive style is independent of intelligence, determining that field-dependence or field-independence seems to be more related to the "how" than to the "how much" of cognitive functioning (Witkin, Moore, Goodenough, & Cox, 1977).

In order to maximize the importance of field-dependence and field-independence, Witkin felt that it is necessary to both match and mis-match learners and teachers in learning situations. In this way, it is possible to promote the diversity in behaviors as well as to utilize the diversity among individuals (Guild & Garger, 1985). Figure 2 compares learning behaviors between field-dependent and field-independent learners (Guild & Garger, 1985, p. 30).

In research conducted based on Witkin's theory, Ramirez and Castaneda referred to field-dependence as "field sensitive." They believed that cognitive differences are related to cultural differences in determining individual learning style (Dunn & DeBello, 1981; Banks, 1988). They also believed that learning style is not permanently set and that intervention can occur based on motivation and interest (Dunn & DeBello, 1981).

The Kolb Experiential Model

Experiential learning is based on the idea that learning style preferences are developed based on experience. Four components outline experiential learning:

Field Dependence	Field Independence
Perceive globally	Perceive analytically
Experience in a global fashion, adhere to structures as given	Experience in an articulated fashion, impose structure or restrictions
Make broad general distinctions among concepts, see relationships	Make specific concept distinctions, see little overlap
Have a social orientation to the world	Have an impersonal orientation to the world
Learn material with social context best	Learn social material only as an intentional task
Attend best to material relevant to own experience	Interested in new concepts for their own sak
Seek externally defined goals and reinforcements	Have self-defined goals and reinforcements
Want organization to be provided	Can self-structure situations
More affected by criticism	Less affected by criticism
Use spectator approach to concept attainment	Use hypothesis testing approach to attain concepts

Figure 2. How Students Learn

1. Communication - appropriate and adequate communication is necessary for learning. New information or knowledge are novel. When information is already known, it is redundant. Redundant information helps with the assimilation of novel information, enhancing the learning process (Phipps, 1988).

2. Perception - the way in which a learner processes information is based on how the information is perceived. Basically, learning is a four-stage cycle: the learning process begins with an experience, observation of the experience is made, abstract generalizations of the observations are developed, and the generalizations are

revised and tested in new experiences (Kendall & Sproles, 1986).

3. Arousal - the degree to which the cortex of the brain is activated prompts learning activity. Variety in teaching approaches is stimulating and can incorporate a number of learning styles (Phipps, 1988).

4. Motivation - Hersey and Blanchard (1988) defined motives as internal needs, wants, drives, or impulses that are directed toward goals which are either conscious or sub-conscious. We depend on the strength of our motives to determine the intensity of our motivation. There is no progress in learning unless there is sufficient motivation (Phipps, 1988).

David Kolb based his learning model on the theory that the adult learning environment is based on experience. The motivation for learning comes from problems that arise from the learner's experiences and the opportunities that exist for solving them. Not only does experience show adults what they need to learn, but experience allows adults to contribute to the learning of others (Kolb, Rubin, & Osland, 1991).

Kolb's learning theory views learning as a process with experience as the foundation. It involves a 4-step cycle that is value-free because as the stages in the cycle interact, none is considered better than another. The four

steps are concrete experience, reflective observation, abstract conceptualization, and active experimentation. As the learner moves through the learning process, he gains a better understanding of his world, finding the confidence to actively experiment and enhance learning. The learner can then repeat the cycle with a new set of experiences (Stewart, 1990). Learners are usually more proficient in one step than in the others (Kolb et al., 1991). Figure 3 shows the graphic illustration of Kolb's model (Guild & Garger, 1985, p. 53).

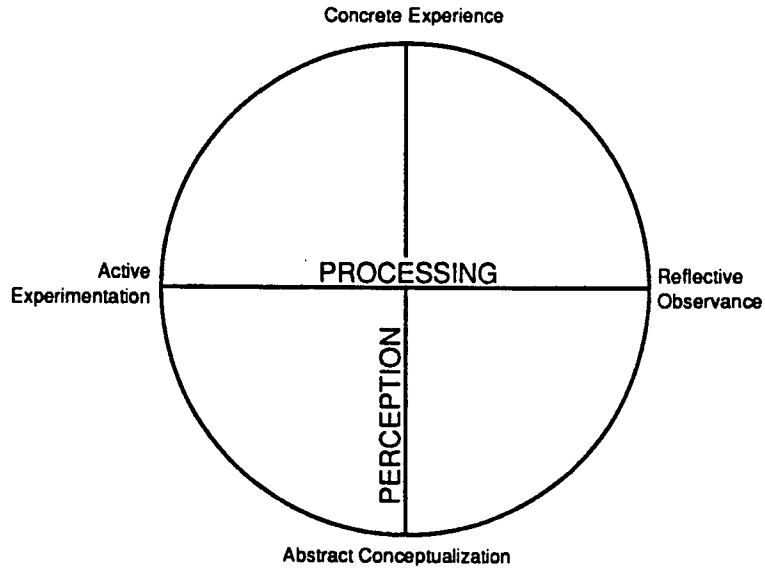


Figure 3. Kolb's Learning Style Dimensions

Step 1: Concrete experience. The first step, concrete experience, involves an openness to becoming involved with

new experiences or situations freely and without bias. Concrete experience places emphasis on intuition and feeling. The learner who is successful with concrete experience usually enjoys relating to others and is comfortable doing so. They function well in unstructured situations and are good intuitive decision makers. They exhibit an open-ended approach to life (Kolb et al., 1991; Kendall & Sproles, 1986).

Step 2: Reflective observation. Reflective observation involves an ability to understand the meaning of ideas, experiences, or situations through careful observation. Open-mindedness and thoughtful judgment are important. People who are good with reflective observation are able to look at things from different perspectives and can appreciate different points of view. They rely on their own thoughts and feelings and are impartial in their decision-making (Kolb et al., 1991; Kendall & Sproles, 1986).

Step 3: Abstract conceptualization. Abstract conceptualization is the ability to integrate concepts into theories, emphasizing analyzing and thinking as opposed to feeling. Learners who excel in abstract conceptualization enjoy systematic planning and analysis. They value precision and the aesthetic quality of a neat, conceptual system (Kolb et al., 1991; Kendall & Sproles, 1986).

Step 4: Active experimentation. Active experimentation involves the application of ideas or theories to solve problems. The focus is on actively influencing people and changing situations. Active experimenters are risk takers who enjoy accomplishing a task. They emphasize doing as opposed to observing, and value having an impact and influence on their environment (Kolb et al., 1991; Kendall & Sproles, 1986).

Looking at Kolb's model in Figure 3, we see that as people move from step to step, they move through four quadrants. These quadrants define the individual learning styles outlined by Kolb. They will be discussed in detail here.

The first quadrant is diverger, which emphasizes concrete experience and reflective observation. The diverger has the ability to view issues and problems from a variety of perspectives because her strengths lie in imaginative abilities, brainstorming approaches and generation of ideas and alternatives. The diverger has an awareness of meaning and value, which aids in the ability to adapt by observation rather than action. Divergers are sensitive to feelings of others, value others, and appreciate the needs and concerns of others (Kolb et al., 1991; Stewart, 1990).

Assimilator is the second quadrant, which is dominated by an interplay between reflective observation and abstract

conceptualization. The assimilator is more interested in the logic of ideas and theory rather than practical application to specific problems, making his greatest strengths inductive reasoning, the ability to create theoretical models, and to assimilate distinct observations into an integrated explanation. Persons who are oriented to assimilation are less focused on people and more concerned with ideas and abstract concepts. The practical value of ideas are not important, rather the theory must be logically sound and precise (Kolb et al., 1991; Phipps, 1988; Stewart, 1990).

In the third quadrant is the converger, whose dominant learning ability is the ability to conceptualize in abstract ways while easily combining the conceptualization with active experimentation. Convergers tend toward deductive reasoning as they apply their ideas in a practical and highly organized manner. The greatest strengths of persons in this group include their approach to problem solving, decision making, and the practical application of ideas. The converger does best in situations that have a single correct solution to a well defined problem. They are more successful dealing with technical problems and tasks than with social and interpersonal issues (Kolb et al., 1991; Stewart, 1990).

The accommodator is the fourth quadrant. This learner is a risk taker who exhibits abilities in concrete experience and active experimentation. The greatest strengths of

accommodators are doing things - "hands-on" experiences - in carrying out plans and in getting involved in new experiences. Accommodators tend to gravitate to situations where they must adapt to immediate and changing situations, through opportunity seeking, risk taking, and action. If the theory or plans are incompatible with facts, the accommodator is likely to discard the theory or plan. Because people in this quadrant rely on other people for information rather than on their own analytic ability, they most often solve their problems in an intuitive trial and error manner. They are generally at ease with people but sometimes appear to be impatient and even "pushy" (Kolb et al., 1991; Phipps, 1988; Stewart, 1990).

By using this model, experience, reflective observation, abstract conceptualization, and active experimentation become important. Although all learners move through each phase in the cycle one style is dominant with each person. Because the learning abilities overlap with the learning styles, the learner has an opportunity to pursue styles that are adjacent to her preferred style.

Kolb's experiential learning cycle is continuously recurring. When practiced in sequence, experiential learning is most effective. Kolb believed that not completing the cycle thwarts the learning process, resulting in partial learning (Stewart, 1990). Experiential learning helps people

to integrate and improve learning abilities because the student learns how to learn from experience. By developing all facets of experiential learning, education becomes a more complete and integrated process. Concepts are continuously tested in experience and modified as a result. To Kolb et al. (1991) "all learning is relearning and all education is reeducation" (p. 59).

In order for any type of learning to be successful the learner must have a clear understanding of felt needs and goals. When personal objectives are unclear, learning is likely to be erratic and incomplete. By having an understanding of what is to be accomplished, the learner then seeks experiences that are related to the goals and interprets them with these goals in mind. He is then able to form concepts and test the concepts that are relevant to the expressed needs and goals (Kolb et al., 1991).

Because our felt needs and goals are individual, learning styles, therefore, are highly individual in both direction and process. A writer may place emphasis on concrete experience, while a mathematician may place greater importance on abstract conceptualization (Kolb, et al., 1991). Regardless, the key point is that although one style may be more important than another to every individual, in order for complete learning to be achieved, the learner must

experience every step. Greater understanding will take place in the predominant quadrant style.

The ultimate goal of Kolb's model is integrated learning. To achieve this and avoid under-development of skills and abilities within each style, it is necessary for all learners to move systematically around the learning cycle. Learning in new stages as the learner integrates them may provide a challenge to some learners. Because it is necessary, though, the learner may struggle to overcome the challenge. Once this has been accomplished, the learner will most likely develop a more complete and integrated approach to learning. Kolb has outlined three stages of maturation as the learner integrates the styles:

1. Acquisition - the learner must acquire basic learning abilities and cognitive structures. Once this has occurred, the learner recognizes that she is a distinct individual and is separate from the surrounding environment.

2. Specialization - in this stage the learner acquires skills and abilities that allow him to adapt to the demands of life functions such as socialization and career development. By the end of this stage the individual is aware of her importance in the world, and conflict resulting in confrontation between self goals and societal goals occurs, allowing movement into the final stage of maturation.

3. Integration - here, the learner recognizes events and experiences as processes that have meaning and purpose. Prior to this happening, maturation of the learning process has been viewed as random accumulation of cognitive abilities that contribute to the well-being of the learner. In order for this integration to occur, learning abilities that had previously been untapped are now more accessible to the learner and contribute

> to the facilitation of the ability of the learner to move through the learning cycle. (Stewart, 1990, pp. 34-35)

Ultimately, all perspectives of learning are important for optimal learning. Learning effectiveness is reduced if one style dominates the others to the point that there is lack of tolerance of the others. If learning is viewed as an activity with an end result of productivity or profit, then conscious and deliberate attempts to integrate the learning processes outlined by Kolb will occur (Kolb et al., 1991).

A final dimension of Kolb's work involves the two dimensions of learning: perception and processing. Figure 4 illustrates the juxtaposition of the two ways of perceiving (concrete experience or abstract conceptualization) and the two ways of processing (reflective observation or active experimentation). A person who perceives best by concrete experience will have difficulty understanding abstract conceptualization because they share no common learning ability. The same is true with the opposite ends of the processing dimension (Stewart, 1990; Guild & Garger, 1985).

Bernice McCarthy used Kolb's model as an umbrella to describe the learning process and the differences in the way people learn. She was interested in hemisphericity of the brain and studies that show that the right hemisphere and the left hemisphere specialize in certain tasks. She looked at the four types of learners described by Kolb with the

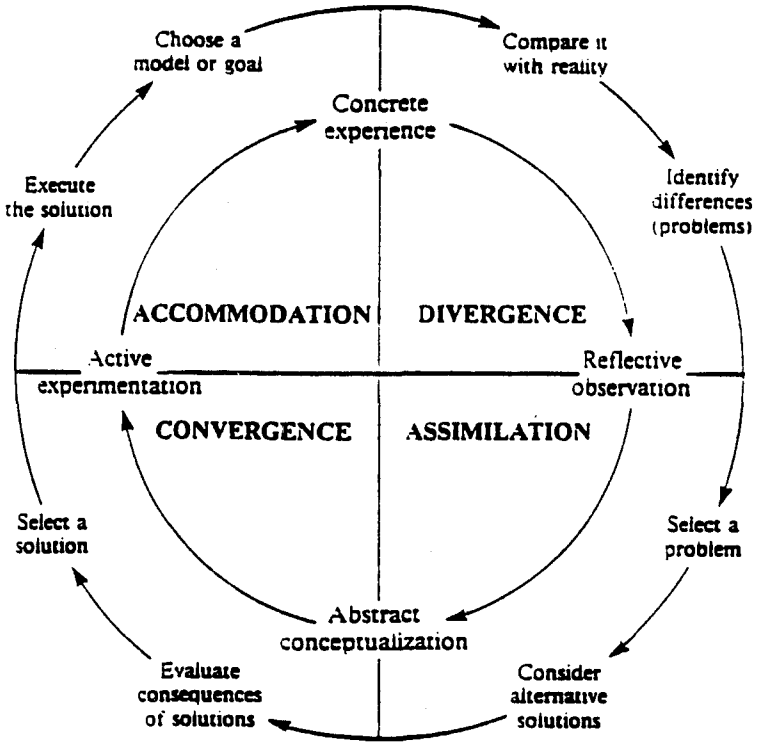


Figure 4. Comparison of the Experiential Learning Model with the Problem-Solving Process

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final result of imposing the right and left specialization onto each of the four learning styles. Her system is called the 4MAT System (see Figure 5) (McCarthy, 1981; Guild & Garger, 1985).

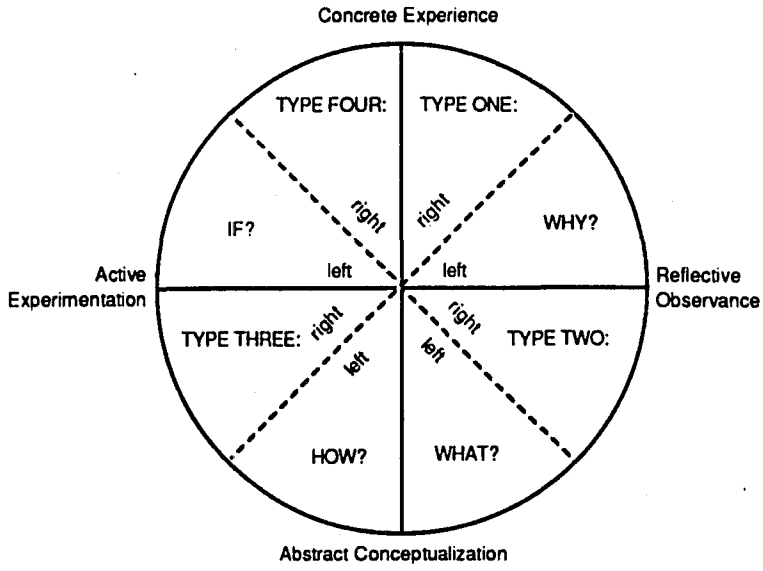

Figure 5. McCarthy's 4MAT System

In Quadrant 1, Kolb labeled his learner the diverger. McCarthy refers to this as the Type One learner. These innovative learners perceive by sensing and feeling and they processes by reflecting and watching. The right hemisphere is interested in personal meaning while the left hemisphere attempts to understand the experience by analyzing it. The primary question asked by Type One learners is "Why?" as they work to understand how learning affects them and their beliefs, feelings, and opinions (McCarthy, 1981; McCarthy, 1985; Guild & Garger, 1985).

Kolb's Quadrant 2 learner is the assimilator; for McCarthy this is the Type Two or analytic learner. Type Two learners perceive information by abstract thinking and they

process information by reflecting and watching. The right hemisphere attempts to integrate experience with knowledge and clarification for more knowledge while the left hemisphere searches for the new knowledge. These learners are primarily interested in facts and accurate information. Exactness and detail are important and they respect authority and expertise. They ask "What?" as they try to identify what can be known by careful seeking of knowledge (McCarthy, 1981; McCarthy, 1985; Guild & Garger, 1985).

The third quadrant, referred to as the converger by Kolb, is what McCarthy calls the Type Three or common sense learner. These learners perceive by abstract thinking and processes by trying and doing. The right hemisphere of the brain searches for an individual application and use for what is learned, and the left hemisphere is searching for examples -- what have others done? The most important question to them is "How?" because the Type Three learners must try things by practicing and doing and they are more able to develop clear
understandings as they test their new knowledge. Procedure is important to them as they work to make things useful, valuable, and practical (McCarthy, 1981; McCarthy, 1985; Guild & Garger, 1985).

The final quadrant, the Type Four learner, is what Kolb referred to as the accommodator. Sensing and feeling are the

ways these dynamic learners perceive information, and they processes by doing things. Self-discovery is their primary goal, and they achieve this by asking "If?" While the right hemisphere of the brain attempts to extend the learning, the left hemisphere analyzes the learning for relevance and significance. It is important for the Type Four learner to see the connections and relationships between things and they are committed to do important life work. They inspire others and make others excited about learning. These learners understand the complexity of situations and have the ability to synthesize knowledge into personal meaning for themselves and others (McCarthy, 1981; McCarthy, 1985; Guild & Garger, 1985).

As with Kolb's model, McCarthy views her version as sequential, recognizing that in order for learning to be complete, each stage must be experienced, beginning with Quadrant 1. She acknowledges that each learner will be more comfortable in one quadrant than in the others. All learners will have the opportunity to develop and strengthen their natural abilities when they are working in their preferred learning style. And by experiencing the other quadrants, they develop a total learning concept (McCarthy, 1981; McCarthy, 1985; Guild & Garger, 1985).

The Dunn and Dunn Learning Style Model

Rita and Kenneth Dunn became involved with learning style theory in the late 1960's when they were asked to help teachers develop ways to help educationally disadvantaged students to learn. Working with teachers, administrators, parents, and the students, they came to realize that some children responded well to certain methods of instruction and others did not. As they refined their work they found that learners are affected by four basic stimuli: environment, emotional, sociological, and physical. These four stimuli contain 18 different elements which, according to the Dunns, "affect a person's ability to absorb and to retain information, values, facts, or concepts" (Dunn & Dunn, 1978, pp. 2-4). Ultimately, the Dunns, with Gary Price, a statistician, developed the Learning Styles Inventory which is available in three forms: grades 3-5, grades 6-12, and an adult version called the Productivity Environmental Preference Survey (PEPS).

An understanding of the stimuli and the elements contained in them is necessary for knowing the individuality of how people, children, and adults learn and function. Figure 6 outlines the Dunn and Dunn Learning Styles model (Dunn & Dunn, 1978, p. 4).

Environmental Stimuli

The elements found in the environmental stimuli include sound, light, temperature, and design. Dunn and Dunn found

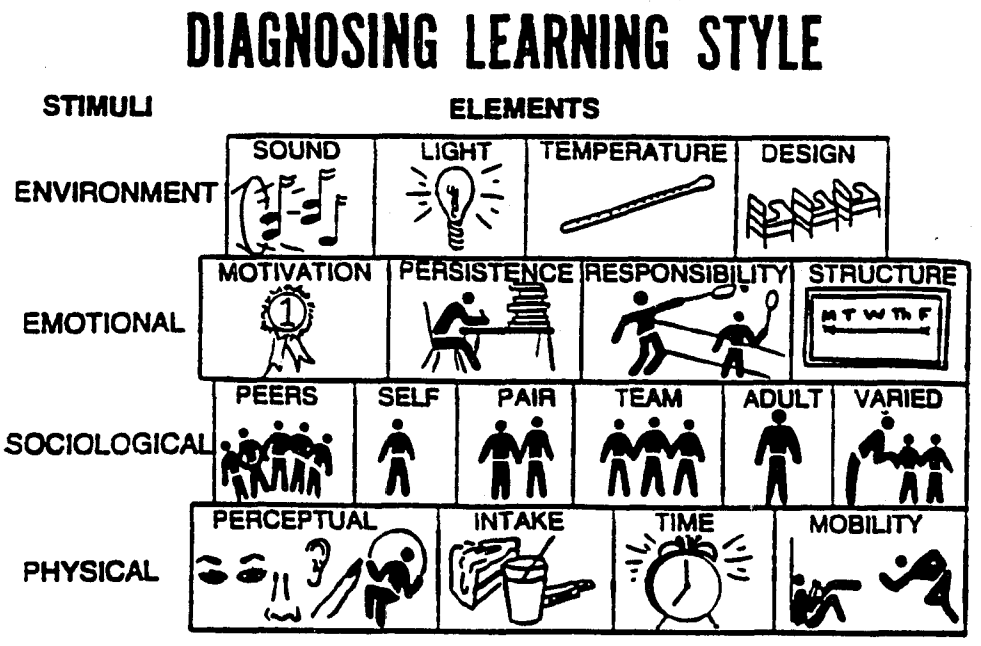

Figure 6. The Learning Style Model designed by Dunn and Dunn

that some people are able to learn easily when surrounded by noise, others must have silence, or degrees of silence. Some people find it easy to block out sound, while others are quite distracted by any noise. The ability to concentrate may depend on the level of or lack of sound in the environment (Dunn & Dunn, 1978).

Light is another element that affects learning, although it affects fewer people than does sound. Some people are light sensitive and are able to tolerate only low, subdued light, while others need and can tolerate bright light. In the early testing of their Learning Style Inventory, Dunn and Dunn found that many students were oblivious to the amount of

light they preferred unless the amount or intensity was suddenly and dramatically changed. Others reported that inadequate lighting causes apathy and difficulty remaining alert, whereas bright light can serve as an energizer (Dunn & Dunn, 1978).

Temperature is the third environmental element which may play a part in individual learning. Tolerance to temperature varies to the extent that some people are able to concentrate when the environment is cool or even cold. Warmth may cause drowsiness and an inability to function alertly. Others experience emotional or physical discomfort which causes a decrease in productivity if the temperature is too warm. Regulating the temperature is difficult in a group setting if there are students with a wide range of warmth or cooling needs, but it is important to know and understand how temperature can affect learning (Dunn & Dunn, 1978).

The fourth environmental element is design. This element refers to the arrangement and comfort of the furniture in a formal or informal manner. Formal arrangements may include hard table and chair or use of a desk which may be necessary for concentration. This arrangement might also restrict creativity and motivation. Informal arrangements may include a lounge, bed, the floor, or an easy chair. For some learners this type of informal arrangement may cause drowsiness that prevents creativity and

production. It is also possible that the design needs may vary depending on the type of learning activity being conducted (Dunn & Dunn, 1978).

Emotional Stimuli

Emotional elements include motivation, persistence, responsibility, and structure. Learners who are motivated are eager to learn. If they are told what to do and understand what is expected of them, they will be able to accomplish their tasks successfully. Unmotivated learners are often unenthusiastic about learning because they have had problems achieving. These learners must be given assignments that complement their strengths, such as listening to cassette tape recordings rather than reading, if the learner prefers not to read. Often, individualized programs are appropriate for an unmotivated learner, particularly if it allows her to make choices, to learn in accordance with her preferences, and to evaluate herself (Dunn & Dunn, 1978).

Persistence is another emotional element that affects learning. Some learners are able to work at a task until it is completed, seeking assistance if problems arise. Other learners have difficulty staying on task and working until the assignment is complete. Trying to force someone to learn in a specific span of time can be detrimental to their progress if they are unable to concentrate until the task is complete. Self-pacing is an alternative for this learner.

When an assignment is made, the learner is given clear objectives and a time frame in which to complete the task. The learner must understand that the task must be completed but that it is not necessary to stick with it without pause. In this way, the learner will acquire the knowledge or skills in her own way, without guilt about taking periodic breaks. This type of successful activity will help the learner begin to function independently (Dunn & Dunn, 1978).

The third emotional element is responsibility. Some learners are capable of follow-through on assigned tasks without direct or frequent supervision. Other learners are not as responsible and they allow their attention to be diverted. As with learners who are not persistent, less responsible learners usually do not seek assistance if they are having problems learning. These learners often become discouraged and lose confidence in their abilities to learn. When this happens, it is imperative to determine specific learning preferences and incorporate them into the learning situation. This will allow the learners to begin to achieve and increase their self-confidence. Eventually, they will begin to exhibit responsible behavior when they are able to do what is required of them without fear of embarrassment or failure (Dunn & Dunn, 1978).

Structure is the fourth emotional element. Structure involves having specific rules and guidelines for working on

and completing tasks. It limits the options a learner may have when working toward the achievement of a specific goal. Some learners are perfectly capable of working without mandated guidelines and find that learning is frustrating and unstimulating when they are required to follow specific rules. Other learners find that it is equally difficult to achieve without a rigid structure. Learners who are motivated, persistent, and responsible are usually capable of making decisions. These learners do not require structure or supervision. The unmotivated learner is most often lacking in persistence and responsibility and has difficulty with responsible decision-making. This learner most often requires structure (Dunn & Dunn, 1978).

Sociological Stimuli

Sociological elements that relate to learning include the ways in which a learner responds to, reacts, and interacts with their peers, themselves, a pair (self and one other individual), a team, adults (teachers or leaders), and varied groups of people. There is no best or preferred way in which an individual learns. Fear of failure, embarrassment, or inability to understand often cause a learner to become too tense to concentrate. Some children may feel more comfortable being guided by an adult; others may be better able to study and concentrate with peers. Peer work or group sessions can easily lead to socialization

rather than learning. Some learners are uncomfortable letting others see their shortcomings and prefer to work alone. Because all learners have preferred ways of functioning it is important that the teacher or leader allow each individual to work dependently or independently to the extent possible to ensure maximum achievement (Dunn & Dunn, 1978).

Physical Stimuli

Elements found in the physical stimuli include perceptual, intake, time, and mobility. Although almost any educator would agree that people learn through their different senses, it has been estimated that 90 percent of all teaching occurs through lecture and question and answer. However, only 20 to 40 percent of all learners learn best by listening. It was not until the 1960's that researchers began to consider that people learn in ways other than listening or seeing. Learners are also tactual - the sense of touch allows them to understand meanings through a "hands-on" approach to learning. Kinesthetic learners must be allowed to move about while processing information. Learners who are kinesthetic must have real-life experiences that relate to what is to be learned if they are to be successful. Finally, there are learners who require that a combination of the senses be used in the teaching/learning process (Dunn & Dunn, 1978).

The second physical element is intake. When a certain task requires concentration, some learners have a need to take periodic breaks for food or drink. Others may smoke or chew gum as they concentrate. Still others may not need to refill or refresh themselves in any way. There may be a couple of reasons why there is a need for intake. First, the food that is ingested may replace the energy that is being expended during the learning process. Also, intake may help in reducing any tension that may be experienced when a person is concentrating. Whatever the reason, research has shown that for those children who need to eat and are allowed to eat while learning, grades and attitudes improve. Signs of need for intake may include nail biting or chewing on pencils or other items while concentrating (Dunn & Dunn, 1978).

Time is the third physical element. Learners of all ages function at maximum capacity at various times of the day and night. Some people are able to perform well early in the morning, while others come alive late at night. When it is possible, the instructional environment must be arranged to permit a wide arrangement of peak time functioning to give all learners an opportunity to perform efficiently (Dunn & Dunn, 1978).

The fourth and final physical element is mobility. The need for mobility, being allowed to move around in the learning environment, is a composite function of the

physical, emotional, and environmental elements. Some learners need a great deal of mobility and do not perform well if they are not allowed to change location and posture frequently. Other learners are capable of achievement without the need to move about. Regardless of their needs, most learners are unable to control their need to move about while learning (Dunn & Dunn, 1978).

Using the Learning Styles Inventory (LSI) or the Productivity Environmental Preference Survey (PEPS) developed by Dunn and Dunn, a teacher is able to become more sensitive to the needs of the learners individually and as a group. By understanding the needs, the teacher is more likely to respond to the learners in a positive, reinforcing manner, ultimately making the learners more comfortable with their personal learning needs and helping them to become more responsible and efficient learners (Guild & Garger, 1985).

Relevant Learning Style Research

Children

Of the learning style research that has been conducted, there is variety in the way the researchers characterize learning styles. Some focus on emotional-psychological dimensions such as motivation and responsibility, and some place more importance on cognitive aspects, such as abstractness and concreteness in learning style. Still others consider students' preferences for teaching methods

and characteristics rather than specific learning style characteristics.

A number of researchers have looked at learning style preferences of African American children, making comparisons to Caucasian children at the same age/grade level. Ramirez and Castenada (1974) believed that learning and other social science theories should reflect the diversity within ethnic groups such as region, gender, and social class. In their research, they substituted "field-sensitive" for "field-dependent," because they believed that "field-dependent" has negative connotations. Learners who are field independent are task-oriented and are inattentive to their social environment as they work, preferring to work independently. Field-sensitive learners prefer working with others to achieve a common goal, taking into consideration feelings and opinions of others as they work. They found that African American students were more field-sensitive than Caucasian students, who were more field independent. Ramirez and Price-Williams (1974) hypothesized that childhood socialization practices and cultural differences contribute more to the field-dependency of African American students, but that there is no effect of social class on field-dependency. Perney (1976), Banks (1988), and Griggs and Dunn (1989) also found African American students to be more field dependent than Caucasian students. In addition to her findings that African

American students are significantly more field-dependent than Caucasian students, Perney found that the scores of the African American females in the study accounted for most of the difference between the races. As a group, females were significantly more field-dependent than males, and African American females were more field-dependent than Caucasian females.

A number of researchers have used the Dunn and Dunn Learning Styles Inventory to determine learning preferences of African American, Caucasian, and Native American children and to determine whether or not variances existed between and among the different cultural groups. In the environmental domain, learning style elements include sound, temperature, light, and design. While African American students prefer low sound and a quiet environment (Jalali, 1989; Sims, 1988), Caucasian students prefer sound while learning (Sims, 1988). Native American students require sound to help screen against other distractions (Griggs & Dunn, 1989). African American children prefer cool temperatures (Jalali, 1989; Griggs & Dunn, 1989) and Caucasian students prefer warm temperatures (Lam-Phoon, 1986). Both African American and Native American children have a preference for bright light while learning (Jalali, 1989; Sims, 1985; Griggs & Dunn, 1989). Caucasian children, on the other hand, expressed a preference for low light while learning (Jalali, 1989; Sims, 1988). Griggs &

Dunn (1989) found that African American children prefer formal study arrangements, conflicting with Jalali (1989) who found that they prefer an informal design. Both Caucasian and Native American children prefer an informal, relaxed design while learning (Jalali, 1989; Dunn & Price, 1988; Griggs & Dunn, 1989).

Responsibility, structure, persistence, and motivation are the learning style elements that are found in the emotional stimulus. Jacobs (1987) found that African American children who are underachievers were more persistent in their quest for learning than were Caucasian underachievers. Even so, African American children prefer a low degree of structure in the learning environment and Caucasian children prefer a higher degree of structure (Sims, 1989). African American children also exhibit a willingness to sustain studying beyond the required time, until the task is completed (Griggs & Dunn, 1989).

Learning style elements found in the sociological stimulus are concerned with the people with whom each student learns best - alone versus with peers, variety of social experiences versus consistent experiences, with or without an authoritative teacher, and teacher or parent motivated. Jalali (1989) found that African American children preferred to learn alone. In contradicting studies, Sims (1988) found that Caucasian children preferred learning with peers whereas

Dunn & Price (in press) found that they learn best alone. The researchers speculated that both socioeconomic and geographical differences in the population could account for the contradictions (Dunn & Griggs, 1990). Needs for variety in learning experiences compared to needs for consistent experiences also varied between African American and Caucasian children and somewhat by gender. African American children need routines and patterns for successful learning (Jalali, 1989) as do Caucasian males (Dunn & Price, in press). Caucasian females, though, are more successful learners when presented with a variety of social experiences (Dunn & Price, in press). African American children respond to and need frequent authoritative feedback (Jalali, 1989). African American children are more parent and teacher motivated than Caucasian children (Jalali, 1989; Jacobs, 1987).

Physical stimulus includes learning styles such as time of day, intake, perceptual strengths, and mobility. Both African American and Caucasian learners indicated a preference for evening learning (Jalali, 1989; Sims, 1988). African American children disliked late morning learning (Jalali, 1989) but did not object to afternoon learning (Jalali, 1989; Sims, 1988). Caucasian males disliked afternoon learning (Dunn & Price, in press). Morning study is least desirable to Native Americans as well (Griggs &

Dunn, 1989). African American and Caucasian children need intake while learning (Jalali, 1989; Lam-Phoon, 1986; Sims, 1988); with Caucasian children strongly needing intake (Lam-Phoon, 1986; Sims, 1988). Perceptually, neither African American nor Caucasian children are auditory (Lam-Phoon, 1986; Jalali, 1989; Jacobs, 1987). Sims (1988) and Lam-Phoon (1986) found that Caucasian children are not as visual as African American children. Strong visual perception was found in Native American children (Cazden & John, 1971; Kleinfeld, 1973; John-Steiner & Osterreich, 1975; Mariash, 1983; and Jalali, 1989). This visual strength derives from a heavy cultural reliance on developing graphic skills and an environment artistically rich in visual stimulation (Griggs & Dunn, 1989). Jalali (1989) and Sims (1988) found that African American children are kinesthetic learners. Native American children prefer to be presented with spatial tasks (Griggs & Dunn, 1989). African American and Caucasian children need mobility in the learning situation (Jalali, 1989; Sims, 1988; Lam-Phoon, 1986). Native American males require significantly more mobility than females (Dunn & Griggs, 1990).

These studies have clearly shown differences in learning style preferences among African American, Caucasian, and Native American children. Some of the differences may be related to geographic location or age/grade in school, but

some are physiological in nature such as preferences for quiet, sound, temperature, intake, and mobility. In addition, the variables are a reflection of the various influences of culture (Dunn & Griggs, 1990).

Adults

A more limited number of studies with adults than with children have been conducted. No studies were found that specifically identified African Americans or Native Americans as the subjects. Most studies identified Caucasian adults as the sample studied, or simply referred to the sample as "adults" with specific age breakdowns rather than giving any racial or ethnic background.

Dorsey and Pierson (1984) used the Kolb Learning Style Inventory to determine dominant learning styles of adult students who were pursuing non-traditional undergraduate degree programs in occupational education at Southwest Texas State University. Of the 513 participants, 68% were males and 33% were females. Almost 79% were age 26-49 and over 51% had prior work experience.

The Learning Style Inventory indicated that the dominant learning abilities of this group included responsible, practical, experienced, evaluative, and receptive. The least dominant characteristics were abstract, impartial, feeling, risk-taking, and tentative. Abstract conceptualization, the ability to integrate concepts into theories, was the primary

learning ability for males and active experimentation, the application of ideas or theories to solve problems, was the primary learning ability for females (Dorsey & Pierson, 1984).

A very important finding of this study is that age and prior work experience influence learning style type. As adults age, age differences become an important index of learning styles. Older students showed an inclination for the accommodator learning style, which involves a preference for learning by doing (Dorsey & Pierson, 1984).

The Productivity Environmental Preference Survey (PEPS) is the adult version of the Dunn & Dunn Learning Styles Inventory. Widely used, the PEPS will permit adults to identify their preferences for learning or working. The PEPS will provide a profile of each individual's preferred learning style as well as a group summary so that educators or supervisors can appropriately group individuals or design work settings based on similarities identified among the productivity elements. This will also provide a basis for supervisor- or instructor-individual/group interaction in ways that allow each person and/or group to concentrate in the best way (Partridge, 1989).

Kuznar, Falciglia, Wood, and Frankel (1991) used the PEPS to study two groups of Caucasian females in northern Kentucky. Forty participants in the study were between the

ages of 35-55 and forty participants were age 65 and over. For the 20 PEPS elements, 75 percent had a reliability equal to or greater than .60 with 40 percent of the elements being <.80.

A number of differences as well as similarities between the two age groups were found. Both age groups preferred a formal setting for learning, although they also preferred conversational sounds and frequent breaks. A structured environment was preferred by both groups including simple, clearly stated objectives and goals. Rather than learning in a variety of ways, both groups were more comfortable with the maintenance of a routine and the presence of an authority figure (Kuznar et al., 1991).

Those adults in the 35-55 age group exhibited specific learning style preferences. In the environmental stimuli they preferred bright light rather than dim or dull lighting. They showed no strong preference regarding motivation or responsibility, although they preferred more responsibility and outer-directed behavior. Sociologically, they preferred peer-oriented learning over learning alone. In the physical needs stimuli, the younger group showed a preference for afternoon learning and a need for intake. They were also auditory and were kinesthetic, preferring manipulative, real and active experiences (Kuznar et al., 1991).

The older group exhibited a number of differences from the younger group. In the environmental stimuli, this group preferred to learn in cooler temperatures and indirect lighting. Emotionally, the older learners exhibited persistence and motivation in learning, but not responsibility. In the sociological stimuli, they indicated that they preferred to learn alone rather than with others, as it is less threatening. Physical needs include learning in the morning and no intake while learning. The older group also liked visual aids and oral delivery, plus manipulative activities (Kuznar et al., 1991).

Kuznar's et al. study showed that five elements of the PEPS were significantly different between the younger and older adult females. These are light, responsibility, motivation, peer versus individual learning and preference for time of day learning.

Reynolds and Gerstein (1991) sought to identify learning style characteristics of adult dependent decision makers, a group described by Buck and Daniels (1985) as people who rely on opinions and expectations of others for help in decision making. The study group was described as predominately Caucasian (87%) with a mean age of 33 years. Using both the PEPS and Kolb's Learning Style Inventory, they hypothesized that adult dependent decision makers would prefer authority oriented learning, show a lack of motivation and

responsibility, and would be more likely to have the Accommodator learning style. The results of the study did not support the hypothesis that this group was authority oriented. Also, no significant difference was found between the dependent decision-making groups and any of Kolb's learning style preference groups, including the accommodator learning style. The results did, however, indicate that this group has reduced motivation for learning, lack of persistence in task completion, and does not take responsibility for their own learning (Reynolds & Gerstein, 1991). This study also indicated that as a group, adult dependent decision makers have a preference for a quiet learning environment.

In a study comparing perceptual learning styles between adult high school graduates and nongraduates, James and Blank (1991) suggested that if students do not effectively receive, process, and store information they are more likely to do poorly in school, become frustrated, and drop out. They further suggest that by addressing the mismatch between learning style and teaching style, more students may remain in school through completion.

Adults who had completed high school but had no postsecondary education beyond high school were compared to adults who had not completed high school. The seven perceptual styles studied were print, aural, interactive,

visual, haptic, kinesthetic, and olfactory. Their findings indicated that there are significant differences between the graduates and nongraduates on five of the seven perceptual learning styles. Scores for visual, haptic, aural, print, and kinesthetic preferences were significantly higher for the high school graduates. No significant difference was found with either the interactive or olfactory scores between the graduates and nongraduates (James & Blank, 1991).

The adult educator has the unique challenge of relating to learners who, for a variety of reasons, have failed to achieve in previous educational settings. In order to contribute to their success as adult learners, the educator must consider the uniqueness of both groups of learners as well as individual learners. Research has shown that as a group, adults have learning style preferences that are often different from those of children.

Because no research has been identified that targets a specific limited-resource audience, it is important to begin to investigate learning style preferences of this group. Although the purpose of this research study is to identify learning style preferences of the limited-resource clientele of the North Carolina Cooperative Extension Program, results of the study will be useful not only to Extension staff, but also to other social service workers and providers who interact with this type of audience.

Instrumentation

A number of instruments have been developed that assess learning style preferences of adults. In their comparison of several instruments, Rule and Grippin (1988) lamented that because there are a variety of approaches to learning style theory and that because a learning style construct has yet to be clearly defined, problems regarding instrument development, reliability, and validity exist, all of which affect the research results. Curry (1987) warns that researchers interested in measuring constructs at specific levels must be certain that the instruments they select actually do predict behavior at the desired level.

Three instruments that are pertinent to this study have been identified. They include the Witkin Group Embedded Figures Test, the Kolb Learning Style Inventory II, and the Price, Dunn, and Dunn Productivity Environmental Preference Survey. Each will be discussed in terms of their usefulness, validity, and reliability.

Group Embedded Figures Test (GEFT)

This instrument, developed by Witkin in 1971, is designed to measure field-dependence/field-independence in order to describe a person's ability to function perceptually (Rule & Grippin, 1988; Curry, 1987). Easy to hand score, it takes 20 minutes to complete. Consisting of 25 items, it is a timed test which requires the subject to locate, in each of

the items, a simple geometric figure which has been embedded in a more complex figure. The ability to locate the embedded figures indicates field-independence (Rule & Grippin, 1988).

The GEFT has evidence of reliability as reported by Carter and Loo (1980). They found an internal consistency coefficient of .86 (Cronbach's alpha) using a sample of 266 undergraduate men and women. Using split-half techniques, Panek, Funk, and Nelson (1980) found reliabilities of .57 (ages 25 to 32) to .90 (ages 33 to 40) with a mean of .75 (ages 17 to 72). With a sample of older learners, Curry (1987) reported a reliability of .86 using split-half techniques and a reliability of .90 using test/retest methods.

Validity of the GEFT is not as strong as the reliability. Panek et al. (1980) reported a low correlation of -.46. This criterion-related measure of validity lies in the relationship between the GEFT and the original Embedded Figures Test. Witkin, Oltman, Raskin, and Karp (1971) reported correlations of -.82 for men and -.63 for women.

The GEFT is a reliable instrument but has questionable evidence of validity. Rule and Grippin (1988) recommend the use of group scores only as a gross measure of the field-dependence/independence construct.

The Learning Style Inventory II (LSI II)

Originally developed in 1976, the LSI II is a revised, simpler version of the original Learning Style Inventory I (LSI I). The LSI I attempted to discriminate concrete experimentation versus reflective observation and abstract conceptualization versus active experimentation among learners and to identify four types of learning style: converger, diverger, assimilator, and accommodator. The LSI II added new items to each scale (Rule & Grippin, 1988; Curry, 1987).

Using Cronbach's alpha, the LSI II reports internal consistency coefficients ranging from .73 to .83 (Rule & Grippin, 1988). Sims, Veres, Watson, and Buckner (1986) reported alphas ranging from .76 to .85. Curry (1987) reported reliability (Cronbach's alpha) of .79. Sims et al. (1986) found test-retest reliabilities ranging from .24 to .66 while Curry (1987) reported test-retest reliability of .58.

The LSI II appears to be lacking in validity. Intercorrelations among the learning mode and difference scores of the LSI II vary widely, ranging from -.05 to -.85 with an absolute value mean of .36. Learning mode and difference score correlations between the LSI I and LSI II range from .87 to .93 (Rule & Grippin, 1988).

Although the LSI II has gained in reliability over the LSI I, because of the lack of validity information, caution is urged when considering the use of this instrument. Care should be taken in interpretation of both group and individual scores if this instrument is used until further studies of it's psychometric qualities are undertaken (Rule & Grippin, 1988).

The Productivity Environmental Preference Survey (PEPS)

The PEPS was designed in 1979 by Rita and Kenneth Dunn and Gary Price as a way to analyze "the conditions under which an adult is most likely to produce, achieve, create, solve problems, make decisions, or learn" (Price, Dunn, & Dunn, 1982, p. 1). Individual learning preferences are determined in each of 20 different modalities: noise level, light, temperature, design, unmotivated/motivated, non-persistent/persistent, irresponsible/responsible, structure, learning alone/peer oriented learner, authority figures present, prefers learning in several ways, auditory preferences, visual preferences, tactile preferences, kinesthetic preferences, requires intake, functions best in evening/morning, functions best in late morning, functions best in afternoon, and mobility (Price, 1987). Although the PEPS does not measure underlying psychological attributes of individuals or groups, it does yield information regarding patterns of productivity levels, revealing how an individual

prefers to learn rather than why (Rule & Grippin, 1988). The PEPS is based on factor and content analysis (Price, 1987).

Using a Likert scale of 1 (strongly disagree) to 5 (strongly agree), the PEPS is comprised of 100 items designed to elicit information regarding the 20 elements of the Dunn and Dunn Learning Styles model. Raw scores are standardized with a range from 20 to 80, a mean of 50, and a standard deviation of 10. A standard score of 40 or less means that the learner does not prefer that particular element when learning or working. A standard score or higher suggests that the learner prefers that element. Scores can be determined for groups as well as individuals (Rule & Grippin, 1988).

Reliabilities for the 20 PEPS elements range from a low of .29 for persistence to a high of .87 for auditory preferences. Mean reliability is .66 (Price, Dunn, & Dunn, 1982). Measures of PEPS reliability over time have not been reported (Rule & Grippin, 1988).

Little validity information is available for the PEPS. Because 89 of the intercorrelations among the 20 elements are significant at the .05 level, the elements do not appear to be independent. Adding to the lack of validity for the PEPS is the fact that research studies included in the PEPS manual are descriptive in nature (Rule & Grippin, 1988).

The strength of the PEPS lies in its ability to permit individuals to identify how they prefer to work and learn (Partridge, 1989). Seventeen of the 20 scales describe the preferred methods and features of the situations in which learning most successfully occurs (Curry, 1987). By knowing these methods and features, those who design and deliver educational programs for the limited-resource audience can take them into consideration as they develop learning experiences with enough flexibility to meet individual preferences for optimum learning to occur (Price, 1987, Griffin & O'Sullivan, 1994).

The Learning Style Survey

O'Sullivan and Griffin (1993) designed the Learning Style Survey using the Dunn and Dunn model. The survey contains 20 statements, each using a series of four choices related to the learning style element being analyzed. For example, the subject is asked to place an X along a scale of 20 - 80 to the following statement: "When learning something new or difficult, you...always need quiet, usually need quiet, usually need sound, always need sound" (O'Sullivan & Griffin, 1993). A self-administered survey, it can be completed in approximately 15-20 minutes (O'Sullivan & Griffin, 1993).

O'Sullivan and Griffin (1993) conducted a concurrent validity study of the Learning Style Survey. Correlations

for each element on the Learning Style Survey were established based on a sample of high school students. The results are contained in Table 1. The correlations ranged from -.03 (tactile) to .78 (temperature and mobility), with the highest correlations belonging to the elements of light, temperature, design, intake, and mobility.

The correlations are considered to be low to moderate, which unfortunately seems to be the case with the Dunn & Dunn (1985) instrument as well. The preference would be to report higher validity coefficients, thus reducing error in the test as an indicator of a particular learning style preference.

Summary

This review of literature has explored the concept of learning styles as they relate to adult learners. The lack of information regarding learning style preferences of limited-resource audiences indicates a void in the research that has been conducted thus far and introduces the need for such research.

Because of the lack of research with limited-resource audiences, no instrument that is currently available to assess learning style preferences of adults has been identified that is appropriate to use with them. The information that can be elicited from the Productivity Environmental Preference Survey (PEPS) has the potential to

Table 1

Validity Correlation Coefficients by Element Learning Style Inventory and Learning Style Survey (N=159)

Element	Correlation
Noise Level	.64
Light	.70
Temperature	.78
Design	.74
Routine/Variety	.08
Motivation	.57
Persistence	.61
Structure	.44
Sociological Preference	.61
Authority Figures Present	.10
Time of Day	.33
Time of Day: Morning	.26
Time of Day: Afternoon	.35
Intake	.74
Mobility	.78
Auditory	.11
Visual	.48
Tactile	-.03
Kinesthetic	.32

aid program developers in the design of appropriate and meaningful curriculum.

This study used an instrument that included elements similar to the PEPS but was better suited to limited-resource populations. The Learning Style Survey developed by O'Sullivan and Griffin (1993) was modified to incorporate graphic illustrations to depict and further explain the statements. Rather than a Likert scale format for responses as is found with the PEPS, a semantic differential format was used, as well as terminology that was better understood by this limited-resource audience.

CHAPTER III

METHODOLOGY

The major purpose of this study was to identify environmental learning style preferences of limited-resource adults in selected counties of North Carolina. This chapter describes the design of the study, counties included in the study, sample selection, instrumentation, data collection procedures, and data analysis methods.

Design of the Study

This study investigated the current learning style preferences of limited-resource women and explored the differences between this group and the general population of women; it determined differences in learning style preference between African American, Caucasian, and Native American limited-resource women; it compared learning style differences based on educational attainment; and it compared learning style differences of women based on age. Because differences in the population were determined, Chi-square tests of independence (Glass & Hopkins, 1984; Jaeger, 1990) and tests of the medians (Hinkle, Wiersma, & Jurs, 1988; Conover, 1980) were used to further define the significance of the differences in preference.

Additionally, an evaluation was used to assess which specific learning style preferences were met. Item frequencies and means were determined for each item on the Learning Style Survey and the evaluation by county. The means of the evaluations were compared to the means of the Learning Style Survey for each item to determine the extent to which each preference had been met.

Demographic information obtained included age, occupation, highest grade completed in school, race or ethnic origin, and number of contacts with the Extension office in the last six months. This information was essential in order to more accurately interpret the data.

In order for the sample to be as random as possible, agents and paraprofessionals were instructed not to present the Learning Style Survey at anything other than workshops or programs already scheduled. They were not to select a certain group of people just for the purpose of this study. At the time this researcher conducted each of the staff training sessions, all field staff already had the necessary number of programs scheduled. (Training of staff will be discussed in detail later in this chapter.)

Subjects and Sample Selection

The participants in this study were limited-resource women in selected counties who participate in continuing activities of the Family Education Outreach Program of the

North Carolina Cooperative Extension Program at A & T State University. Six counties in North Carolina include the Family Education Program as part of their total county Extension outreach efforts. These counties are Cherokee, Forsyth, Guilford, Rockingham, Robeson, and Brunswick. Each of these six counties were included in this study. Racial and ethnic backgrounds of the participants included African American, Caucasian, and Native American.

Two counties, Rockingham and Guilford, place special interest on pregnant and parenting adolescents. Girls ages 15-19 participate in this program, which is an integral part of the Family Education Program. For this reason, this audience was included in the study.

The women who attended programs presented by the Extension staff were essentially volunteer participants in the study. They were told about the study and what their contribution was to be. Although no one was required to participate in the study, participation rates in all six counties at all programs were 100%. A total of 177 people completed the survey. Of that number, 17 were men, therefore, those surveys were eliminated from the final analysis. A total of 160 surveys from the female participants were used.

Participants in four of the six counties were given the evaluations at the end of the educational program. In two counties, Forsyth and Brunswick, the agents determined that

the evaluations were not appropriate to use based on the programs they were conducting at the time. In their opinions, the participants in their programs would have preferred not to complete both the Learning Style Survey and the evaluation; therefore, the participants in these two counties were not asked to complete the evaluation. In the four counties returning the evaluations, all of the forms returned were useable.

Instrumentation

Learning Style Survey

The instrument used was modified from the Learning Styles Survey developed by O'Sullivan and Griffin (1993). The modified Learning Style Survey that was used in this study was developed by O'Sullivan, Griffin, and Smoak (1994) and sponsored by a project called "Teaching to Diversity" within the School of Education at The University of North Carolina at Greensboro (UNCG). The survey included 15 elements similar to the Dunn, Dunn, and Price Productivity Environmental Preference Survey (1985).

The modified instrument used a semantic differential scale rather than the Likert scale format of the PEPS. The survey, which was self-administered, contained a total of 15 statements (See Appendix A). The participants marked their responses to each question at the appropriate point on the continuum.

Addition of graphics. In order for those participants with low reading skills to more easily understand and interpret the statements, graphic illustrations of each of the statements were developed. With the assistance of a graphic artist, appropriate illustrations were developed and incorporated into the survey. Two graphics, depicting each element, were used to define the extremes of each dimension. One was placed at each end of the continuum. For example, the graphic to illustrate sound was a loud horn blaring near an ear; conversely, quiet was depicted with a graphic showing a pin dropping. Figure 7 illustrates the graphic illustration for noise level. To determine the preference regarding the element of sound, the survey asked the respondent to mark an **X** at the appropriate place on the continuum in response to the following:

When learning something new or difficult, you prefer:

0 10 20 30 40 50 60

quiet sound

Figure 7. Item 1 on the Learning Style Survey

Evaluation

Using the format of the Learning Style Survey, an evaluation form was developed to help determine the extent to which learning style preferences were met. For example, the

respondents were asked to circle their response on a scale of 1-5 to such statements as: "During today's program, the noise level was:" Means for each statement were calculated and compared to the means for the related item on the Learning Style Survey. If the evaluation mean was within one standard deviation of the Learning Style mean, the learning style preference had been met. If not, the preference was unmet.

Demographic Information

In order to develop a description of the participants in the study, certain demographic information was obtained. Information regarding age, race, employment status, and years of schooling completed was asked in an open-ended format, allowing the respondents to provide this information.

Pilot Study

Once the Learning Style Survey was developed, it was pilot-tested with a group of limited-resource women who were participants in the Family Education Program, but who were not to have been included in the sample. Test-re-test was the method used to determine the reliability of the instrument. A total of 23 limited-resource women in two communities completed the survey two times, one week apart. The researcher asked for verbal feedback at the end of the second meeting. Two questions/comments were consistent with both groups. Item number 3 concerned temperature preferences

during the learning situation. Both groups agreed that the preferred temperature during learning depended on the season and outside temperature at the time. Item number 6 concerned interest in what is being taught. In this instance, both groups stated that their participation in Extension programs was almost always voluntary, therefore they would not participate if they were not interested in the topic. Ultimately, it was determined that the survey form was appropriate for this audience since each of the fifteen statements had been clearly understood by those persons involved in the pilot study.

Validity correlations had been established since this survey contained the same elements as the Learning Style Survey by O'Sullivan and Griffin (1993). The validity correlations ranged from -.03 (tactile/kinesthetic) to .78 (temperature and mobility (O'Sullivan & Griffin, 1993).

Reliability correlation coefficients for the pilot study (see Table 2) were determined for each of the 15 survey items of the test-retest. The correlations ranged from .59 (for learning alone versus with others) to .90 (for visual learning). Eighty percent (12 out of 15) of the correlations were greater than .70. The elements with the highest correlations (.80 and greater) were persistence, structure, time of-day, intake, and visual. Twenty percent (3 out of 15) of the correlations were less than .70. The elements with the

Table 2

Comparison of Correlations from Pilot-Testing and Reliability Coefficients of the Learning Style Survey

Element	N=23 Pilot-Test Correlations	N=159 Learning Style Survey Correlations
Noise Level	.75	.44
Light	.69	.73
Temperature	.74	.68
Design	.79	.70
Routine/Variety	.79	.49
Motivation	.79	.63
Persistence	.80	.74
Structure	.81	.39
Alone/Peer	.59	
Sociological Preference		.64
Authority Figures Present		.15
Time of Day	.83	.40
Morning		.41
Afternoon		.43
Intake	.83	.64
Mobility	.72	.65
Auditory	.66	.40
Visual	.90	.36
Tactile/Kinesthetic	.70	
Tactile		.74
Kinesthetic		.32

lowest correlations were light, alone/peer, and auditory. Based on the verbal responses and the correlations on each of the 15 items, no revisions were necessary. The results of the pilot test are compared to the results found by Griffin and O'Sullivan (1993) with the Learning Style Survey (Table 2).

Data Collection and Analysis Procedures

The research proposal for this study was submitted to and approved by both the Director and Assistant Director of the North Carolina Cooperative Extension Program at North Carolina A & T State University. They, in turn, presented the idea of the study to the Administrative Council of the Extension Service at North Carolina State University (NCSU). The Administrative Council is the governing body of Extension and is composed of the Extension Administrator at NCSU, Assistant Directors at both NCSU and NC A & T, and department heads within Extension. This council gave a verbal approval during a regularly scheduled meeting. The written response from Dr. D. H. McAfee, Assistant Director of Extension at A & T, is found in Appendix B.

Data Collection

Involvement of county Extension staffs was necessary for this research project. The appropriate Family Education staff person in each of the six counties received training on learning style theory and application, how to assess learning

style preferences, and how to develop or adapt curriculum materials based on a variety of learning style techniques.

Six training sessions were held during the first two weeks of November 1993. The researcher visited with each county staff person individually, except the Guilford County staff. Because three persons in that county participated in the study, all were trained at the same time. In every instance, the eight Extension workers expressed enthusiasm for this project, knowing that there was potential for them to gain greater insight about the learning needs of their clientele.

Prior to the training sessions, all of the agents and paraprofessionals were given the opportunity to have their learning style preferences assessed using the Dunn, Dunn, and Price Productivity Environmental Preference Survey. All staff members were sent a PEPS form to complete and return to the researcher for analyzing. Only one paraprofessional took advantage of this opportunity; none of the agents completed the PEPS. The staff person who did have her learning style preferences analyzed received a detailed printout of the results, which was incorporated into the training session. Although the other staff members did not have their learning style preferences assessed, a similar learning style preference printout was given to each of them at each of the training sessions and the information was interpreted and dis-

cussed. The complete training guide used is found in Appendix C.

Once training had been conducted for all 8 field staff, they were ready to collect the data. Agents and paraprofessionals were instructed to conduct the surveys at the beginning of each of the next three educational programs they had scheduled, present the program, and evaluate it using the evaluation provided.

Data were collected during November and December 1993, with all forms returned to the researcher by December 17. In each of the six counties, the staff person administered the survey at the beginning of the next three educational programs scheduled after the training session. They then presented the educational program and evaluated it to determine which learning style preferences were or were not met during that specific program. After the Learning Style Surveys and evaluations were administered, the field staff returned all forms to the researcher.

From initial staff conversations about the training and ultimately from their responses to this survey, the researcher found overwhelming support and interest in the topic from the Extension field staff. Extension workers are constantly searching for better ways to serve the public, and information such as what can come from this study can only

serve to help with the program development and implementation process.

Data Analysis

Each item on the Learning Style Survey and the evaluation was coded and entered into three computer statistical software programs, Fastat, SAS, and StatPac. Data were entered two times to make certain no entry mistakes occurred.

The data analysis included means, medians, and standard deviations for race/ethnic origin, educational attainment, and age. This information was cross-tabulated for each item on the survey to include differences by county and for the total sample. Chi-square distributions were determined for each item and were cross-tabulated by ethnicity, educational attainment, and age by county and for the total sample. Finally, median tests were conducted to obtain additional evidence of significance for each item on the Learning Style Survey.

CHAPTER IV

RESULTS AND DISCUSSION

The purpose of this study was to identify learning style preferences of female participants in the Cooperative Extension Family Education Program and to identify differences in learning style preferences among groups with varying educational attaimnent levels, race/ethnic origins, and age groups within the target audience. Additionally, an evaluation identified the extent to which those preferences were met at the time of the survey. The data were also analyzed to determine differences in learning style preferences between limited-resource women and the general population, racial or ethnic origin, and educational attainment.

The results of this study will be presented in the following manner: (a) description of the sample, (b) explanation of the data analysis procedures, (c) testing the hypothesis, (d) analysis of the data, and (e) discussion of the results.

Description of the Sample

Participants in this research represented women in six counties of North Carolina who were enrolled in the Family Education Program in their county. Participating counties included Cherokee, Forsyth, Rockingham, Guilford, Robeson,

and Brunswick. A total of 160 female respondents completed the learning style survey. Of that number, seven respondents did not provide demographic information pertaining to age, nine did not report demographic information pertaining to race, and six did not provide information pertaining to educational attainment. See Table 3 for a summary of the demographic data.

Race/Ethnic Origin

The subjects who participated in this study included African American, Caucasian, and Native American women. The overall mean age was 32.5 with a range from 14-82 years. Among 81 African Americans reporting, the mean age was 28.1 with a range from 15 to 72 years. The 43 Caucasian subjects reporting had a mean age of 37.9 with a range from 14 to 82 years. The 27 Native American subjects reporting had a mean age of 34.4 with a range from 18 to 64 years.

Educational Attainment

Of the 160 respondents, only six did not provide information regarding educational attainment. Among African Americans, 43.8% (n=35) had not completed high school, 40% (n=32) had a high school diploma or equivalency, and 16.3% (n=13) had at least some education beyond high school. Of the 27 Native Americans reporting, 44.4% (n=12) had not completed high school, 37% (n=10) had a high school diploma or equivalency, and 18.5% (n=5) had at least some education

Table 3

Ethnicity (African American, AA; Caucasian, C; Native American, NA), Age, and Educational Attainment by County

County	Ethnicity				Age	Educational Attainment			
	AA	C	NA	NR	$\bar{X}$	Beyond High School	Diploma or Equivalency	Did Not Complete High School	NR
Cherokee	0	4	6	(2)	43.55	7	3	0	(2)
Forsyth	12	2	1	(1)	24.53	1	10	5	(0)
Rockingham*	14	16	0	(1)	15.80	0	2	27	(2)
Guilford	42	16	0	(5)	36.17	11	22	28	(2)
Robeson	4	2	20	(0)	32.58	0	12	14	(0)
Brunswick	9	3	0	(0)	57.18	3	7	2	(0)
Total	81	43	27	(9)	Grand Mean 32.46	22	56	76	(6)

N=160

( ) NR indicates non-response for ethnicity and educational attainment
* Of those who had not completed high school, 23 were enrolled as full-time high school students at the time of the study.

beyond high school. Of the 41 Caucasian, 68.3% (n=28) did not complete high school, 24.4% (n=10) had a high school diploma or equivalency, and 7.3% had at least some education beyond high school.

Overall, 75% (n=51) of the respondents had not completed high school. This group included thirty 14-18 year-olds (participants in the pregnant and parenting teen program), most of whom were still in school. Of those respondents age 18 and older, 35.1% (n=52) had a high school diploma or equivalency and 14.2% (n=21) had at least some education beyond high school.

Missing data accounted for the slight discrepancy in total numbers.

Occupation

A variety of occupations was reported by 149 participants for a response rate of 93.1%. Eleven respondents failed to provide any information regarding their occupational status. Twenty-three young women, all from Rockingham County and participants in the teen pregnancy and parenting program, reported that they were full-time students. Another 40 were homemakers/mothers and nine had retired. Other occupations listed were housekeeper/maid (40), factory worker (20), cook (3), nurse's aide (4), and farmer (3).

Although most of the reported occupations would be classified as laborer or blue collar (Holland, 1983), a few

occupations were professional: teacher (4), registered nurse (2), and accountant (1). However, the professional occupations accounted for only seven of all the occupations reported.

Contact with Extension

Thirty-four percent (n=54) of all respondents reported that they had had no contact with their County Extension office in the last six months. Twenty-six percent (n=42) did not respond to this question. The other 40% (n=64) reported 1-6 contacts during the previous six month period.

Analysis of the Data

All hypotheses were stated in the direction of the expected results. A variety of calculations were determined in relation to the three hypotheses.

Completed survey forms were obtained from 177 people. Seventeen of these were from men; therefore, those surveys were eliminated from the study. A total of 160 surveys were analyzed; however, not all surveys were complete. Of the 160 surveys, 48 had at least one item with no response.

Fifty-nine percent (n=95) of all respondents completed the evaluation form at the end of the educational session. Those participants were in Cherokee, Guilford, Robeson, and Rockingham counties. No participants in either Forsyth or Brunswick counties were given the opportunity to respond. The agents in these two counties determined that the evaluation

was not appropriate for the educational programs they had conducted and made the decision not to present it to their program participants. Results of the evaluation are discussed at the end of this chapter following the analysis of findings from the Learning Style Survey.

Results and Testing the Hypotheses

Item frequencies, means, and standard deviations were used to make comparisons between the target population in this study and general adult audiences (H_1). Comparisons were made to the studies of Kuznar et al. (1991), Reynolds and Gerstein (1991), and Price (1987).

Chi-square tests of independence and tests of the medians with a probability of $\alpha = .05$ were used to determine whether or not differences in learning style preferences were significant based on educational attainment, race/ethnic origin, or age (H_2, H_3, and H_4). Item means, medians, and standard deviations were used for comparison of all items.

For the first hypothesis, overall means were used to determine learning style preferences of the sample.

Learning Style Preferences Compared to the General Population

H_1: There are significant differences in learning styles between limited-resource women and the general population of women.

Table 4 shows the item means and medians for elements of the Learning Style Survey for the sample of women in this

Table 4

Overall Means ($\bar{X}$), Medians (Md), Standard Deviations (SD), and Range of Scores for all Elements of the Learning Style Survey

Element	N	$\bar{X}$	Md	SD	Range	
					Min.	Max.
Noise Level	157	20.76	20	16.79	0	60
Light	157	43.20	50	15.08	0	60
Temperature	157	39.18	40	14.41	0	60
Design	156	36.51	40	21.34	0	60
Routine/ Variety	156	38.85	40	17.34	0	60
Motivation	157	46.94	50	13.66	5	60
Persistence	149	45.77	50	14.64	4	60
Structure	142	35.62	35	18.08	0	60
Alone/Peer	150	33.44	31	18.78	0	60
Time of Day	155	29.78	30	20.26	0	60
Intake	156	37.45	40	19.24	0	60
Mobility	157	36.07	38	18.56	0	60
Auditory	158	36.42	40	16.19	0	60
Visual	156	41.57	44.5	15.09	0	60
Tactile/ Kinesthetic	158	50.56	55	11.81	1	60

study. The studies of Kuznar et al. (1991), Reynolds and Gerstein (1991), and Price (1987) were used to compare learning preferences. Figure 8 contains a comparison of these studies to the current study, and the comparisons are discussed in the following section.

One-hundred fifty-seven people responded to the statement regarding **noise level**. The participants in this study showed a preference for quiet during learning, supporting the findings of Reynolds & Gerstein (1991). Kuznar et al. (1991) and Price (1987) found that the people in their studies preferred conversational sounds.

One-hundred fifty-seven people responded to the statement regarding their preference for **light**. Similarly, this study found that the participants preferred moderate to bright light for better learning, which supports the Kuznar et al. (1991) study.

One-hundred fifty-seven people responded to the **temperature** preference statement. This study found that the respondents preferred warmer temperatures during learning, supporting the Price (1991) study. Kuznar et al. (1991) found that participants in their study preferred cool temperatures while learning.

The element of **design** was responded to by 156 participants. This study found that female adult learners preferred a formal learning environment. Both the Kuznar et al. study

Preference	Kuznar et al.	Reynolds & Gerstein	Price	Current Study
Environmental				
Sound	Conversational	Quiet	Sound	Quiet
Light	Indirect - young Bright - older	NA	NA	Moderate to bright
Temperature	Cool	NA	Warm	Warm
Design	Formal	NA	Formal	Formal
Emotional				
Motivation	No preference - young Strong motivation - older	Reduced motivation	Motivated - both	Motivated - both
Persistence	Strong preference	No persistence	Persistent	Persistent
Structure	High structure	NA	Prefer - older Not prefer - younger	Prefer
Routine/Variety	Routine	NA	Variety	Variety
Sociological				
Peer/Alone	Alone - older Peers - younger	NA	Alone	Peers
Physical				
Time of Day	Afternoon - young Morning - older	NA	Afternoon - young Morning - older	Afternoon - young Morning - older
Intake	Prefer - younger Not prefer - older	NA	Prefer - both	Prefer - younger Not prefer - older
Mobility	Prefer - both	NA	Prefer - both	Prefer - both
Auditory	Prefer - both	NA	Prefer - both	Prefer - both
Visual	Prefer - both	NA	Prefer - both	Prefer - both
Tactile/ Kinesthetic	Prefer - both	NA	NA	Prefer - both

Figure 8. Comparison of Learning Style Research to the Current Study

(1991) and the Price study (1987) found that adult learners preferred the more formal desk/chair arrangement for learning rather than an informal couch, bed, floor, or carpet arrangement.

The statement regarding preference for **routine or variety** had a response rate of 156 people, and showed a preference for variety in the learning process. The Kuznar et al. study (1991) found that people preferred a routine process for learning, conversely, Price (1987) found that people preferred variety in learning.

The women participating in this study had a high degree of **motivation**. The Kuznar et al. study (1991) found that there was no strong preference toward motivation by the general population of adults. Price (1987) found that adults were motivated to learn.

The 149 people who responded to the statement regarding **persistence** showed strong persistence when learning. Kuznar et al. (1991) and Price (1987) also found that people in their studies had strong persistence, whereas Reynolds and Gerstein (1991) found that people lacked persistence.

One-hundred forty-two people responded to the statement about **structure**, giving it the lowest response rate on the survey. The responses indicated that the participants had a preference for structure, but not a strong preference. The Kuznar et al. (1991) study found a strong preference for

structure. Price (1987) found that older learners (age 35 and above) prefered structure, while younger learners (age 18-34) did not.

One-hundred fifty people responded to the statement regarding **learning alone or with others**. The women in this study showed a slight preference for learning best with others. This was supported by the Kuznar et al. (1991) study, as well as Price's (1987). Both studies found that the older participants in that study preferred to learn alone, whereas the younger participants preferred to learn with others.

The **time-of-day** item had a response rate of 155 people, showing a preference for mid-day learning. In both the Kuznar et al. study (1991) and the Price study (1987), among older learners, morning learning was preferable, whereas the younger learners preferred afternoon learning.

The element of **intake** was responded to by 156 people. Results of this study found that people generally preferred to have some type of intake during the learning process. Kuznar et al. (1991) found that the younger people in their study preferred intake and the older ones did not. Price (1987) found that people prefer intake.

The 157 people responding to the statement regarding **mobility** showed a preference for mobility during the learning process, supporting the findings of Kuznar et al. (1991).

Price (1987) found that older learners tended to prefer mobility more than younger learners.

The 158 women responding to the item of **auditory** learning showed a preference for auditory learning. This supports the studies of Kuznar et al. (1991) and Price (1987), both of whom also found preferences for auditory learning.

One-hundred fifty-six people responded to the statement regarding preference for **visual** learning. The respondents showed a preference for visual learning, supporting the findings of Kuznar et al. (1991), who also found that the people in their study had a preference for visual learning.

One-hundred fifty-eight people responded to the statement regarding **tactile/kinesthetic** learning preferences. Those responses showed a strong preference for tactile learning. Kuznar et al. (1991) also found a preference for tactile/kinesthetic learning.

The data support the findings about differences in learning style preferences from Kuznar's study in relation to five elements: temperature, motivation, change versus routine, intake, and time of day. There were two differences in preference between the Reynolds and Gerstein study and the present study: motivation and persistence. The only differences in learning style preferences between this study and the Price study is the preference to learn alone or with others.

There is enough evidence of differences between the previous studies and the current study to give partial support to this hypothesis. Figures 1-4 (See Appendix D) contain box-and-whisker plots of each learning style element by educational attainment level, ethnicity, age, and county. For hypotheses 2, 3, and 4, Chi-square analyses and tests of the median were used to determine differences in learning style preferences. Overall data for the elements on the Learning Style Survey is embedded in the prior Tables. However, for the convenience of the reader, data for each element is contained in Appendix E, Tables A-O. Each table is titled by element name.

Educational Attainment and Learning Style Preferences

H_2: There are significant differences in learning styles between limited-resource women who completed high school and those who did not.

Of the 160 surveys used in this analysis, six did not report educational attainment. Twenty-two people reported that they had educational attainment beyond high school, and 13 of these reported that they had received at least a college degree. Fifty-three people earned a high school diploma or equivalency, and 79 people had less than a high school education (including 23 teenagers in Rockingham County who were still in school). Means, medians, and standard devia-

tions for each item in the survey by educational attainment are shown in Table 5.

There was some difference in **preference for noise level** based on educational attainment, although the differences were not significant. Those with less than a high school diploma (n=77) preferred the least amount of quiet, those with education beyond high school (n=22) preferred more quiet, and those with a high school diploma or equivalency (n=52) preferred the greatest amount of quiet. The range of the means was from a minimum of 17.21 (high school diploma or equivalency) to a maximum of 23.76 (less than a high school diploma). The range of the median scores was similar, with a minimum of 15 (high school diploma or equivalency) to a maximum of 25 (less than a high school diploma).

Educational level was a not significant factor in the **preference for light** according to the mean scores and χ^2 analysis. The median scores and the χ^2, however, indicated significance. Those respondents with at least a high school diploma or equivalency (n=53) expressed the preference for the brightest light. Those with education beyond high school (n=22) preferred slightly less bright light, and those with less than a high school diploma (n=76) preferred the least bright light. The range of the means by educational level was from a minimum of 40.50 (less than a high school diploma) to a maximum of 47.03 (high school diploma or equivalency).

Table 5

Means ($\bar{X}$), Medians (Md), Standard Deviations (SD), and Range of Scores for all Elements of the Learning Style Survey by Educational Levels

Element	n	$\bar{X}$	Md	SD	Range Min.	Range Max.
Noise Level						
Beyond High School	22	20.40	19.5	15.68	0	60
High School Diploma	52	17.21	15.0	15.62	0	53
Less Than HS	77	23.76	25.0	17.26	0	60
Light						
Beyond High School	22	43.72	50.0	14.39	10	60
High School Diploma	53	47.03	50.0	13.00	0	60
Less Than HS	76	40.50	40.0	16.11	0	60
Temperature						
Beyond High School	22	38.45	32.5	10.89	30	60
High School Diploma	52	38.94	40.0	16.08	0	60
Less Than HS	77	39.84	40.0	14.32	1	60
Design						
Beyond High School	22	41.81	50.0	18.64	5	60
High School Diploma	52	40.90	50.0	20.93	0	60
Less Than HS	76	32.89	40.0	21.48	0	60
Routine/Variety						
Beyond High School	22	35.31	35.0	15.27	4	60
High School Diploma	53	36.49	40.0	19.48	0	60
Less Than HS	75	42.04	45.0	16.06	0	60
Motivation						
Beyond High School	22	47.72	50.0	8.68	30	60
High School Diploma	52	54.40	58.0	7.63	30	60
Less Than HS	77	41.76	45.0	15.59	5	60
Persistence						
Beyond High School	22	48.31	50.0	11.17	20	60
High School Diploma	47	51.04	55.0	12.16	11	60
Less Than HS	74	41.60	42.5	15.83	4	60

Table 5 (cont'd.)

Element	n	$\bar{X}$	Md	SD	Range Min.	Range Max.
Structure						
Beyond High School	21	36.33	40.0	16.80	5	60
High School Diploma	44	41.27	47.5	18.40	0	60
Less Than HS	71	31.60	30.0	17.49	0	60
Alone/Peer						
Beyond High School	21	27.19	30.0	14.74	4	60
High School Diploma	50	34.04	30.5	21.05	0	60
Less Than HS	73	34.65	40.0	18.32	0	60
Time of Day						
Beyond High School	20	23.80	20.0	20.41	0	60
High School Diploma	52	24.86	30.0	19.71	0	60
Less Than HS	77	34.57	31.0	19.83	0	60
Intake						
Beyond High School	22	34.40	31.5	14.78	2	60
High School Diploma	52	34.90	37.0	20.34	0	60
Less Than HS	76	40.56	41.0	19.31	0	60
Mobility						
Beyond High School	22	32.18	30.0	18.68	0	60
High School Diploma	53	31.67	30.0	19.64	0	60
Less Than HS	76	40.25	43.5	17.00	0	60
Auditory						
Beyond High School	22	36.68	37.0	14.01	3	53
High School Diploma	53	40.94	48.0	16.77	2	60
Less Than HS	77	33.61	33.0	15.94	0	60
Visual						
Beyond High School	22	43.59	48.0	10.72	15	57
High School Diploma	53	43.98	50.0	15.72	3	60
Less Than HS	75	38.88	40.0	15.70	0	60
Tactile/Kinesthetic						
Beyond High School	22	48.18	50.0	11.14	30	60
High School Diploma	53	53.01	58.0	9.78	35	60
Less Than HS	77	50.36	55.0	11.87	3	60

Total Observations Beyond High School = 22
Total Observations High School Diploma = 53
Total Observations Less Than High School = 79

The range of the medians was from a minimum of 40 (less than high school) to a maximum of 50 (both beyond high school and high school diploma).

There was practically no difference in mean scores of **temperature preference** based on educational attainment. Those with education beyond high school (n=22) had the lowest mean of 38.45. Those with a high school diploma or equivalency (n=52) had the next highest preference for warm temperatures, and those with less than a high school diploma (n=77) had the highest preference for warm temperatures while learning. The range of the means by educational level was small, with a minimum of 38.45 to a maximum of 39.84. Similarly, the median scores were close, with a minimum of 32.50 (beyond high school) to a maximum of 40 (both high school diploma and less than high school). Neither of the Chi-square statistics showed significance at $\alpha = .05$.

Educational attainment made a significant difference in preference for **design**. Those participants with education beyond high school (n=22) and those with a high school diploma or equivalency (n=52) had similar mean scores of 41.81 and 40.90, respectively. These scores indicated a stronger preference for a more formal design while learning. Participants with less than a high school diploma (n=76) had a lesser preference for a formal design, with a mean score of 32.89. The median scores for both those participants with

education beyond high and those with a high school diploma was 50. The median score for those with less than a high school diploma was 40. The Chi-square statistic of 17.88 (test of independence) and the Chi-square statistic of 6.82 (test of the median) were both significant at $\alpha = .05$.

Educational attainment levels varied only slightly in relation to **routine or variety** in learning. Although persons in all levels of educational attainment preferred variety, those with education beyond high school (n=22) had the least preference for variety. Those with less than a high school diploma (n=75) had the strongest preference for variety. The mean scores ranged from a minimum of 35.31 to a maximum of 42.04. Median scores were similar, with those participants with education beyond high school having the lowest median score of 35 and those with less than a high school education having the highest median of 45. Neither of the Chi-square statistics were significant.

Motivation was a significant factor in the learning preferences based on educational attainment. Not surprisingly, those respondents with less than a high school diploma (n=77) had the lowest motivation preference. Those respondents with a high school diploma or equivalency (n=52) had the strongest motivation for learning. The range of mean scores for this item was from a minimum of 41.76 (less than a high school diploma) to a maximum of 54.40 (those with a high

school diploma or equivalency). Median scores followed a similar pattern. Those with less than a high school education had the lowest preference for motivation based on the median scores, while those with a high school diploma or equivalency had the strongest preference for motivation. Both Chi-square statistics, 28.61 (test of independence) and 20.96 (test of the medians), were significant at $\alpha = .05$.

The varying educational attainment levels made a significant difference in **persistence**. As with the element of motivation, those respondents with less than a high school diploma (n=74) had the least amount of persistence, while those respondents with a high school diploma or equivalency (n=47) showed the greatest persistence. The mean scores ranged from a minimum of 41.60 (less than high school diploma) to a maximum of 51.04 (high school diploma or equivalency). The median scores ranged from a minimum of 42.50 (less than a high school diploma) to a maximum of 55 (high school diploma or equivalency). Both of the Chi-square statistics of 12.96 (test of independence) and 12.93 (test of the medians) were significant at $\alpha = .05$.

Educational attainment levels made a significant difference in the preference for **structure** in learning. Those persons in the study with a high school diploma or equivalency (n=44) showed the strongest desire to be given exact

directions. Those with less than a high school diploma (n=71) showed a lesser desire to be given exact directions. The mean scores ranged from a minimum of 31.60 (less than a high school diploma) to a maximum of 41.27 (high school diploma or equivalency). Median scores ranged from a minimum of 30 (less than a high school diploma) to a maximum of 47.5 (high school diploma or equivalency). Both of the Chi-square statistics of 13.67 (tests of independence) and 6.58 (tests of the median) were significant at $\alpha = .05$.

Educational attainment levels were not significant in preference for **learning alone or with others**. Those participants with education beyond high school (n=21) showed a slight preference for learning alone, while those with a high school diploma or equivalency (n=50) and those with less than a high school diploma (n=73) almost identically showed a slight preference for learning with others. The range of the mean scores was from a minimum of 27.19 (education beyond high school) to a maximum of 34.65 (less than a high school diploma). Medians were similar, with a range of 39 (education beyond high school) to 40 (less than a high school education).

Time of day was not a significant finding in learning style preference based on the Chi-square analysis of the means of educational attainment levels, although there were some differences. Those in the study who had education

beyond high school (n=20) showed a stronger energy level in the morning, whereas those with less than a high school education showed a stronger energy level in the afternoon. The range of mean scores was from a minimum of 23.80 (education beyond high school) to a maximum of 34.57 (less than a high school education). The analysis of the median scores, however, indicated significance. Those with education beyond high school showed a preference for learning in the morning, with a median score of 20. Those with a high school diploma or equivalency and those with less than a high school education preferred mid-day learning, with median scores of 30 and 31, respectively. The Chi-square statistic of 7.94 (test of the medians) was significant at $\alpha = .05$.

Educational attainment levels showed a significant difference in **preference for intake**. Those respondents with education beyond high school (n=22) and those with a high school diploma or equivalency (n=52) had almost identical mean scores, with a slight preference toward intake. Those with less than a high school diploma (n=76) have a stronger desire for intake. The mean scores ranged from a minimum of 34.40 (education beyond high school) to a maximum of 40.56 (less than a high school education). Median scores were slightly more spread out, with a range from 31.5 (education beyond high school) to 41 (less than high school). The Chi-square statistic 16.52 (test of independence) was

significant at $\alpha = .05$. The test of the median was not significant.

Tests of independence showed that there was no significant difference in preference for **mobility** based on educational attainment levels for the participants in the study. People with a high school diploma or equivalency (n=53) and those with education beyond high school (n=22) were less likely to move around than those who had less than a high school diploma (n=76). The range of the mean scores for this element was from a minimum of 31.67 (high school diploma or equivalency) to a maximum of 40.25 (less than a high school diploma). Median tests, however, were significant. The median scores ranged from a minimum of 30 (beyond high school) to a maximum of 48 (high school diploma or equivalency). The Chi-square statistic of 11.07 based on the median test was significant at $\alpha = .05$.

There were no significant differences in preference for **auditory** learning based on educational attainment levels. Whereas all educational attainment groups had a preference for auditory learning, those with less than a high school diploma (n=77) were least likely to remember what was said and those with at least a high school diploma (n=53) were most likely to remember what was said. The range of the mean scores was from a minimum of 33.61 to a maximum of 40.94.

The median scores ranged from 33 (less than a high school education) to 48 (high school diploma or equivalency).

Educational attainment levels accounted for very little difference for preference toward **visual** learning. People with a high school diploma or equivalency (n=53) had the strongest preference for visual learning, whereas those with less than a high school diploma (n=75) had the least preference for visual learning. The range of the mean scores was from a minimum of 38.88 to a maximum of 43.98. The median scores ranged from a minimum of 40 (less than a high school diploma) to a maximum of 50 (high school diploma or equivalency). Neither of the Chi-square statistics were significant.

There were no significant differences by educational attainment levels for **tactile/kinesthetic** preference based on the Chi-square test of independence. Those with education beyond high school (n=22) had the lowest mean score of 49.18 and those with a high school diploma or equivalency (n=53) had the highest mean score of 53.01. Tests of the medians, however, showed significance. Those with education beyond high school had the lowest median score of 50 and those with a high school diploma or equivalency had a median score of 58. The Chi-square statistic of 6.70 based on the test of the median was significant at $\alpha = .05$.

Chi-square tests of independence and tests of the medians were used to determine whether or not differences in educational attainment levels were significant in identification of learning style preference. Of the 15 items in the survey, five showed significance in the stated direction of the hypothesis at $\alpha = .05$ using Chi-square analysis. These included design (item #4), motivation (item #6), persistence (item #7), structure (item #8), and intake (item #11). The remaining ten Chi-square statistics were not significant at $\alpha = .05$. Tests of the medians showed that eight items were significant in the stated direction of the hypothesis at $\alpha = .05$. These included light (item #2), design (item #4), motivation (item #6), persistence (item #7), structure (item #8), time of day (item #10), mobility (item # 12), and tactile/kinesthetic (item #15). Table 6 contains the Chi-square distributions for differences in educational attainment levels.

There is sufficient evidence of significance in the items on the Learning Style Survey based on educational attainment levels to give partial support to this hypothesis.

Ethnicity and Learning Style Preferences

H_3: There are significant differences in learning styles between African American, Caucasian, and Native American limited-resource women.

Table 6

Chi-Square Distribution for Elements on the Learning Style Survey by Educational Levels

	χ^2 Test of Independence		χ^2 Median Test	
Stimuli Element	χ^2	Probability of chance	χ^2	Probability of chance
Environmental				
Noise Level	5.612	.4697	3.704	.1569
Light**	9.247	.1601	6.689	.0353
Temperature	7.759	.2562	3.021	.2207
Design***	17.822	.0065	6.819	.0331
Emotional				
Routine/Variety	7.096	.3120	3.774	.1515
Motivation***	28.611	.0001	20.963	.0001
Persistence***	12.960	.0437	12.933	.0016
Structure***	13.667	.0336	6.583	.0372
Sociological				
Alone/Peer	12.355	.0545	1.992	.3693
Physical				
Time of Day**	11.075	.0861	7.940	.0189
Intake**	16.517	.0112	5.920	.0518
Mobility**	10.762	.0960	11.065	.0040
Auditory	10.410	.1084	5.156	.0759
Visual	5.702	.4573	4.478	.1065
Tactile/Kinesthetic**	8.398	.2103	6.695	.0352

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05

Nine of the 160 respondents to this survey did not report their race or ethnic origin. Of those reporting, 50.6% (n=81) were African American, 26.9% (n=43) were Caucasian, and 16.9% (n=27) were Native American. Table 7 contains the means, medians, and standard deviations by ethnicity for each item in the survey.

Ethnicity was not a significant factor in **noise** level preference. Native Americans (n=27) preferred the least amount of quiet, African Americans (n=79) preferred greater quiet, and Caucasian (n=43) preferred the greatest level of quiet. The range of the means, however, was small with a minimum of 19.46 (Caucasian) to a maximum of 23.59 (Native Americans). Median scores for all ethnic groups was 20.

Ethnicity was not significant in the preference for **light**. Native Americans (n=27) preferred the brightest light. Caucasian (n=43) and African Americans (n=79) showed similar preferences for light that is less bright than that preferred by Native Americans.

There was a greater variety in **temperature** preferences based on race/ethnic origins, but again, there were no significant differences. Caucasian (n=42) preferred the least warm, followed by African Americans (n=79) and Native Americans (n=27) having the greatest preference for warmth. The range of mean scores was from a minimum of 35.69 (Caucasian) to a maximum of 44.74 (Native Americans). The range of the

Table 7

Means ($\bar{X}$), Medians (Md), Standard Deviations (SD), and Range of Scores for Elements of the Learning Style Survey by Race/Ethnic Origin

Element	n	$\bar{X}$	Md	SD	Range Min.	Range Max.
Noise Level						
African American	79	20.16	20	17.55	0	60
Caucasian	43	19.46	20	17.40	0	60
Native American	27	23.59	20	12.21	2	50
Light						
African American	79	41.26	45	17.37	0	60
Caucasian	43	42.60	48	13.78	5	60
Native American	27	48.37	50	8.27	30	60
Temperature						
African American	79	38.67	40	15.29	0	60
Caucasian	42	35.69	31	12.77	1	60
Native American	27	44.74	43	12.08	20	60
Design						
African American	79	38.13	48	21.36	0	60
Caucasian	42	30.45	31	21.45	0	60
Native American	27	39.92	50	18.77	4	60
Routine/Variety						
African American	79	38.87	40	18.57	0	60
Caucasian	42	40.73	44	17.08	2	60
Native American	26	36.23	40	12.07	10	59
Motivation						
African American	79	49.00	53	13.43	5	60
Caucasian	44	43.27	44	15.05	10	60
Native American	26	45.69	51	10.68	15	60
Persistence						
African American	79	48.48	51	13.75	5	60
Caucasian	41	45.29	41	12.21	10	60
Native American	20	33.85	38	17.49	4	60

Table 7 (cont'd.)

Element	n	$\bar{X}$	Md	SD	Range Min.	Range Max.
Structure						
African American	77	35.14	31	18.78	0	60
Caucasian	40	38.17	40	17.13	5	60
Native American	17	34.05	31	12.89	10	58
Alone/Peer						
African American	78	32.94	31	19.89	0	60
Caucasian	42	38.40	42	18.71	0	60
Native American	22	28.13	31	10.60	10	51
Time of Day						
African American	77	30.02	31	21.96	0	60
Caucasian	42	34.45	30	20.28	0	60
Native American	27	22.03	23	13.03	1	41
Intake						
African American	79	43.07	50	16.50	0	60
Caucasian	42	31.90	31	21.28	0	60
Native American	26	32.80	37	18.42	1	60
Mobility						
African American	79	37.46	40	19.64	0	60
Caucasian	43	38.02	40	17.95	0	60
Native American	27	26.00	31	13.51	5	59
Auditory						
African American	79	38.02	40	15.63	0	60
Caucasian	43	31.20	30	17.86	0	60
Native American	27	41.70	43	11.19	20	59
Visual						
African American	79	42.03	46	14.78	0	60
Caucasian	42	38.35	40	17.24	3	60
Native American	27	43.96	46	11.46	11	58
Tactile/Kinesthetic						
African American	79	51.39	54	9.99	30	60
Caucasian	43	47.34	54	16.07	1	60
Native American	27	52.59	52	8.56	30	60

Total Observations African American = 81
Total Observations Caucasian = 43
Total Observations = Native American = 27

median scores was similar, with a minimum of 31.5 (Caucasian) to a maximum of 42 (Native Americans). Neither of the Chi-square statistics were significant.

Ethnicity was not significant in **design** preferences for learning considering only the mean scores. African Americans (n=79) and Native Americans (n=27) had similar mean scores of 38.13 and 39.92, respectively. Caucasian (n=42) had a lower mean of 30.45, indicating a desire for a slightly less formal arrangement. Median scores, however, indicated that ethnicity was significant in preference for design. The medians ranged from a minimum of 30 (Caucasian) to a maximum of 50 (Native Americans). The Chi-square statistic based on the median of 6.45 was significant at $\alpha = .05$.

Ethnicity also was not a significant factor in preference for **routine or variety** in learning. Even though Native Americans (n=26) showed a preference for variety in learning, this group had the lowest mean score of the three ethnic groups included in the study. Caucasian (n=42) had the strongest preference for variety, but only slightly so. The range of mean scores was from a minimum of 36.23 (Native Americans) to a maximum of 40.73 (Caucasian). Median scores varied only slightly. African Americans and Native Americans had identical median scores of 40, and Caucasian had a median score of 43.5. Neither of the Chi-square statistics were significant.

Motivation also was a strong, but not significant, factor in the learning preferences of the three ethnic groups represented in this study. African Americans (n=79) showed the strongest motivational preferences, followed by Native Americans (n=26) and Caucasian (n=43). The range of the mean scores for motivation of respondents based on race/ethnic origin was from a minimum of 43.27 (Caucasian) to a maximum of 49.00 (African Americans). The range of the median scores was from a minimum of 45 (Caucasian) to a maximum of 53 (African Americans). Neither of the Chi-square statistics were significant at $\alpha = .05$.

Ethnicity proved to make a strong difference in **persistence** in learning. African Americans in the study (n=79) showed a strong leaning toward persistence with a mean score of 48.48 and a median score of 51, followed by Caucasian (n=41) with a mean score of 45.29 and a median score of 50, and Native Americans (n=20) with a mean score of 33.85 and a median score of 42.5. Both of the Chi-square statistics of 25.33 (test of independence) and 8.85 (test of the medians) were significant at $\alpha = .05$.

There was no significant difference in the scores for **structure** based on ethnic origin. Native Americans (n=17) showed the least desire for structure while Caucasian (n=40) showed the greatest desire. The mean scores ranged from a minimum of 34.05 to a maximum of 38.17. Both African Ameri-

cans and Native Americans had median scores of 31 and Caucasian had a median score of 40.

Ethnicity was significant in determining preference for learning **alone or with others**. Native Americans (n=22) showed the greatest preference for learning alone, while African Americans (n=78) and particularly Caucasian (n=42) had a preference for learning with others. The range of mean scores was from a minimum of 28.13 (Native Americans) to a maximum of 38.40 (Caucasian). The median scores were similar, with a minimum of 30 (Native Americans) to a maximum of 43.5 (Caucasian). Both of the Chi-square statistics of 17.26 (test of independence) and 8.10 (test of the medians) were significant at α = .05.

Ethnicity was a significant factor in preference for **time of day** learning based on the Chi-square test of independence. Native Americans (n=27) had a strong preference for morning learning and Caucasians (n=42) had a stronger preference for afternoon learning. The range of the mean scores was from a minimum of 22.03 (Native Americans) to a maximum of 34.45 (Caucasian). The Chi-square statistic (test of independence) of 16.12 was significant at α = .05. There was no significance based on the median test. Native Americans had a preference for morning learning with a median score of 22. African Americans and Caucasians in the study

had preferences for mid-day learning, with median scores of 30 and 30.5, respectively.

Intake was significant based on race/ethnic origin. Caucasian (n=42) and Native Americans (n=26) showed a preference for intake, although not a strong preference. African Americans (n=79), however, had a stronger preference for intake. The range of mean scores was from a minimum of 31.90 (Caucasian) to a maximum of 43.07 (African Americans). The median scores ranged from 31 (Caucasian) to 49 (African Americans). Both of the Chi-square statistics of 17.31 (test of independnce) and 7.26 (test of the medians) were significant at $\alpha = .05$.

Ethnicity was significant in the preference for **mobility** during learning. Native Americans (n=27) were least likely to move around, whereas African Americans (n=79) and Caucasian (n=43) were more likely to want to move around while learning. The mean scores for mobility ranged from a minimum of 26.00 (Native Americans) to a maximum of 38.02 (Caucasian). Median scores were 30 for Native Americans and 40 for both African Americans and Caucasian. Both of the Chi-square statistics of 15.36 (test of independence) and 9.41 (test of the medians) were significant at $\alpha = .05$.

Significant differences in **auditory** preferences were found among the three ethnic groups in the study when looking at the means. Caucasian (n=43) were the least likely to

remember what was said, whereas Native Americans (n=27) were the most likely to remember what was said. The range of the mean scores was from a minimum of 31.20 (Caucasian) to a maximum of 41.70 (Native American). Median scores ranged from a minimum of 30 (Caucasian) to a maximum of 41 (Native American). The Chi-square statistic of 15.92 (test of independence) was significant at $\alpha = .05$. Test of the median showed no significance.

Ethnicity was also not an important factor in preference for **visual** learning. Caucasian (n=42) had the least preference for visual learning with a mean score of 38.35 and a median score of 40. Native Americans (n=27) showed the greatest preference for visual learning with a mean score of 43.96. African Americans and Native Americans had identical median scores of 45. Neither of the Chi-square statistics were significant.

Ethnicity was an important, but not significant, factor in the preference for **tactile/kinesthetic** learning. Caucasians in the study (n=43) had the lowest mean score of 47.34 and Native Americans in the study (n=27) had the highest mean score of 52.59. The median scores were nearly identical, with Caucasians having the lowest score of 54 and African Americans and Native Americans having identical scores of 55. Neither of the Chi-square statistics were significant.

Chi-square tests were used to determine whether or not differences in learning style preference were significant based on race or ethnic origin. Of the 15 items in the survey, six were significant at $\alpha = .05$. These included persistence (item #7), alone versus with others (item #9), time of day (item #10), intake (item #11), mobility (item #12) and auditory preferences (item #13). The remaining nine Chi-square statistics were not significant at $\alpha = .05$. Median tests indicated significant differences based on race or ethnic origin. Of the 15 items in the survey, five were significant at $\alpha = .05$. These included design (item #4), persistence (item #7), alone versus with others (item #9), intake (item #11), and mobility (item #12). The Chi-square distributions for each item by race/ethnic origin are shown in Table 8.

There is sufficient evidence of significance of items on the Learning Style Survey based on race/ethnic origin to give partial support to this hypothesis.

Age and Learning Style Preferences

H_4: There are significant differences in learning styles between limited resource women ages 14-22, 23-42, 43-62, and 63-82.

Of the 160 surveys used in this analysis, seven did not report age. Fifty-eight people reported that they were in the 14-22 age group, 64 people were in the 23-42 age group,

Table 8

Chi-Square Distribution for Elements on the Learning Style Survey by Race/Ethnic Origin

	χ^2 Test of Independence		χ^2 Median Test	
Stimuli Element	χ^2	Probability of chance	χ^2	Probability of chance
Environmental				
Noise Level	4.806	.5689	0.154	.9257
Light	9.000	.1736	1.841	.3982
Temperature	8.800	.1851	5.144	.0764
Design**	4.206	.6487	6.448	.0398
Emotional				
Routine/Variety	11.059	.0866	1.241	.5375
Motivation**	11.971	.0626	6.603	.0368
Persistence***	25.331	.0003	8.847	.0120
Structure**	7.086	.3130	0.170	.0183
Sociological				
Alone/Peer***	17.260	.0084	8.095	.0175
Physical				
Time of Day*	16.120	.0131	3.922	.1407
Intake***	17.313	.0082	7.259	.0265
Mobility***	15.364	.0176	9.414	.0090
Auditory*	15.915	.0142	5.682	.0584
Visual	4.971	.5475	1.168	.5576
Tactile/Kinesthetic	10.967	.0894	0.597	.7417

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05

11 were in the 43-62 age group, and 20 were in the 63-82 age group. Means, medians, and standard deviations for each item in the survey by age are contained in Table 9.

There was no significant difference in preference for **noise** level based on age. Those aged 63-82 (n=19) preferred the greatest amount of quiet, whereas those aged 14-22 (n=58) preferred the least amount of quiet. The range of the means was from a minimum of 17.63 (63-82) to a maximum of 22.97 (14-22). The range of the medians was similar, with a minimum of 10.0 (63-82) to a maximum of 25.0 (14-22).

Light preference was a significant factor in the learning preferences based on age ranges. The oldest group (63-82) had the strongest preference for light with a mean score of 52.85 and a median score of 56.0. The youngest group (14-22) had the least preference for light, with a mean score of 36.26 and a median score of 31.5. The Chi-square test of independence (31.71) and the test of the medians (13.96) were both significant at $\alpha = .05$.

All age groups had a preference for warm **temperatures** during learning. The oldest group (63-82) preferred the least warm temperatures whereas the 23-42 group preferred the warmest temperatures. The mean scores ranged from a minimum of 37.74 to a maximum of 40.36. The median scores ranged from a minimum of 35 (63-82) to a maximum of 47 (43-62). Neither of the Chi-square statistics were significant.

Table 9

Means ($\bar{X}$), Medians (Md), Standard Deviations (SD), and Range of Scores for all Elements of the Learning Style Survey by Age

Element	n	$\bar{X}$	Md	SD	Range Min.	Range Max.
Noise Level						
14-22	58	22.97	25.0	16.40	0	57
23-42	62	20.82	20.0	16.09	0	60
43-62	11	19.36	19.0	17.52	0	53
63-82	19	17.63	10.0	19.11	0	60
Light						
14-22	58	36.26	31.5	16.91	0	60
23-42	62	44.66	49.5	13.23	0	60
43-62	11	49.46	52.0	9.25	30	60
63-82	20	52.85	56.0	7.81	36	60
Temperature						
14-22	58	38.69	40.0	14.44	6	60
23-42	62	40.36	40.0	14.11	0	60
43-62	11	39.91	47.0	17.24	3	60
63-82	19	37.74	35.0	13.34	5	60
Design						
14-22	58	31.45	30.0	22.65	0	60
23-42	62	38.11	45.5	19.98	0	60
43-62	11	42.27	50.0	18.62	2	60
63-82	18	45.89	56.5	19.64	0	60
Routine/Variety						
14-22	57	41.04	45.0	17.92	0	60
23-42	62	35.23	34.0	16.54	2	60
43-62	10	40.80	44.5	17.04	2	60
63-82	20	45.10	50.5	14.04	4	60

Table 9 (cont'd.)

Element	n	$\bar{X}$	Md	SD	Range Min.	Range Max.
Motivation						
14-22	58	41.33	40.0	15.29	5	60
23-42	61	50.61	50.0	9.72	15	60
43-62	11	48.09	50.0	11.92	20	60
63-82	20	53.90	58.0	9.40	30	60
Persistence						
14-22	56	44.00	49.0	15.02	5	60
23-42	56	45.02	50.0	15.91	4	60
43-62	10	48.70	55.5	13.02	30	60
63-82	20	50.80	54.5	10.70	30	60
Structure						
14-22	56	32.25	30.0	17.62	0	60
23-42	52	35.92	40.0	16.79	0	60
43-62	9	42.78	48.0	16.42	10	60
63-82	18	46.94	54.5	14.25	20	60
Alone/Peer						
14-22	58	36.45	40.0	19.21	0	60
23-42	56	33.84	33.0	17.53	0	60
43-62	11	29.64	33.0	20.06	0	57
63-82	19	25.84	30.0	18.49	0	57
Time of Day						
14-22	58	38.93	42.5	20.30	0	60
23-42	62	22.95	27.5	16.52	0	60
43-62	10	26.00	30.0	20.37	2	57
63-82	18	24.78	25.0	21.15	0	60
Intake						
14-22	58	44.97	50.0	17.57	0	60
23-42	61	36.95	39.0	16.07	1	60
43-62	11	32.00	30.0	19.62	3	58
63-82	19	21.05	11.0	21.72	0	60
Mobility						
14-22	58	39.71	47.5	19.24	0	60
23-42	62	33.07	31.5	16.48	0	60
43-62	11	28.64	30.0	22.52	0	58
63-82	20	35.80	32.0	19.01	6	60

Table 9 (cont'd.)

Element	n	$\bar{X}$	Md	SD	Range Min.	Range Max.
Auditory						
14-22	58	34.12	30.0	17.26	0	60
23-42	62	41.15	42.0	12.19	10	60
43-62	11	40.82	41.0	18.54	3	60
63-82	20	28.30	30.0	17.77	2	60
Visual						
14-22	58	39.81	40.0	16.04	0	60
23-42	62	42.86	44.5	13.11	11	60
43-62	11	48.91	50.0	9.34	30	60
63-82	20	38.10	43.5	18.99	3	60
Tactile/Kinesthetic						
14-22	58	51.85	55.0	10.08	30	60
23-42	62	50.42	53.5	11.27	3	60
43-62	11	52.55	58.0	9.64	30	60
63-82	20	47.45	54.5	16.08	1	60

Total Observations 14-22 = 58
Total Observations 23-42 = 64
Total Observations 43-62 = 11
Total Observations 63-82 = 20

Age was not significant in the preference for **design**. The youngest group (14-22) preferred the least formal arrangement during learning, whereas the oldest group (63-82) preferred the most formal structure. Mean scores ranged from a minimum of 31.45 (14-22) to a maximum of 45.89. Median scores were similar, with a minimum of 30.0 (14-22) to a maximum of 56.5 (63-82). Neither of the Chi-square statistics were significant.

All groups had similar preferences for some **variety** in learning. The 23-42 age group had the least preference for variety with a mean score of 35.23 and a median score of 34.0. The 63-82 age group had the greatest preference for variety with a mean score of 45.10 and a median score of 50.5. Neither of the Chi-square statistics were significant.

Motivation was a significant factor in the learning preferences based on age. Although all ages were motivated, the youngest group (14-22) had the least preference for motivation with a mean score of 41.33 and a median score of 40. The oldest group had the greatest preference for motivation with a mean score of 53.90 and a median score of 58.0. Both Chi-square statistics, 32.03 (test of independence) and 11.87 (test of the medians) were significant at $\alpha = .05$.

Age was not significant in the preference for **persistence**. While all groups showed persistence, the youngest group (14-22) had the least preference, with a mean score of

44.0 and a median score of 49.0. The oldest group (63-82) had the strongest preference for persistence, with a mean score of 50.80 and a median score of 54.5.

Age was a significant factor in the preference for **structure** by the Chi-square test of independence. The younger group (14-22) had a lesser preference for structure with a mean score of 32.25, whereas the older group had a stronger preference for structure with a mean score of 46.94. The Chi-square test of independence of 11.61 was significant at $\alpha = .05$. Median tests, however, were not significant. The younger group (14-22) had a median score of 30, and the older group (63-82) had a median score of 54.5.

Although mean and median scores varied somewhat, age was not significant in the preference for **learning alone or with others**. The oldest group (63-82) showed a stronger preference for learning alone, whereas the youngest group (14-22) had a stronger preference for learning with others. The mean scores ranged from a minimum of 25.84 to a maximum of 36.45. The median scores ranged from a minimum of 30.0 to a maximum of 40.0.

Time of day was a significant factor for learning based on age. The 23-42 age group had the strongest preference for morning learning with a mean score of 22.95. The youngest group (14-22) had a stronger preference for learning later in the day with a mean score of 38.93. Median scores varied

somewhat, with the oldest group (63-82) having the stronger preference for morning learning with a median score of 25.0 and the youngest group still having the stronger preference for learning later in the day with a median score of 42.5. Both of the Chi-square statistics of 27.65 (test of independence) and 13.54 (test of the medians) were significant at $\alpha = .05$.

Desire for **intake** was significant based on age. The oldest group (63-82) had the lowest preference to eat or drink, whereas the youngest group (14-22) had the strongest desire for intake during learning. The mean scores ranged from a minimum of 21.05 to a maximum of 44.97. The median scores ranged from a minimum of 11.0 to a maximum of 50.0. Both of the Chi-square statistics of 40.72 (test of independence) and 10.47 (test of the medians) were significant at $\alpha = .05$.

There was no significance for **mobility** based on age. All groups preferred to move around while learning. The 43-62 age group was the least likely to move about, with a mean score of 28.64 and a median score of 30.0, whereas the 14-22 age group preferred the most mobility with a mean score of 39.71 and a median score of 47.5. Neither of the Chi-square statistics were significant.

Auditory preferences were significant based on age. Although all groups had a preference for auditory learning,

the oldest group (63-82) had the least preference with a mean score of 28.30. The 23-42 age group had the strongest auditory preference with a mean score of 41.15. Both the oldest (63-82) and youngest (14-22) groups had the lowest median score of 30.0, and the 23-42 group had the highest median score of 42.0. Both of the Chi-square statistics of 19.33 (test of independence) and 9.23 (test of the medians) were significant at $\alpha = .05$.

Visual preferences based on age were not significant. All groups showed a preference for visual learning, with the oldest group (63-82) having the least preference with a mean score of 38.10. The 43-62 group had the strongest preference for visual learning with a mean score of 48.91. Median scores were somewhat different, with the 14-22 group having the least preference for visual learning with a median score of 40.0 and the 43-62 group having the strongest preference for visual learning, with a median score of 50.0.

There were no significant differences by age for **tactile/kinesthetic** preference. The oldest group (63-82) had the least preference for tactile learning with a mean score of 47.45, and the 43-62 age group had the strongest tactile preference with a mean score of 52.55. Median scores varied slightly, with the 23-42 age group having the lowest median score of 53.5 and the 43-62 age group having the highest median score of 58.0.

Chi-square tests of independence and tests of the medians were used to determine whether or not differences in age were significant in identification of learning style preference. Of the 15 items in the survey, five showed significance in the stated direction of the hypothesis at $\alpha = .05$ with both the Chi-square test of independence and the test of the medians. These included light (item #2), motivation (item #6), time of day (item #10), intake (item #11), and auditory (item #13). Structure (item #8) was also significant with the test of the medians, but not with the test of independence. Table 10 contains the Chi-square distributions for differences in age.

There is sufficient evidence of significance in the items on the Learning Style Survey based on age to give partial support to this hypothesis.

Evaluation of Learning Style Preferences During an Educational Program

H_5: There are differences in identified learning style preferences and learning style preferences that are met during an educational program.

Four counties returned the evaluation forms: Cherokee, Guilford, Robeson, and Rockingham. During the course of county training, agents in Forsyth and Brunswick counties expressed apprehension about presenting this audience with both the Learning Style Survey and an Evaluation form at the

Table 10

Chi-Square Distribution for Elements on the Learning Style Survey by Age

	χ^2 Test of Independence		χ^2 Median Test	
Stimuli Element	χ^2	Probability of chance	χ^2	Probability of chance
Environmental				
Noise Level	3.748	.9272	2.537	.4687
Light***	31.710	.0002	13.955	.0030
Temperature	10.007	.3500	1.861	.6017
Design	9.083	.4297	7.405	.0600
Emotional				
Routine/Variety	7.825	.5519	6.488	.0901
Motivation***	32.033	.0002	11.866	.0079
Persistence	7.751	.5594	6.713	.0816
Structure**	16.114	.0645	11.611	.0088
Sociological				
Alone/Peer	12.091	.2082	1.952	.5825
Physical				
Time of Day***	27.654	.0011	13.541	.0036
Intake***	40.716	.0000	10.473	.0149
Mobility	15.767	.0719	7.499	.0576
Auditory***	19.333	.0225	9.230	.0264
Visual	9.173	.4214	0.818	.8451
Tactile/Kinesthetic	4.761	.8546	2.206	.5308

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05

same program. During the training sessions, the researcher advised all agents and paraprofessionals to use their judgment regarding the evaluation. Ultimately, no evaluations were submitted from either Forsyth or Brunswick County.

Table 11 contains a comparison of the mean scores for learning style preference and the mean scores for the extent to which those preferences were met at this particular educational setting.

Overall, it appeared that some preferences were being met while others were not. Participants in the programs in Guilford County had all of their learning style preferences met and participants in the program in Robeson County had most of their learning style preferences met. Participants in both Cherokee and Rockingham counties had five unmet preferences each. Nine of the elements of learning style preference were not met by at least one county. Preferences met or not met will be discussed by county.

Cherokee county. Five learning style preferences were unmet by the participants in Cherokee County. These are noise level, persistence, structure, alone/peer, and audito ry. This group (n=12) preferred a relatively quiet atmosphere for learning ($\bar{X}$ = 16.75) but at the meetings the noise level was fairly loud ($\bar{X}$ = 40.56).

Table 11

Comparison of Mean Scores of Learning Style Preferences and Evaluation of Educational Meeting/Program for Selected Counties

	Cherokee			Guilford			Robeson			Rockingham		
Stimuli Element	SD	Pref. X	At Mtg. X	SD	Pref. X	At Mtg. X	SD	Pref. X	At Mtg. X	SD	Pref. X	At Mtg. X
Environmental												
Noise Level	16.05	16.75	40.56*	17.53	18.64	30.36	10.75	26.41	33.12	15.09	22.64	26.76
Light	11.16	43.83	40.56	15.14	45.96	42.36	6.60	50.00	51.60	16.86	30.83	46.80
Temperature	11.58	43.83	35.04	12.21	41.57	39.12	9.26	49.75	56.28	14.21	36.77	37.92
Design	19.71	34.83	48.84	19.93	41.59	35.52	20.72	36.37	38.28	19.62	20.83	55.56*
Emotional												
Routine/Variety	15.89	35.25	47.04	17.71	40.96	50.28	12.49	34.26	34.56	16.50	45.33	36.00
Motivation	12.45	41.91	51.60	11.30	52.17	55.80	10.46	46.78	48.84	14.32	34.51	43.44
Persistence	12.81	43.91	24.84*	9.54	52.71	45.60	18.13	30.06	52.56*	14.47	36.64	47.16
Structure	14.34	33.27	48.00*	19.95	36.72	48.00	13.13	37.20	33.96	16.28	29.74	42.96
Sociological												
Alone/Peer	14.26	29.08	47.04*	20.27	28.90	18.36	11.78	27.44	19.32	16.85	41.41	22.32*
Physical												
Time of Day	12.19	23.72	29.52	20.48	25.93	32.40	13.94	21.58	38.40*	16.80	46.03	16.20*
Intake	14.98	33.83	45.00	18.76	34.59	37.44	18.89	32.21	33.60	17.82	48.25	25.56*
Mobility	12.73	39.91	52.56	18.89	37.64	36.00	12.72	25.08	47.04*	17.92	45.41	18.96*
Auditory	13.94	22.25	48.84	14.39	38.57	52.32	9.35	46.41	51.60	17.18	28.83	43.44
Visual	18.88	36.41	53.52	13.80	42.58	51.84	10.69	47.58	53.04	17.04	37.29	40.80
Tactile/Kinesthetic	12.52	45.75	50.76	12.46	49.84	52.80	5.03	55.29	55.80	9.49	52.06	46.32

* Preferences not met

This group showed a preference toward persistence (X = 43.91), but were not given the opportunity to complete what was started during the educational program ($\bar{X}$ = 24.84).

Also, although the participants in this county leaned slightly toward a preference for being told what to do during learning ($\bar{X}$ = 33.27), during the meeting or educational programs they were more likely to be told what they were to do ($\bar{X}$ = 48.00).

The respondents from Cherokee County showed a preference toward learning alone ($\bar{X}$ = 29.08), but were involved in small group process during the programs ($\bar{X}$ = 47.04).

Finally, the participants from Cherokee County were not auditory learners, ($\bar{X}$ = 22.23), but at the educational programs, they were required to learn more by listening ($\bar{X}$ = 48.84).

Guilford county. Guilford County (n=63) was the only county included in the study whose learning style preferences were all met. According to the evaluation means, every element was within one standard deviation of the preference mean.

Robeson county. Three learning style preferences were not met by participants in Robeson County (n=26). On the Learning Style Survey, for persistence, these respondents had a mean score of 30.06, indicating a moderate preference for persistence. At the educational programs which followed,

however, they indicated a stronger leaning toward persistence, with a mean score of 52.56.

Another preference not met in Robeson County was time-of-day. Participants in this county preferred a mid - to - late morning time for learning ($\bar{X}$ = 21.58) but had their educational settings at a later than preferred time (evaluation $\bar{X}$ = 38.40).

The third learning style preference not met in Robeson County was that of mobility. This group preferred to stay in one place while learning ($\bar{X}$ = 25.08), but during the educational programs they were fairly mobile ($\bar{X}$ = 47.04).

Rockingham county. Five learning style preferences were not met by the participants from Rockingham County (n=31). This group had a preference for an informal arrangement of the setting in which learning was to take place ($\bar{X}$ = 20.83). However, the learning settings were very formal ($\bar{X}$ = 55.56).

The second unmet preference for this county was that of alone/peer. The preference during the learning process was to learn with others ($\bar{X}$ = 41.41). Evaluation results showed that the learning situations were most likely to be alone ($\bar{X}$ = 22.32).

Another preference not met was that of time-of-day learning. The participants in Rockingham County had a strong desire for afternoon learning ($\bar{X}$ = 46.03). Evaluation re-

sults showed that learning experiences for this group were in the morning ($\bar{X}$ = 16.20).

Intake was another learning style preference that was not met. The responses to the Learning Style Survey indicated a preference to eat or drink while learning ($\bar{X}$ = 48.25). In reality, eating or drinking was discouraged during the learning process ($\bar{X}$ = 25.56).

The fifth learning style preference that was not met by the participants in Rockingham County was that of mobility. The group in this study preferred to move around while learning ($\bar{X}$ = 45.41). During the learning situation, though, little mobility took place ($\bar{X}$ = 18.96).

Overall Analyses of Learning Style Preferences by County

In addition to hypothesis testing, differences in learning style preferences were determined for each element by county. Evidence of significance was found in each item on the Learning Style Survey except noise level, visual, and tactile/kinesthetic. Table 12 contains means, medians, and standard deviations for each item in the survey by county. Table 13 contains the Chi-Square distributions for each item by county.

There were no significant differences in noise level preference by county. Respondents from Cherokee County (n=12) had the greatest preference for quiet with a mean score of 16.75 and a median score of 12.5. Respondents from

Table 12

Means ($\bar{X}$), Medians (Md), Standard Deviations (SD), and Range of Scores for all Elements of the Learning Style Survey by County

Brunswick County

Stimuli Element	n	$\bar{X}$	Md	SD	Range Min	Range Max
Environmental						
Noise Level	12	20.41	9.500	23.30	2	60
Light	12	47.33	52.500	14.21	10	60
Temperature	12	35.33	32.500	19.04	3	60
Design	12	44.00	53.500	20.56	2	60
Emotional						
Routine/Variety	12	39.66	49.500	20.95	2	60
Motivation	12	50.58	57.000	14.17	10	60
Persistence	12	51.75	56.500	11.37	20	59
Structure	12	46.58	51.500	16.76	5	60
Sociological						
Alone/Peer	11	35.45	40.000	21.45	2	60
Physical						
Time of Day	10	26.10	15.000	25.03	0	57
Intake	12	36.25	41.000	22.90	3	60
Mobility	12	29.16	25.000	23.97	0	58
Auditory	12	34.83	41.500	21.17	3	58
Visual	11	45.45	52.000	15.18	15	60
Tactile/Kinesthetic	12	50.00	56.500	14.99	10	60

Total observations = 12

Table 12 (cont'd)

Cherokee County

Stimuli Element	n	$\bar{X}$	Md	SD	Range Min	Range Max
Environmental						
Noise Level	12	16.75	12.500	16.05	0	50
Light	12	43.83	50.000	11.16	30	58
Temperature	11	34.09	30.000	11.58	30	60
Design	12	34.83	30.000	19.71	3	60
Emotional						
Routine/Variety	12	35.25	35.000	15.89	10	58
Motivation	12	41.91	42.500	12.45	20	60
Persistence	12	43.91	40.000	12.81	30	60
Structure	11	33.27	30.000	14.34	10	56
Sociological						
Alone/Peer	12	29.08	29.500	14.26	10	57
Physical						
Time of Day	11	23.72	30.000	12.19	5	40
Intake	12	33.83	30.000	14.98	3	60
Mobility	12	39.91	37.500	12.73	19	59
Auditory	12	22.25	25.000	13.94	2	50
Visual	12	36.41	44.500	18.88	3	60
Tactile/Kinesthetic	12	45.75	49.500	12.52	25	60

Total observations = 12

Table 12 (cont'd)

Forsyth County

Stimuli Element	n	$\bar{X}$	Md	SD	Range Min	Range Max
Environmental						
Noise Level	16	20.12	17.500	19.29	0	59
Light	16	42.68	40.000	11.12	27	60
Temperature	16	25.00	30.000	13.82	0	48
Design	16	43.43	52.000	19.59	3	60
Emotional						
Routine/Variety	16	27.06	30.000	15.98	2	60
Motivation	16	51.68	52.500	9.63	25	60
Persistence	16	47.81	50.000	11.90	27	60
Structure	16	35.12	35.000	17.27	3	60
Sociological						
Alone/Peer	16	44.18	50.000	15.91	3	60
Physical						
Time of Day	16	32.25	30.500	19.61	0	60
Intake	16	38.75	41.000	18.91	3	60
Mobility	16	30.68	30.000	15.35	5	58
Auditory	16	39.50	40.000	14.89	2	60
Visual	16	38.18	40.000	16.27	2	60
Tactile/Kinesthetic	16	47.43	55.000	15.75	3	60

Total observations = 16

Table 12 (cont'd)

Guilford County

Stimuli Element	n	$\bar{X}$	Md	SD	Range Min	Range Max
Environmental						
Noise Level	62	18.64	15.000	17.53	0	60
Light	62	45.96	50.000	15.14	0	60
Temperature	63	41.57	40.000	12.21	15	60
Design	61	41.59	50.000	19.93	0	60
Emotional						
Routine/Variety	63	40.96	40.000	17.71	0	60
Motivation	63	52.17	60.000	11.30	10	60
Persistence	63	52.71	59.000	9.54	30	60
Structure	62	36.72	40.000	19.95	0	60
Sociological						
Alone/Peer	62	28.90	30.000	20.27	0	60
Physical						
Time of Day	63	25.93	30.000	20.48	0	60
Intake	62	34.59	35.000	18.76	0	60
Mobility	62	37.64	40.000	18.89	0	60
Auditory	63	38.57	40.000	14.39	3	60
Visual	62	42.58	42.000	13.80	10	60
Tactile/Kinesthetic	63	49.84	54.000	12.46	1	60

Total observations = 63

Table 12 (cont'd)

Robeson County

Stimuli Element	n	$\bar{X}$	Md	SD	Range Min	Range Max
Environmental						
Noise Level	24	26.41	30.000	10.75	10	50
Light	24	50.00	51.000	6.60	39	60
Temperature	24	49.75	50.000	9.26	32	60
Design	24	36.37	50.000	20.72	3	60
Emotional						
Routine/Variety	23	34.26	33.000	12.49	10	59
Motivation	23	46.78	50.000	10.46	15	60
Persistence	15	30.06	31.000	18.13	4	51
Structure	10	37.20	35.500	13.13	20	58
Sociological						
Alone/Peer	18	27.44	30.500	11.78	10	51
Physical						
Time of Day	24	21.58	22.500	13.94	1	41
Intake	23	32.21	40.000	18.89	1	60
Mobility	24	25.08	25.500	12.72	5	42
Auditory	24	46.41	49.000	9.35	20	59
Visual	24	47.58	49.500	10.69	11	60
Tactile/Kinesthetic	24	55.92	56.500	5.03	45	60

Total observations = 26

Table 12 (cont'd)

Rockingham County

Stimuli Element	n	$\bar{X}$	Md	SD	Range Min	Range Max
Environmental						
Noise Level	31	22.64	25.000	15.09	0	55
Light	31	30.83	30.000	16.86	0	60
Temperature	31	36.77	30.000	14.21	10	60
Design	31	20.83	15.000	19.62	0	60
Emotional						
Routine/Variety	30	45.33	50.000	16.50	0	60
Motivation	31	34.51	30.000	14.32	5	60
Persistence	31	36.64	35.000	14.47	5	60
Structure	31	29.74	30.000	16.28	0	60
Sociological						
Alone/Peer	31	41.41	49.000	16.85	0	60
Physical						
Time of Day	31	46.03	52.000	16.80	0	60
Intake	31	48.25	56.000	17.82	0	60
Mobility	31	45.41	50.000	17.92	0	60
Auditory	31	28.83	30.000	17.18	0	60
Visual	31	37.29	40.000	17.04	0	60
Tactile/Kinesthetic	31	52.06	55.000	9.49	30	60

Total observations = 31

Table 13

Chi-Square Distribution for Elements on the Learning Style Survey by County

	χ^2 Test of Independence		χ^2 Median Test	
Stimuli Element	χ^2	Probability of chance	χ^2	Probability of chance
Environmental				
Noise Level	24.516	.0568	6.965	.2232
Light***	46.713	.0000	18.428	.0025
Temperature***	51.012	.0000	23.872	.0002
Design***	40.732	.0004	19.050	.0019
Emotional				
Routine/Variety***	34.308	.0031	14.229	.0142
Motivation***	53.474	.0000	28.344	.0001
Persistence***	58.693	.0000	29.832	.0001
Structure***	25.510	.0435	13.144	.0221
Sociological				
Alone/Peer***	40.097	.0004	13.992	.0157
Physical				
Time of Day***	49.439	.0000	21.839	.0007
Intake***	36.997	.0013	18.832	.0021
Mobility***	45.174	.0001	24.242	.0002
Auditory***	44.744	.0001	21.405	.0007
Visual	23.695	.0705	4.768	.4448
Tactile/Kinesthetic	15.995	.3824	1.031	.9600

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05

Robeson County (n=24) had the least preference for quiet with a mean score of 26.41 and a median score of 30.

County differences in light preference were striking. Respondents in Rockingham County (n=31) had the lowest mean and median scores of 30.83 and 30, respectively. Respondents in Robeson County (n=26) had the highest mean score of 50.00, whereas respondents in Brunswick County had the highest median score of 52.5. The Chi-square test of independence of 46.71 was significant at $\alpha = .05$, as was the Chi-square statistic of 18.43, based on the median scores. Nearly 77% of the respondents from Robeson County were Native Americans, the ethnic group with the strongest preference for bright light.

County differences in temperature were more significant than the differences between educational attainment or ethnicity. Based on the mean scores, participants in Forsyth County (n=16) expressed a preference for the coolest temperatures and Robeson County participants (n=26) preferred a much warmer climate for learning. The range of the means for temperature preference was from a minimum of 25.00 (Forsyth County) to a maximum of 49.75 (Robeson County). Median scores, however, indicated a similar preference for average temperatures during learning for participants in Cherokee, Forsyth, and Rockingham counties, with median scores of 30 for each county. Robeson County participants indicated the

strongest preference for a warmer learning climate with a median score of 50. The Chi-square test of independence statistic of 51.012 was significant at $\alpha = .05$. The Chi-square statistic based on the test of the medians of 23.872 was significant at $\alpha = .05$.

There were greater differences in both mean and median scores by county. Participants in Rockingham County (n=31) showed the strongest preference for an informal design, with a mean score of 20.83 and a median score of 15. Based on mean scores, participants in Brunswick County (n=12) had the strongest preference for a more formal design. Based on median scores, however, participants in Forsyth County had the strongest preference for a more formal design. The range of county mean scores was a minimum of 20.83 (Rockingham County) to a maximum of 44.00 (Brunswick County). The range of the median scores was from a minimum of 15 (Rockingham County) to a maximum of 52 (Forsyth County). The Chi-square statistics of 40.732 (test of independence) and 19.050 (test of the medians) were both significant at $\alpha = .05$.

There were greater differences in mean scores by county. Participants from Forsyth County (n=16) showed a moderate preference for a more routine procedure during learning. By contrast, participants from Rockingham County had the strongest preference for variety in learning. The mean scores ranged from a minimum of 27.06 (Forsyth County) to a

maximum of 45.33 (Rockingham County). Median scores were similar. Forsyth County respondents had the lowest median score of 30 and Rockingham County respondents had the highest mean score of 50. Both the Chi-square statistic of 34.308 (test of independence) and the Chi-square statistic of 14.229 (test of the medians) were significant at $\alpha = .05$.

County differences were strong. Respondents from Rockingham County (n=31) showed the lowest motivation with a mean score of 34.51 and a median score of 30. Cherokee County (n=12) had the next highest mean and median scores for motivation at 41.91 and 42.5, respectively. Respondents from Guilford County (n=63) had the strongest preference for motivation, with a mean score of 52.17 and a median score of 60. Both of the Chi-square statistics of 53.474 (test of independence) and 28.344 (test of the medians) were significant at $\alpha = .05$.

County differences for persistence also were significant, with participants in Guilford (n=63) and Brunswick (n=12) counties showing the strongest preferences with mean scores of 52.71 and 51.75, respectively. Median scores for Guilford and Brunswick counties were 59 and 56.5, respectively. Participants in Robeson County (n=15) showed the lowest preference for persistence with a mean score of 30.06 and a median score of 31. It must be noted, however, that only 57.6% of all participants in Robeson County responded to

this item on the survey. Both of the Chi-square statistics of 58.69 (tests of indepencence) and 29.832 (tests of the medians) were significant at $\alpha = .05$.

County differences in the preference for structure were significant. Participants from Brunswick County (n=12) showed the strongest desire to be given directions, whereas the participants from Rockingham County (n=31) were more likely to prefer to make their own choices. Brunswick County had the highest mean and median scores of 46.58 and 51.5, respectively, and Rockingham County had the lowest mean score of 29.74. Cherokee and Rockingham County participants had the lowest medians of 30. Both of the Chi-square statistics of 25.510 (test of independence) and 13.144 (test of the medians) were significant at $\alpha = .05$.

There were significant differences in preference for learning alone or with others by county. The mean scores indicated that the participants in Robeson County (n=18) had the greatest preference for learning alone, followed closely by the participants in Guilford County (n=62) and Cherokee County (n=12). Median scores for these counties were 30.5, 30, and 29.5, respectively. The participants in Forsyth County (n=16) had the greatest preference for learning with others. The range of mean scores was from a minimum of 27.44 (Robeson County) to a maximum of 44.18 (Forsyth County). Both of the Chi-square statistics of 40.097 (test of inde-

pendence) and 13.992 (test of the medians) were significant at $\alpha = .05$.

Three of the six counties included in the study showed similar preferences for mid-day learning. The respondents in Brunswick and Robeson counties preferred mid-morning learning, but the respondents in Rockingham County showed a much stronger preference for learning later in the day. The range of the mean scores for time-of-day were from a minimum of 21.58 (Robeson County) to a maximum of 46.03 (Rockingham County). The Chi-square statistic of 49.439 (test of independence) was significant at $\alpha = .05$. The median test also showed significance in county preference for time-of-day learning. Brunswick County had a median score of 15 and Rockingham County had a median score of 52. The Chi-square statistic of 21.389 (test of the medians) was significant at $\alpha = .05$.

All of the six counties had mean scores indicating at least a slight preference for intake. Rockingham County had the strongest preference for intake while learning. The mean scores ranged from a minimum of 32.21 (Robeson County) to a maximum of 48.25 (Rockingham County). Median scores differed, with Cherokee County respondents having the lowest preference for intake, with a score of 30. Rockingham County respondents had the strongest median score of 56, indicating a preference for intake. Both of the Chi-square statistics

of 36.997 (test of independence) and 18.832 (test of the medians) were significant at $\alpha = .05$.

County differences for mobility were also significant. Robeson County (n=24) had the least preference for moving around whereas learning with a mean score of 25.08. Rockingham County had the greatest preference for mobility, with a mean score of 45.41. Rockingham County also had the greatest median score of 50 and Robeson and Brunswick counties had the lowest median scores of 25 and 25.5, respectively. Both of the Chi-square statistics of 45.174 (test of independence) and 24.242 (test of the medians) were significant at $\alpha = .05$.

County differences for auditory preferences were significant. Respondents from Cherokee County (n=12) were the least likely to remember what was said, whereas the respondents from Robeson County (n=24) were most likely to remember what was said. The range of the mean scores was from a minimum of 22.25 to a maximum of 46.41. The range of the median scores was from a minimum of 25 (Cherokee County) to a maximum of 49 (Robeson County). Both of the Chi-square statistics of 44.744 (test of independence) and 21.405 (test of the medians) were significant at $\alpha = .05$.

Although there were some differences in preference for visual learning based on counties, they were not significant. Respondents from Cherokee County (n=12) had the lowest mean

score of 36.41 and respondents from Robeson County (n=47) had the greatest mean score of 47.58. Respondents from Forsyth and Rockingham Counties shared the lowest median score of 40 and respondents from Brunswick County had the highest mean score of 52. Neither of the Chi-square statistics were significant.

There was no significance in preference for tactile learning based on county. Cherokee County respondents (n=12) had the least preference for tactile learning with a mean score of 45.75 and a median score of 49.5. Robeson County respondents (n=24) had the greatest preference for tactile learning with a mean score of 55.29. Both Brunswick and Robeson counties had median scores of 56.5.

Chi-square test of independence and tests of the medians were used to determine whether or not differences in county were significant in identification of learning style preference. Of the 15 items in the survey, six showed significance at $\alpha = .05$. These included light (item #2), motivation (item #6), structure (item #8), time of day (item #10), intake (item #11), and auditory (item #13). Table 13 contains the Chi-square distributions for differences due to county.

Summary of Results

As with the original Dunn & Dunn Productivity Environmental Preference Survey, this Learning Style Survey was organized around four stimuli: environmental, emotional,

sociological, and physical (Dunn & Dunn, 1978). Crosstabulations of significant items on the survey by educational attainment levels, race/ethnic origin, age, and county are found in Table 14.

Of the 15 items in the survey, only two were not significant by either educational attainment level, race/ethnic origin, age, or county. These were noise level and visual preference. Time of day and intake were sigificant with all of the variables. More items were significant with county and educational attainment levels than with race/ethnic origin or age. Significant items based on educational attainment levels included light, design, motivation, persistence, structure, time of day, intake, mobility, and tactile/kinesthetic. Significant items based on race/ethnic origin included design, motivation, persistence, alone/peer, time of day, intake, mobility, and auditory. Significant items based on age included light, motivation, structure, time of day, intake, and auditory. Significant items based on county included light, temperature, design, routine/variety, motivation, persistence, structure, alone/peer, time of day, intake, mobility, and auditory. Educators who work with the limited-resource audience should be aware of these differences and as much as possible, develop educational programs and curricula based on the learning preferences of the audiences.

Table 14

Crosstabulations of Significant Items on The Learning Style Survey by Educational Attainment, Race/Ethnic Origin, Age, and County

	Educational Level	Race/Ethnic Origin	Age	County
Stimuli Element	Significance	Significance	Significance	Significance
Environmental				
Noise Level	-	-	-	-
Light	X	-	X	X
Temperature	-	-	-	X
Design	X	X	-	X
Emotional				
Routine/Variety	-	-	-	X
Motivation	X	X	X	X
Persistence	X	X	-	X
Structure	X	-	X	X
Sociological				
Alone/Peer	-	X	-	X
Physical				
Time of Day	X	X	X	X
Intake	X	X	X	X
Mobility	X	X	-	X
Auditory	-	X	X	X
Visual	-	-	-	-
Tactile/Kinesthetic	X	-	-	-

A number of researchers have found that when students are taught to their learning styles, academic achievement increases (Carbo, 1980; Krimsky, 1982; Pizzo, 1981; Shea, 1983; Tannenbaum, 1982; Trautman, 1979; White, 1980). Also, attitudes toward learning improve when learners are taught through their personal preferences (Copenhaver, 1979; Prizzo, 1981). It is crucial that those persons who are involved in any type of adult education become aware of the individual needs of all learners as they develop and present educational information to this audience.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purposes of this study were to identify environmental learning style preferences of the limited-resource women who participate in educational programs with the Cooperative Extension Service in six counties of North Carolina and to determine the extent to which those preferences were met. Family education agents and paraprofessionals in the six participating counties received training on learning style assessment. Following the training sessions, the agents and paraprofessionals presented the Learning Style Survey to clientele in their counties at the beginning of regularly scheduled educational workshops or programs. Once the survey was completed by the participants, the agent or paraprofessional conducted the educational program as scheduled. At the conclusion of the program, the participants were asked to evaluate it in terms of learning style preferences that were or were not met.

The sample consisted of 160 African American, Caucasian, and Native American women ranging in age from 14 to 82 from six counties in North Carolina. Counties included in the study were Brunswick, Cherokee, Forsyth, Guilford, Robeson,

and Rockingham. Participants in all counties except Brunswick and Forsyth responded to the evaluation.

An instrument for assessing learning style preference was adapted by O'Sullivan, Griffin, and Smoak (1993) from the Productivity Environmental Preference Survey, or the PEPS, developed by Dunn and Dunn (1985). The instrument was developed around four stimuli: environmental, emotional, sociological, and physical. A total of 15 elements, each addressing at least one aspect of learning style preference, were contained within each of these stimuli. The self-administered survey was developed so that respondents only had to mark an "X" on that point on the continnuum (0 to 60) that best described the circumstance around which they preferred to learn. Demographic information regarding age, occupation, educational attainment level, race, and number of contacts with the County Extension office were also included on the survey.

The evaluation was arranged similarly to the Learning Style Survey. Instead of a range from 0 to 60, the evaluation had a range from 1-5. The statements on the evaluation used the same terminology as the statements on the Learning Style Survey.

Means, medians, and standard deviations were initially used to examine the learning style preferences of this sample. Chi-square analyses and tests of the median were used

to determine the significance of differences of populations within the sample group. Because the standard deviations were large for this survey, tests of the medians were used to provide the strongest support for significance.

Five hypotheses were established and tested by this research. Each hypothesis and the results are discussed below:

1. There are significant differences in learning styles between limited-resource women and the general population of women. This hypothesis was partially supported.

2. There are significant differences in learning styles between limited-resource women who completed high school and those who did not. This hypothesis was partially supported.

3. There are significant differences in learning styles between African American, Caucasion, and Native American limited-resource women. This hypothesis was partially supported.

4. There are significant differences in learning styles between limited-resource women ages 14-22, 23-42, 43-62, and 63-82. This hypothesis was partially supported.

5. There are differences in learning style preferences and learning style preferences that are met among limited-resource women. This hypothesis was partially supported.

Studies with general population of adults compared to the limited-resource adults in the present study found dif-

ferences in learning style preferences with the following items: temperature, routine/variety, motivation, persistence, alone/peer, time of day, and intake. The present study found similar preferences to the research by Kuznar, et al. (1991), Reynolds and Gerstein (1991), and Price (1987) with the following items: noise level, light, design, structure, mobility, auditory, visual, and tactile/kinesthetic.

There were significant differences in learning styles between limited-resource people based on their educational attainment on eight items in the Learning Style Survey. These included light, design, motivation, persistence, structure, time of day, mobility, and tactile/kinesthetic.

Race/ethnic origin was significant in learning style preference for 5 items in the Learning Style Survey. These included design, persistence, alone/peer, intake, and mobility.

Although no hypothesis was stated, the research also analyzed differences in learning style preference by the counties involved in the study. County of residence was significant in learning style preference for 12 items on the Learning Style Survey. These included light, temperature, design, routine/variety, motivation, persistence, structure, alone/peer, time of day, intake, mobility, and auditory. The

three items that were not significant for the counties were noise level, visual, and tactile/kinesthetic.

Evaluations results varied by county. Overall, nine of the 15 preferences were not met during the educational program which was presented after the Learning Style Survey was administered. These included noise level, design, persistence, structure, alone/peer, time of day, intake, mobility, and auditory preferences.

Responses of extension agents and paraprofessionals to this study were favorable. Staff members are always seeking better ways in which to serve clientele. The staff as a group, both during the training sessions and informal verbal feedback sessions following the collection of the data, were anxious to continue to look at learning style preferences of their clientele and expand their knowledge base of this subject. They are aware that by making any educational endeavor more comfortable to the learner, the potential exists to bring about behavior and practice change, which is an ultimate goal of the Cooperative Extension Service.

Conclusions

The following conclusions were drawn:

1. Learning style preferences were significant due to educational attainment levels for these elements: light, design, motivation, persistence, structure,

time of day, intake, mobility, and tactile/ kinesthetic.

2. Learning style preferences were significant due to race/ethnic origin for these elements: design, motivation, persistence, structure, alone/peer, intake, and mobility.
3. Learning style preferences were significant due to age for these elements: light, motivation, structure, time of day, intake, and auditory.
4. Learning style preferences were significant due to county of residence for these elements: light, temperature, design, routine/variety, motivation, persistence, structure, alone/peer, time of day, intake, mobility, and auditory.
5. Learning style preferences not met in Cherokee County were: noise level, persistence, structure, alone/peer, and auditory.
6. Learning style preferences not met in Robeson County were: persistence, time of day, and mobility.
7. Learning style preferences not met in Rockingham County were: design, alone/peer, time of day, intake, and mobility.
8. Learning style preferences were met in Guilford County.

Implications

This study has identified learning style preferences of the limited-resource women in six counties of North Carolina. More than anything else, it has acknowledged that the clientele that is served by the Extension Program at NC A & T State University is diverse, and has a variety of learning preferences. In order to continue to effectively develop program strategies for this audience, Extension workers must respect these needs and begin to design educational curricula that is appropriate.

Recommendations

This study has set the stage for additional development of learning style assessment for the limited-resource audience of the North Carolina Cooperative Extension Program. More work must be done to further develop the Learning Style Survey used in this study and other assessment instruments to improve their reliability. Also, refinement of instruments that are appropriate for this audience is necessary.

Field staff with the Cooperative Extension System are continuously seeking ways by which they can help their clientele retain knowledge, ultimately leading to behavior change. During the training and data collection of this study, the eight staff members involved expressed high levels of enthusiasm and interest in learning style as it relates directly to the work they do. They have a desire to know how

their audiences best internalize the information they receive, and under what conditions maximum learning takes place. The Extension Administration and other policy-makers in the organization are encouraged to allow Extension staffs to pursue the topic of learning styles.

Finally, other organizations and agencies charged with delivering educational programs to the limited-resource or low-income segment of the population are urged to determine learning style preferences of their clientele. Subsequently, all curricula and other educational materials could be altered to reflect the diverse learning needs of the audiences served.

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APPENDIX A

LEARNING STYLE SURVEY
AND
EVALUATION

LEARNING STYLE SURVEY

This survey is to help you identify how you learn best. There are no right or wrong answers. Read the statements that follow and decide where along each scale you would rank yourself if you had something new or difficult to learn. Mark an X on each line to show your ranking. To help you get started...

> Suppose there was a billionaire businessman who decided that he was going to help people learn. He has chosen you as one of the first people to work with him. First he is going to give you a test in something that is hard for you to learn. Different people find different things hard to learn. For example, some people have a hard time with math; some people find music or art difficult. He will give you this test and then give you a week to study and retake the test. If you can get 10 or more questions right he'll give you $1000. He will allow you to study any way you think will work the best and also will provide you with a place to study that you may furnish any way you like. How will you study the information? Will you use written materials or pictures, because you find it easy to remember what you read and see? Or do you find it hard or easy to remember what you see; you might be in the middle or somewhere else. Mark an X where you think your learning style strength lies for each of the statements presented, thinking about the types of things that are important to help you learn.

Learning Style Survey

Read the statement and decide where along each scale you would rank yourself if you had something new or difficult to learn. Mark an X on each line to show your ranking.

When learning something new or difficult, you prefer

1.

0 10 20 30 40 50 60

Quiet — Sound

2.

0 10 20 30 40 50 60

Low Light — Bright Light

3.

0 10 20 30 40 50 60

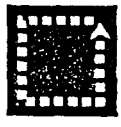
Cool Area — Warm Area

4.

0 10 20 30 40 50 60

Couch, Bed Floor or Carpet — Chair or Desk

5.



0 10 20 30 40 50 60

Routine — Change/Variety

When learning something new or difficult, usually you

6.

0 10 20 30 40 50 60

Are Not Interested in What is Taught — Are Very Interested in What is Taught

7.

0 10 20 30 40 50 60

Do Not Finish Work — Finish Work

Please turn the page ☞

8.  0 10 20 30 40 50 60 

Like to Make Own Choices — Like to Be Given Exact Directions

9.  0 10 20 30 40 50 60 

Learn Best Alone — Learn Best With Someone Else

10.  0 10 20 30 40 50 60 

Have High Energy in the Morning — Have High Energy at Night

11.  0 10 20 30 40 50 60 

Do Not Eat or Drink — Eat or Drink

12.  0 10 20 30 40 50 60 

Can Stay in One Place for Long Periods of Time — Cannot Stay in One Place for Long Periods of Time

When learning something new or difficult, you find it

13.  0 10 20 30 40 50 60 

Hard to Remember What is Said — Easy to Remember What is Said

14.  0 10 20 30 40 50 60 

Hard to Remember What You Read and See — Easy to Remember What You Read and See

15.  0 10 20 30 40 50 60 

Hard to Remember By Doing — Easy to Remember By Doing

The information you are providing will help the Cooperative Extension Program develop program information and handout materials that best suit your needs. In order to do this, please complete the following information as specifically as possible.

What is your age today?_____

What is your occupation?_____

What is the highest grade you completed in school?_____

What is your race or ethnic origin?_____

How many times in the last six months have you had contact with the Extension Office?_____

Thank you for taking the time to complete this survey.

EVALUATION OF TODAY'S PROGRAM

Please take a moment to evaluate today's program. **Circle** your response on the scale of 1-5.

During today's program, (Circle your response)

The noise level was:

Quiet_ _Loud
1 2 3 4 5

The lighting was:

Lo_ Bright
1 2 3 4 5

The temperature was:

Cool_ _Warm
1 2 3 4 5

The room arrangement was:

Casual (couch or floor)_ _ _ _ _ _ _ _ _ _ _ _ _Chairs and Table
1 2 3 4 5

The information was presented:

With little/no variety _ _ _ _ _ _ _ _ _In a variety of ways
1 2 3 4 5

I was not interested _ _ _ _ _ _ _ _ _ _ _ _ _I was interested
1 2 3 4 5

I was alone with agent/assistant _ _ _ _ _ _This was a group
1 2 3 4 5

If this program was a workshop,

I finished the project_ _ _ _ _ _ _ _ _ _ _ _I did not finish
1 2 3 4 5

I made my own choices_ _ _ _ _ _ _ _ _ I was given directions
1 2 3 4 5

This program was held:

In the morning_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _In the evening
1 2 3 4 5

During the program I:

Did not eat or drink _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _Ate or drank
1 2 3 4 5

Stayed in my place _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ Moved around some
1 2 3 4 5

In a few days, I probably will:

Not remember what I heard _ _ _ _ _ _ _Remember what I heard
1 2 3 4 5

Not remember what I saw _ _ _ _ _ _ _ _ _Remember what I saw
1 2 3 4 5

Not remember what I did _ _ _ _ _ _ _ _ _Remember what I did
1 2 3 4 5

THANK YOU FOR YOUR TIME TODAY!

APPENDIX B

CORRESPONDENCE FROM NORTH CAROLINA EXTENSION ADMINISTRATION

September 21, 1993

Mrs. Ellen Smoak
1110 Jefferson Road
Greensboro, NC 27410

Dear Mrs. Smoak:

The Cooperative Extension Program at NCA&T State University supports your research proposal to study learning style preferences of some of the participants in the Family Education Program.

Permission is granted for you to involve county agents and paraprofessionals in Cherokee, Forsyth, Guilford, Brunswick, Rockingham, and Robeson counties in the data collection process.

Because this study is concerned with the limited-resource clientele in these counties, the Extension Administration supports their involvement in this study.

Sincerely,

Dalton H. McAfee
Assistant Administrator

DHM/w

September 21, 1993

TO: **AGENTS IN CHEROKEE, FORSYTH, GUILFORD, & BRUNSWICK COUNTIES AND FAMILY EDUCATION ASSISTANTS IN ROCKINGHAM, GUILFORD, AND ROBESON COUNTIES**

FR: **Dalton H. McAfee**
Assistant Administrator

RE: **Research Study**

As you know, Mrs. Ellen Smoak is completing the requirements for a Ph.D. in Home Economics Education at UNCG. She is now developing her research study which revolves around the identification of learning style preferences of our limited-resource clientele.
Because you are involved with the education of the adults who participate in the Family Education Program, knowledge of the way our clientele prefers to process information can help you strengthen your programming efforts. It is important for us to know not only how our clientele prefers to learn, but to also know what is necessary for them to retain certain information, resulting in change.

I am asking you, by way of this letter, to provide assistance to Mrs. Smoak as she completes her study. The procedure for obtaining information about learning style preferences is:

- She will visit with you, at your convenience, to provide you with information on learning style theory and application and how to assess learning style information with your clientele. This visit will last approximately 2 hours.

- You will administer the Learning Style Survey to your Family Education Program participants the beginning of the next three educational programs you have scheduled. The completed forms will be returned to Mrs. Smoak. The Learning Style Survey will take 5-10 minutes to complete.

As you can see, a minimum amount of your time will be involved. The information to be gleaned will help us as an organization to provide learning experiences for this clientele. Baseline information will be available regarding the learning style preferences of our clientele by various racial and ethnic backgrounds, as well as by counties.

Mrs. Smoak will contact you by October 15 to answer any questions you may have and to schedule her visit. You are encouraged to give her your support.

DHM/w

APPENDIX C

TRAINING GUIDE FOR FIELD STAFF

LEARNING STYLE PREFERENCES
UNDERSTANDING, TEACHING, AND ASSESSING

Family Education Field Staff Training

Objectives

Family Education Agents and Paraprofessionals will:

1. Assess and interpret individual learning style preferences.
2. Assess and interpret learning style preferences of their clientele.
3. Adapt new and existing curriculum materials to incorporate a variety of learning style techniques.

Learner Competencies

Family Education Agents and Paraprofessionals will:

1. Discuss the differences in learning style preferences.
2. Make adaptations needed in curriculum.

Time Frame

2 hours

Materials Needed

Individual Learning Style Inventories (PEPS)
Learning Style Inventory Homework Guide
Interpretation for the Learning Style Inventory
Handouts - MBTI Personality Dimensions and Types
How People Learn
Comparison of the Experiential Learning Model with the Problem-Solving Process
Diagnosing Learning Style

Directions for Instructional Resources
Video - Learning Style Differences
Learning Style Survey
Program Evaluation Forms

TRAINING OUTLINE

I. Understanding Individual Learning Style Preferences

Introduction to Learning Style Theory
- Jung
- Witkin
- Kolb
- Dunn & Dunn

Video - Learning Style Preferences
- Discuss video

Look at Individual Learning Styles
- Review interpretations and homework guide printout

II. Adapting Curriculum to Address Learning Style

Task Cards
Electroboards
Flip Chutes
Pic-A-Hole
Learning Circles
Contract Activity Packages

III. Assessing and Interpreting Learning Style Preferences

Using the Learning Style Survey

PART I - UNDERSTANDING INDIVIDUAL LEARNING STYLE PREFERENCE

INTRODUCTION TO LEARNING STYLE THEORY

Introduction

There is no single, all-encompassing definition of learning style. Studies of the way people learn were originally concentrated in the psychological field as psychologists attempted to show a relationship between cognitive style (defined as distinctive ways of living in the world) and intellectual ability. In the 1970's David Kolb looked at learning style as important to the educational process.

Now, two views or learning style widely recognized by educators are Kolb's Experiential Learning Model and Dunn & Dunn's Environmental Learning Style Theory. We will discuss these approaches to learning style and we will use some of the suggestions and recommendations in the Dunn & Dunn model to adapt some of our Extension curriculum.

However, before we do that, it is important to look at the development of learning style and why it is so important for Extension to be concerned with the way people learn and retain knowledge.

Carl Jung's Personality Types

Carl Jung set the stage for looking at the possibility of a relationship between psychological types and cognitive style differences in the early 1920's. He believed that people have patterns of behavior that are comfortable to them and are predictable. He also believed that if a person is psychologically healthy, then he is capable of understanding what has been experienced.

Jung identified two ways people use to view and internalize people and situations: through the senses and through intuition. Those who use their senses observe the actual happening. To them, seeing is believing, and they stick to what they see. This function of sensation allows an individual to observe, gather facts, and focus on practical actions.

People who rely on intuition usually gain a different understanding of possibilities and relationships. Because intuition allows for a clear interpretation of sensual experiences by helping read subtleties, body language, and tone of voice, those who understand through intuition gain a different understanding of people and situations. Images that are created

in the mind allow for the observation of problems in original and creative ways.

Everyone uses both senses and intuition in our behavioral practices; however, individually, we each have a preference for the way in which we approach and view life. We associate more with those who share our preference and are confused by those who do not understand the way we do.

Two functions associated with sensing and intuition are thinking and feeling. Thinking involves analyzing information, data, situations, and people through application of a logical, rational process. The thinker takes pride in remaining cool, calm, and collected, and will search deeper if a decision is difficult. Accuracy and thoroughness are important to the thinker who is able to trust objectivity, data, logic, and rationality.

One of the most important points Jung made regarding these basic human functions of sensing, intuition, thinking, and feeling is that no special value is placed on any one of the approaches to perception or decision-making. Although each person has a preferred approach, situations may require a different process.

Jung further described people as either extraverts - those who are comfortable interacting to things external to us as people, situations, or experiences, or introverts - those who are more comfortable with the internal world of their own minds, hearts, and souls. As with sensing versus intuition and thinking versus feeling, everyone functions in both extraverted and introverted ways, with one pattern being more typical for each individual. Extraverts often explore their thoughts by talking or doing and thinking aloud. Introverts are more likely to reflect thoughts and actions, and are slower to act because they translate their internal thoughts externally only when ready to do so. Extraverts and introverts usually do not understand each other, which causes problems when they try to work together.

The most well-known adaptation of Jung's theories is the Myers-Briggs Type Indicator, the MBTI, which is a psychological instrument designed to help people learn their personality type. This instrument is a forced-choice questionnaire that allows people to measure their own balance of intuition versus sensing, of thinking versus feeling, and of extraversion versus introversion. The MBTI produces 16 different personality types.

Myers and Briggs also believed that people also have a preference for either judging or perceiving. Judgers are those who prefer to bring closure or regulate life. Perceivers are those who are open-ended and desire to understand life.

(Handout 'MBTI - Personality Dimensions and Types')

The handout I am giving you shows the 16 personality types determined by the MBTI. If you have any questions regarding the MBTI or Jung's theory, let's discuss them at this time. If not, we will now move on to Herman Witkin and his field-dependence/independence.

Herman Witkin's Field-Dependence/Independence

By the end of the 1940's, Herman Witkin began to explore the idea that people have distinctive perceptual characteristics and that they vary in their abilities to differentiate objects from their backgrounds. These differences are described as field-dependent or field-independent. A field-dependent person needs to have the situation clarified and every component spelled out prior to action or reaction. A field-independent person, on the other hand, will respond quickly as her perceptual ability is not dependent on anyone or anything else.

(Handout - 'How People Learn')

Look at the handout I am now giving you. This comparison of field-dependent and field-independent learners clearly shows the differences between the two perceptual characteristics. Do you have any questions about Witkin's theory? If not, we will now look at experiential learning.

David Kolb's Experiential Learning Model

Experiential learning is based on the idea that learning style preferences are developed based on experience. It involves four components:

1. Communication - appropriate and adequate communication is necessary for learning. New information or knowledge are novel. Information that is already known is redundant. But, redundant information helps with the assimilation of novel information, enhancing the learning process.

2. Perception - the way in which a learner processes information is based on how the information is perceived. Learning is seen as a four-stage cycle: the learning process begins with an experience, observation of the experience is made, abstract generalizations of the observations are developed, and the generalizations are revised and tested in new experiences.

3. Arousal - the degree to which the cortex of the brain is activated prompts learning activity. Variety in teaching approaches can be stimulating and can incorporate a number of learning styles.

4. Motivation - motives are seen as internal needs, wants, drives, or impulses that are directed toward goals which are either conscious or sub-conscious. The strength of our motives determines the intensity of our motivation. Learning does not progress without sufficient motivation.

(Handout - 'Comparison of the Experiential Learning Model with the Problem-Solving Process')

The handout I have just given you shows Kolb's Model. Observe that this model is divided into four quadrants. These quadrants define the individual learning styles outlined by Kolb.

The first quadrant is the diverger, which emphasizes concrete experience and reflective observation. The diverger has the ability to view issues and problems from a variety of perspectives because her strengths lie in imaginative abilities, brainstorming approaches, and generation of ideas and alternatives.

Assimilator is the second quadrant. This quadrant is dominated by an interplay between reflective observation and abstract conceptualization. The assimilator is more interested in the logic of ideas and theory rather than practical application to specific problems, making his greatest strength inductive reasoning, the ability to create theoretical models. and to assimilate distinct observations into an integrated explanation.

The third quadrant is the converger, whose dominant learning ability is the ability to conceptualize in abstract ways, easily combining the conceptualization with active experimentation. They tend to use deductive reasoning and they apply their ideas in a practical and highly organized manner. Their greatest strengths include their approach to problem solving, decision making, and the practical application of ideas.

The accommodator is the fourth quadrant. This learner is a risk taker who exhibits abilities in concrete experience and active experimentation. The greatest strengths of accommodators are doing things - "hands-on" experiences - in carrying out plans and in getting involved in new experiences. They tend to gravitate to situations where they must adapt to immediate and changing situations, through opportunity seeking, risk taking, and action. If the theory or plans are incompatible with facts, the accommodator is likely to discard the theory or plan. Because people in this quadrant rely on other people for information rather

than on their own analytic ability, they most often solve their problems in an intuitive trial-and-error manner. They are generally at ease with people but sometimes appear to be impatient and even "pushy."

Although all learners move through each phase in the cycle one style is dominant with each person. Because the learning abilities overlap with the learning styles, the learner has an opportunity to pursue styles that are adjacent to her preferred style.

This learning cycle is continuously recurring. When practiced in sequence, experiential learning is most effective. Kolb believed that not completing the cycle thwarts the learning process, resulting in partial learning.

In order for any type of learning to be successful the learner must have a clear understanding of felt needs and goals. When personal objectives are unclear, learning is likely to be erratic and incomplete. By having an understanding of what is to be accomplished, the learner will seek experiences that are related to the goals and interprets them with these goals in mind. He is then able to form concepts and test the concepts that are relevant to the expressed needs and goals. The learning cycle can then be completed.

We will discuss any questions you may have at this time. If there are none, we will proceed. The final learning style theory we will explore is the Dunn & Dunn Environmental Preference theory.

The Dunn & Dunn Productivity Environmental Preference Survey (PEPS)

Rita and Kenneth Dunn became involved with learning style theory in the late 1960's when they were asked to help teachers develop ways to help educationally disadvantaged students to learn. Working with teachers, administrators, parents, and the students, they came to realize that some children responded well to certain methods of instruction and others did not. As they refined their work they found that learners are affected by four basic stimuli: environmental, emotional, sociological, and physical. These four stimuli contain elements which affect a learner's ability to gain knowledge, values, facts, or concepts. The Dunns ultimately developed an adult version of their learning style model which is called the Productivity Environmental Preference Survey, or PEPS.

In order to know the ways in which adults learn and function, it is necessary to understand the stimuli and the elements contained in them.

(Handout - 'Diagnosing Learning Style')

The handout I have just given you shows the stimuli and the elements they contain. Let's look at each of them.

Environmental - The elements found in this stimuli include sound, light, temperature, and design. Each of these elements may affect learning in different degrees. For instance, one person may prefer very bright, fluorescent light while another is more comfortable in soft light. Some people may find it difficult to learn when there is noise, others may be able to block out sound. Tolerance to temperature may also vary from person to person, with some preferring warm conditions, others preferring it to be cooler. The design element refers to the arrangement and comfort of the furniture in a formal or informal manner. Formal arrangements may include hard table and chair or use of a desk which may include a lounge, bed, the floor, or an easy chair. It may also be possible that the design needs may vary according to the type of learning activity being conducted.

Emotional - The elements in this stimuli include motivation, persistence, responsibility, and structure. Learners who are motivated are eager to learn. If they are told what to do and understand what is expected of them, they will be able to accomplish their tasks successfully. On the other hand, unmotivated learners are often unenthusiastic about learning because they have had problems achieving. These learners must be given assignments that complement their strengths, such as listening to cassette tapes rather than reading, if the learner prefers not to read. Persistence is closely related to motivation. Some learners are able to work at a task until it is completed, seeking assistance if problems arise. Other learners have difficulty staying on task and working until it is complete. A third related element is responsibility. Some learners are capable of follow-through on assigned tasks without direct or frequent supervision. Others are not as responsible and they allow their attention to be diverted. Most of the time, less responsible learners usually do not seek assistance if they are having problems learning. These learners often become discouraged and lose confidence in their abilities to learn. The fourth emotional element is structure. This involves having specific rules and guidelines for working on and completing tasks. It limits the options a learner may have when working toward the achievement of a specific goal. Some learners are capable of working without mandated guidelines and find that learning is frustrating and unstimulating when they are required to follow specific rules. Others find that is equally difficult to achieve without a rigid structure. Learners who are motivated, persistent, and responsible are usually capable of making decisions. These learners do not require structure or supervision. The unmotivated learner is most often lacking in persistence and responsibility and has difficulty with responsible decision-making. This learner most often requires structure.

Sociological - This element includes the ways in which learners respond to, react, and interacts with their peers, themselves, a pair (self and one other individual), a team, adults (teachers or leaders), and varied groups of people. There is no best or preferred way in which an individual learns. Fear of failure, embarrassment, or inability to understand often cause a learner to become too tense to concentrate. Some people are more comfortable working one-on-one with another person, others may be better able to learn in a group setting. Because all learners have preferred ways of functioning it is important that the teacher or leader allow each individual to work dependently or independently to the extent possible to ensure maximum achievement.

Physical - Elements found in the physical stimuli include perceptual, intake, time, and mobility. Although educators acknowledge that people learn through their different sensed, it is estimated that 90 percent of all teaching occurs through lecture and question and answer. However, only 20 to 40 percent of all learners learn best by listening. Learners are tactual - the sense of touch allows them to understand meanings through a "hands-on" approach to learning. Kinesthetic learners must be allowed to move about while processing information. And, there are learners who require that a combination of the senses be used in the learning process. Intake is the second physical element. Some learners may have a need to take periodic breaks for food or drink. Others may need to smoke or chew gum as they concentrate. Still others may not need to refill or refresh themselves in any way. Intake may serve two purposes: the food that is ingested during learning may replace the energy that is being expended during the learning process, and intake may help in reducing any tension that may be experienced when a person is concentrating. Time is the third physical element. People function best at all times of the day or night. When it is possible, the instructional environment must be arranged to permit a wide arrangement of peak time functioning to give all learners an opportunity to perform efficiently. The fourth physical element is mobility, which is the need to move around during the learning environment. Some learners need to be allowed a great deal of movement while others are capable of learning without moving around during the process. Regardless of their needs, most learners are unable to control their need to move about while learning.

The research I am conducting is based on the Dunn & Dunn Learning Styles Model. An adaptation of this model for our limited-resource clientele is the appropriate instrument to use to determine a learning style profile of our audience.

* * * * * * * * *

VIDEO - LEARNING STYLE PREFERENCES

The video we will now see is a program based on the Dunn & Dunn Learning Style Model. It was developed and produced by high school students in South Carolina.

(Video)

Does this help you to better understand the differences in approaches to learning? What are your thoughts regarding this video?

* * * * * * * * *

LOOKING AT INDIVIDUAL LEARNING STYLE PREFERENCES

Now we will look at your individual learning style preferences. The Learning Style Survey you completed is the Dunn & Dunn Productivity Environmental Preference Survey or "PEPS". They have been analyzed. Let's look at the results.

(Pass out Learning Style Inventory Homework Guide and Interpretation)

The Learning Style Interpretation defines each portion of the Learning Style Survey. The Homework Guide and the synopsis of your scores define the way you prefer to learn. In developing an understanding of the scores it is important to know tat if any score is **below 40** or **above 60,** then it is considered extreme for that particular item.

Take a few moments to review your guide.

Do you understand the interpretation? Do you agree with the results?

Before we move on to the next phase of our training, let's clear up any confusion or problems you have based on the information you have received so far.

If there are no further questions, we are now ready to look at ways you can adapt existing curriculum and ideas for incorporating these suggestions into new curriculum.

PART II - ADAPTING CURRICULUM TO ADDRESS LEARNING STYLE

IDEAS FOR CURRICULUM

We have talked about the importance of knowing learning style preferences when you plan educational experiences for our clientele. Now it is time to put that knowledge into practice. I am going to show you a few approaches to curriculum development and adaptation that will help introduce variety into your programming process. These techniques are appropriate for adults as well as children and youth.

(Handout - Directions for Instructional Resources)

Let us look at each of these adaptations in the order they are presented in your handout:

1. Task Cards
2. Electroboards
3. Flip Chutes
4. Pic-A-Hole
5. Learning Circles
6. Contract Activity Packages

Do you have any questions about some of the ways you can adapt your curriculum to incorporate a variety of learning styles?

* * * * * * * * *

PART III - ASSESSING AND INTERPRETING LEARNING STYLE PREFERENCES

USING THE LEARNING STYLE SURVEY

(Hand out Learning Style Survey)

This Learning Style Survey is a modified version of the PEPS which you have taken. The statements have been condensed to a total of 15, rather than the 100 that you had to respond to. The graphics have been added for the benefit of our low-level readers. They will visually help interpret the statements.

Procedure

1. After today's training, you will give this survey to the participants in the next **three** educational programs you have scheduled. They will complete the surveys and give them back to you.

2. Once everyone has a chance to complete the survey, you will present your educational program as planned. Following that, you will have the participants to complete the brief evaluation form.

3. Both the surveys and the evaluation forms will be returned to me as soon as you complete each program.

4. The identification numbers on the forms are for my purpose only. They identify counties, not individuals. At no time will I know the names of the participants. If you wish, you may keep a list of names of participants in each of your programs.

5. Once I have completed my study and analyzed the data, I will be able to provide you with a profile of the learners in your county. I will also be able to determine if differences exist between counties or regions of the state, what cultural differences exist, if any, or if our audience has similar learning preferences across the board.

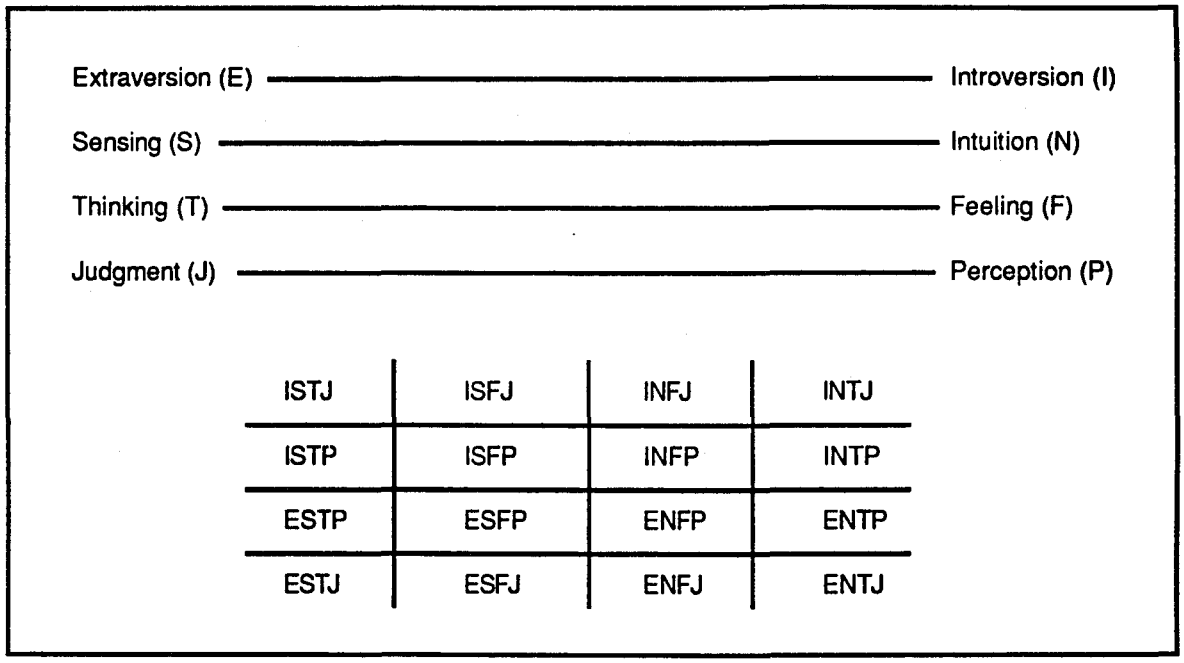
HOW PEOPLE LEARN

BY

HERMAN WITKIN

Field Dependence	Field Independence
Perceive globally	Perceive analytically
Experience in a global fashion, adhere to structures as given	Experience in an articulated fashion, impose structure or restrictions
Make broad general distinctions among concepts, see relationships	Make specific concept distinctions, see little overlap
Have a social orientation to the world	Have an impersonal orientation to the world
Learn material with social content best	Learn social material only as an intentional task
Attend best to material relevant to own experience	Interested in new concepts for their own sake
Seek externally defined goals and reinforcements	Have self-defined goals and reinforcements
Want organization to be provided	Can self-structure situations
More affected by criticism	Less affected by criticism
Use spectator approach to concept attainment	Use hypothesis testing approach to attain concepts

MBTI PERSONALITY DIMENSIONS AND TYPES



ISTJ	ISFJ	INFJ	INTJ
ISTP	ISFP	INFP	INTP
ESTP	ESFP	ENFP	ENTP
ESTJ	ESFJ	ENFJ	ENTJ

DIRECTIONS FOR INSTRUCTIONAL RESOURCES

Package includes instructions for:

Task Cards

Electroboards

Flip Chutes

Pic-A-Hole

Learning Circles

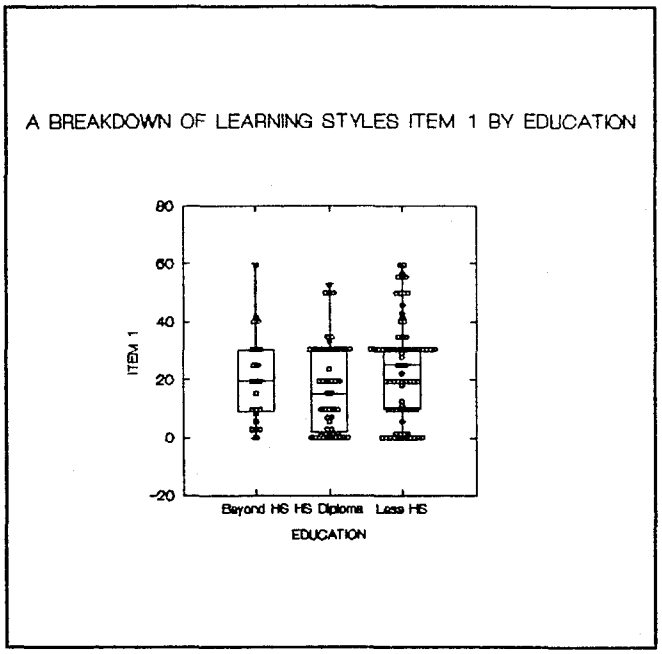
Contract Activity Package

APPENDIX D

BOX-AND-WHISKER GRAPHS OF EACH ITEM ON THE LEARNING STYLE SURVEY BY EDUCATIONAL ATTAINMENT LEVELS, RACE/ETHNIC ORIGIN, AND COUNTY

Environmental Stimuli - Educational Level

Noise Level



Light

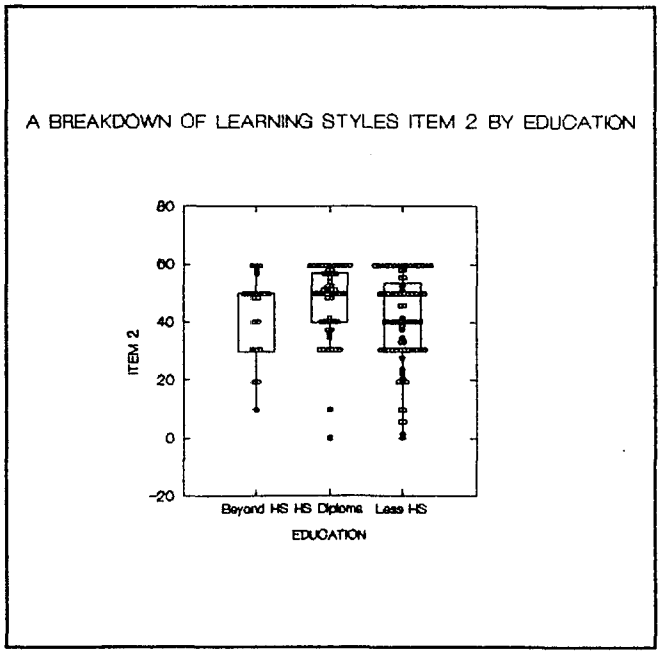
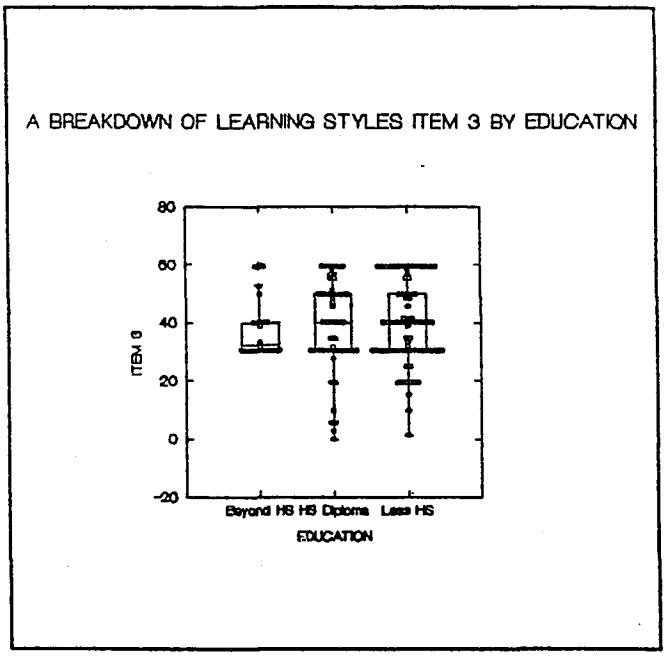
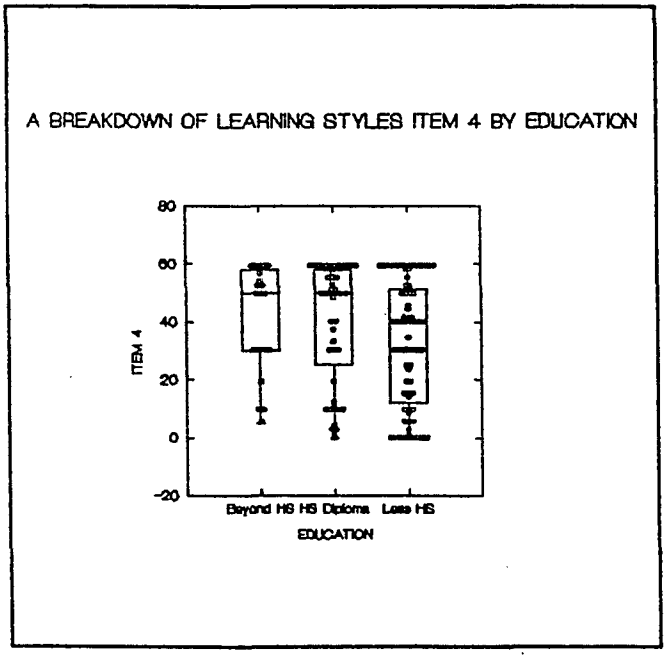


Figure 1. Box-and-whisker plots by educational attainment

Temperature



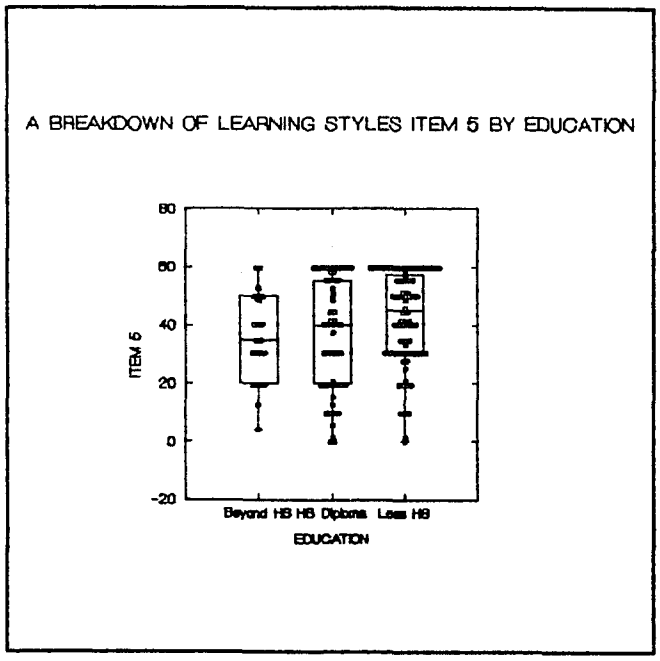
Design



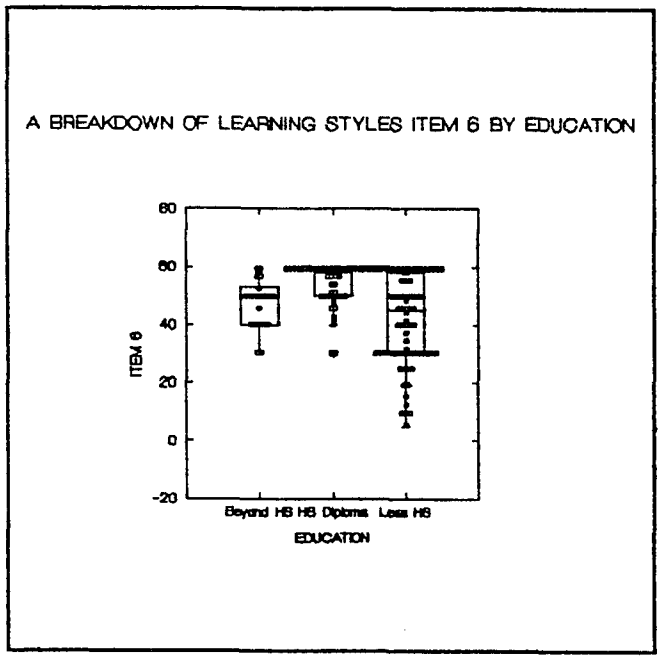
(Figure 1. continued)

Emotional Stimuli - Educational Level

Routine/Variety

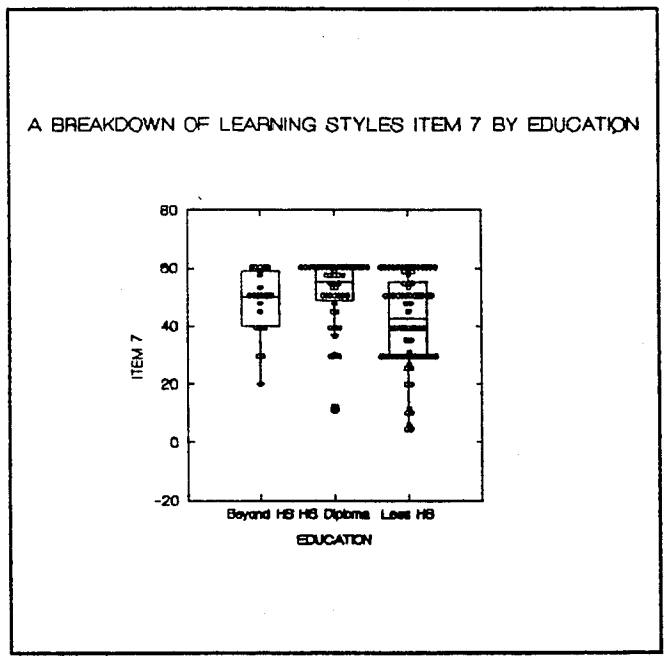


Motivation

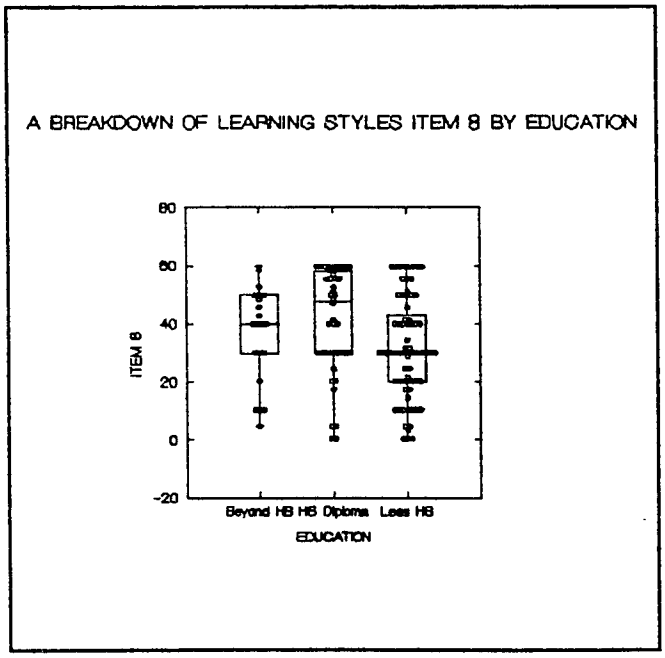


(Figure 1. continued)

Persistence



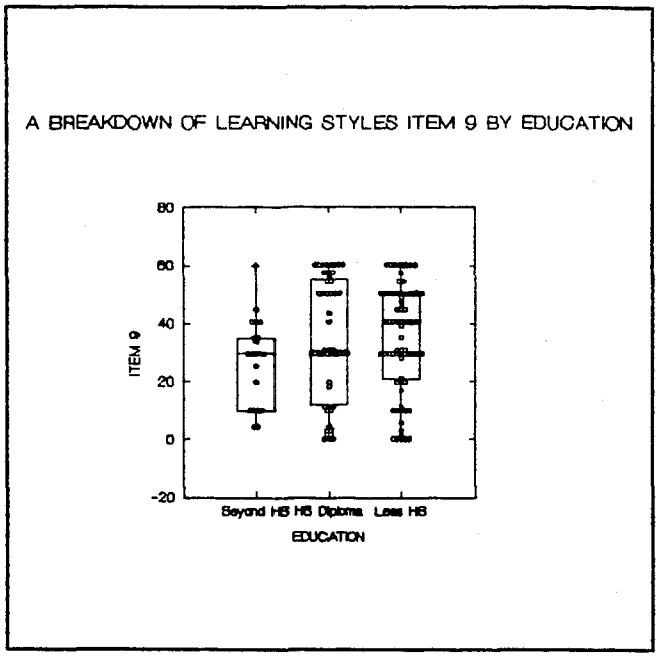
Structure



(Figure 1. continued)

Sociological Stimuli - Educational Level

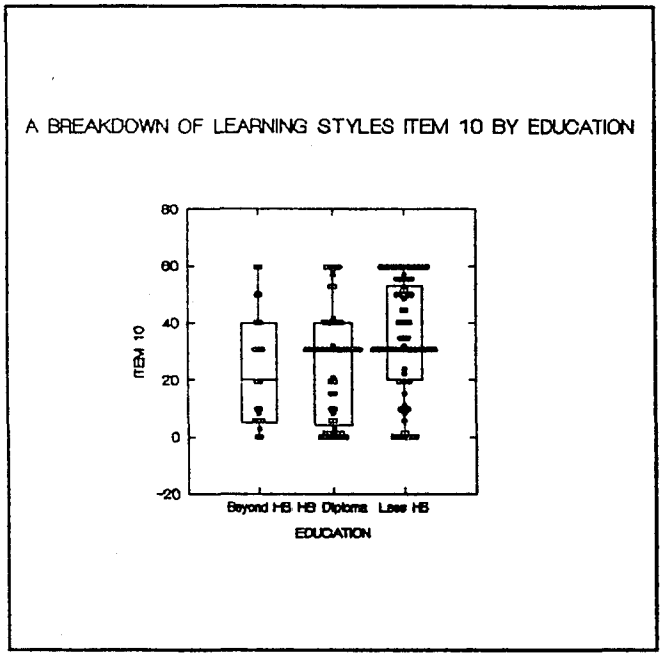
Alone/Peer



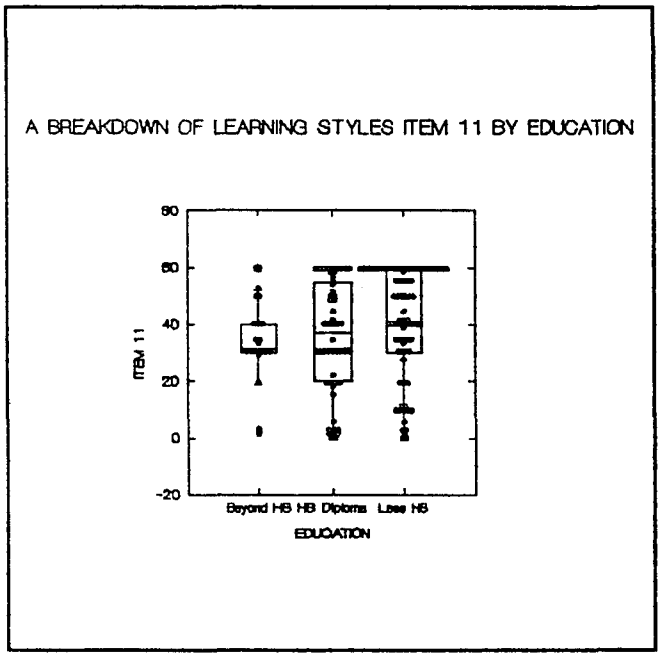
(Figure 1. continued)

Physical Stimuli - Educational Level

Time of Day

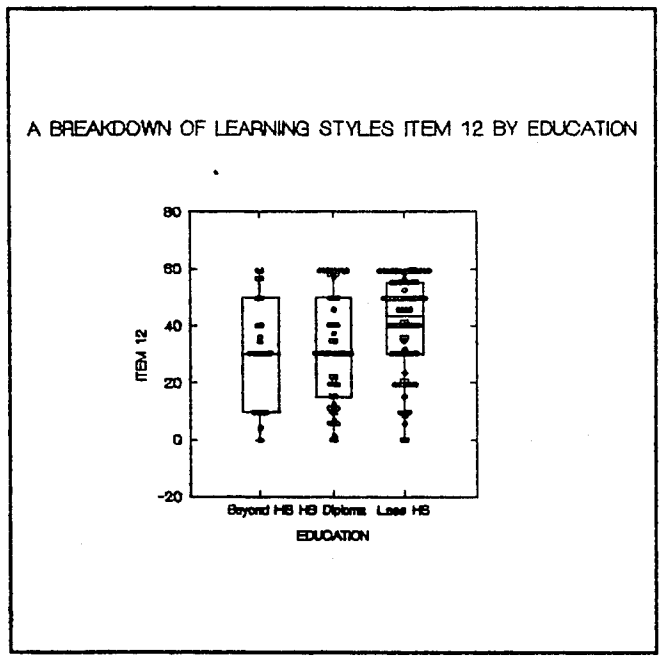


Intake

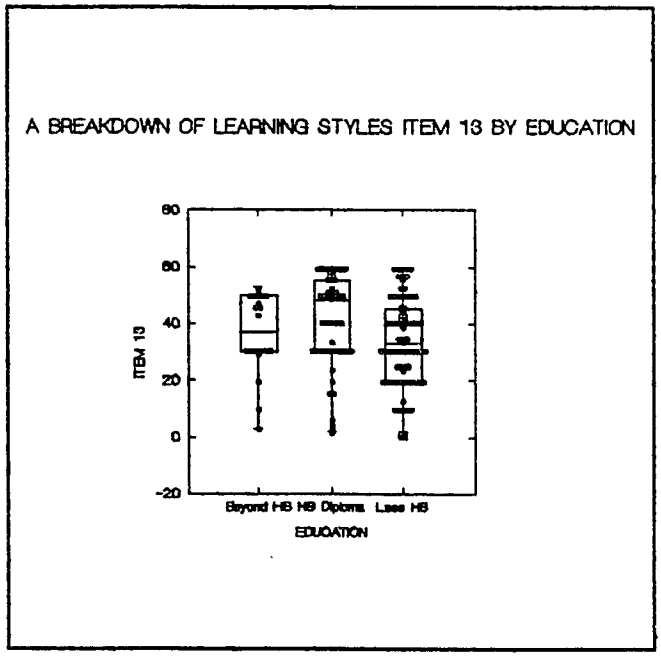


(Figure 1. continued)

Mobility



Auditory



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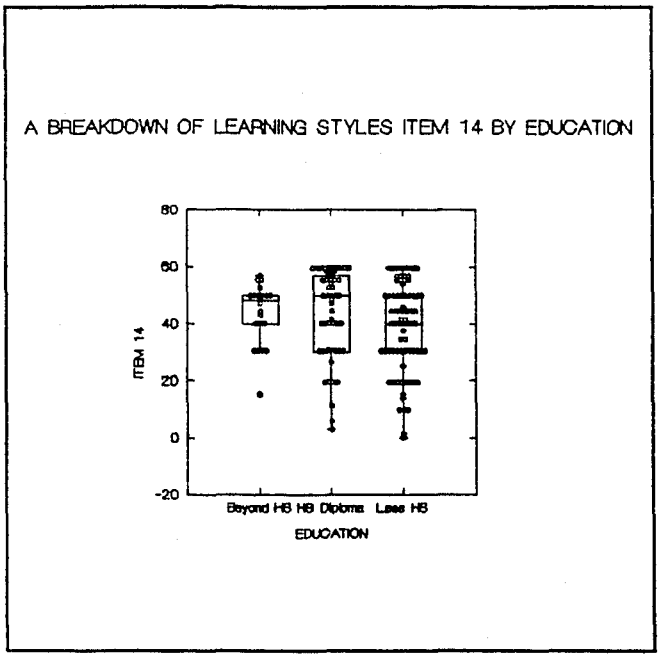
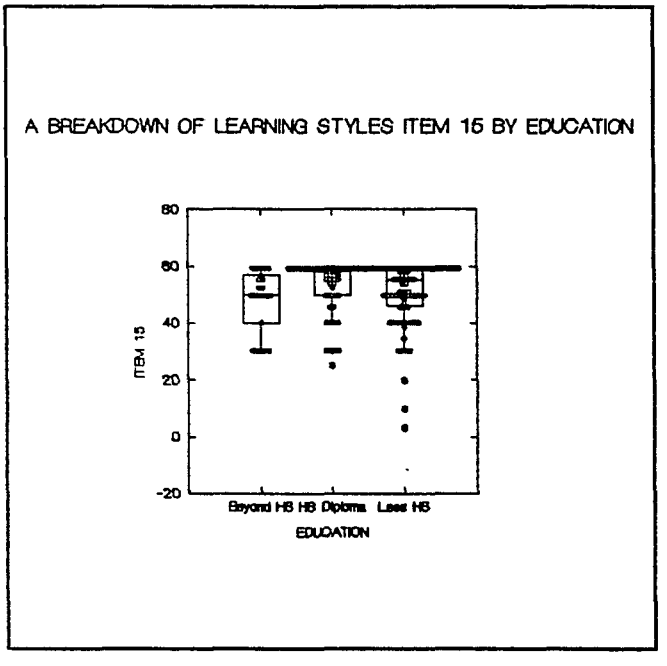
Visual



Tactile/Kinesthetic



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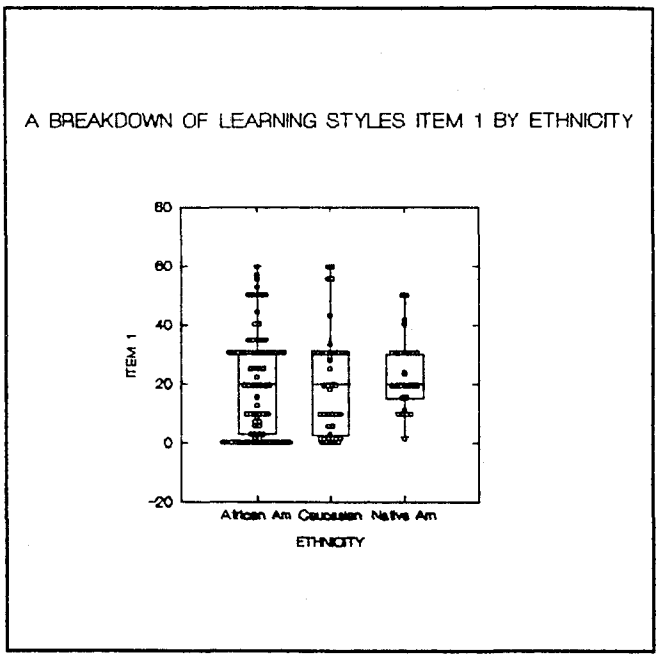
Environmental Stimuli - Race/Ethnic Origin

Noise Level



Light

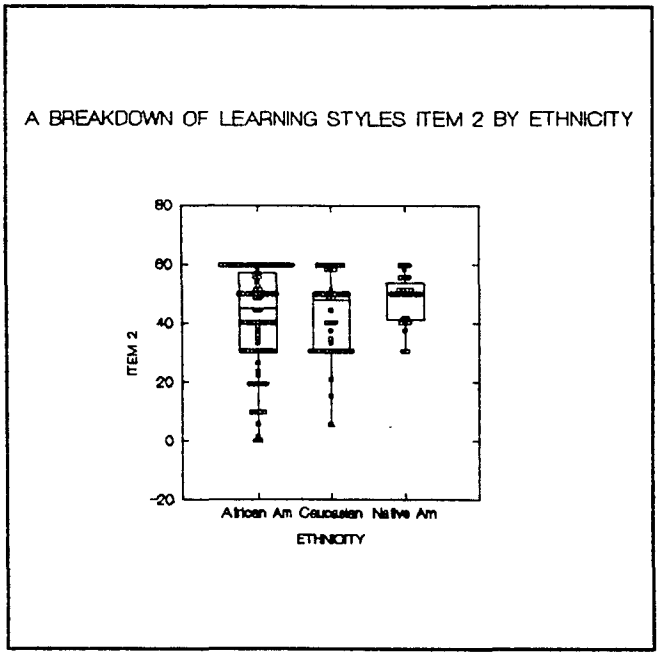
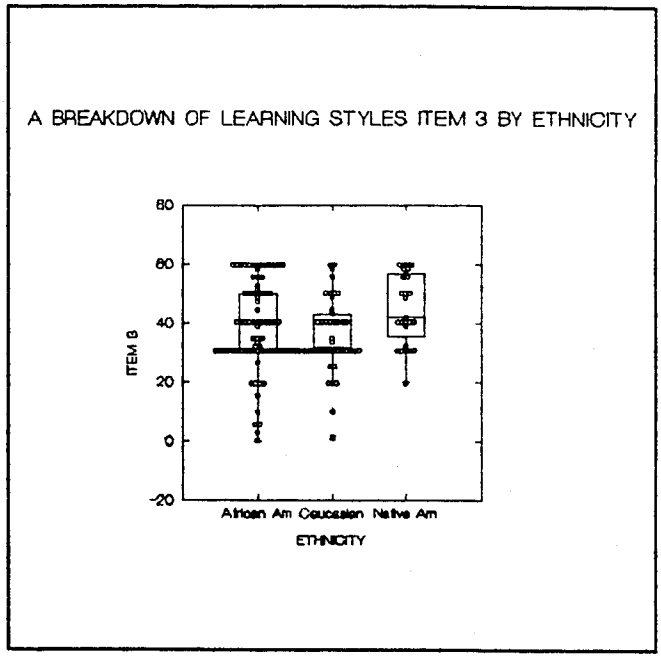
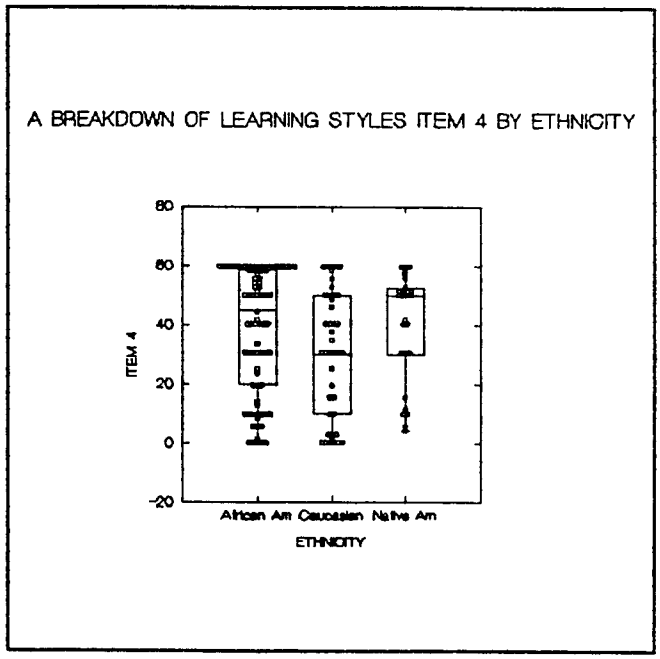


Figure 2. Box-and-whisker plots by race/ethnic origin

Temperature



Design



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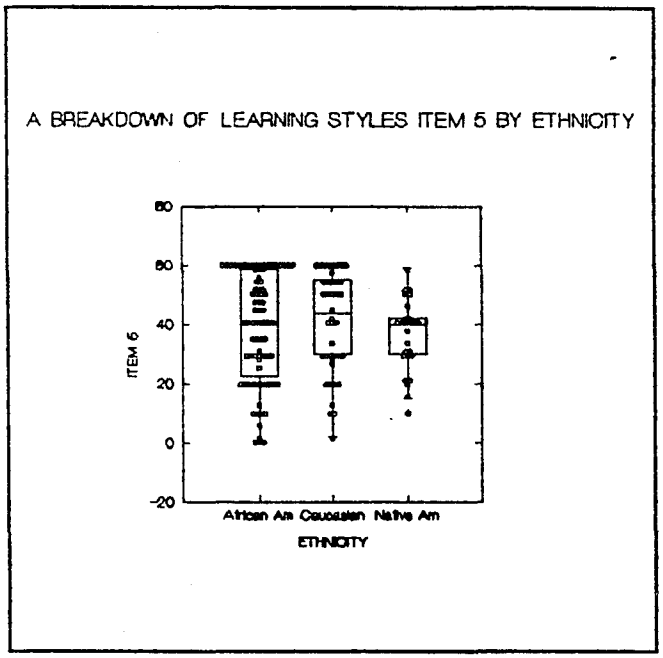
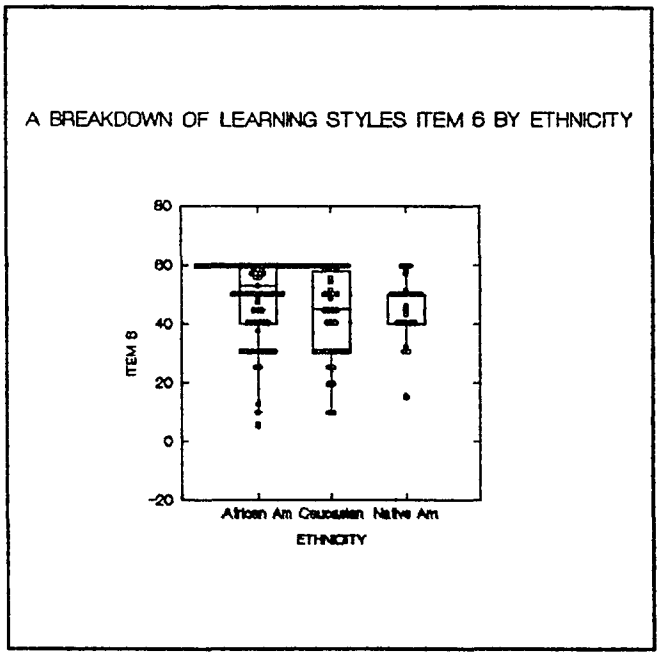
Emotional Stimuli - Race/Ethnic Origin

Routine/Variety



Motivation



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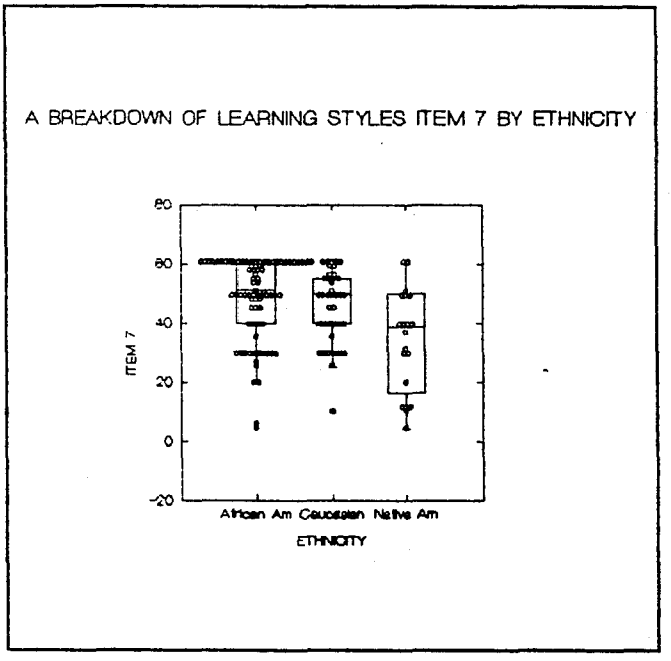
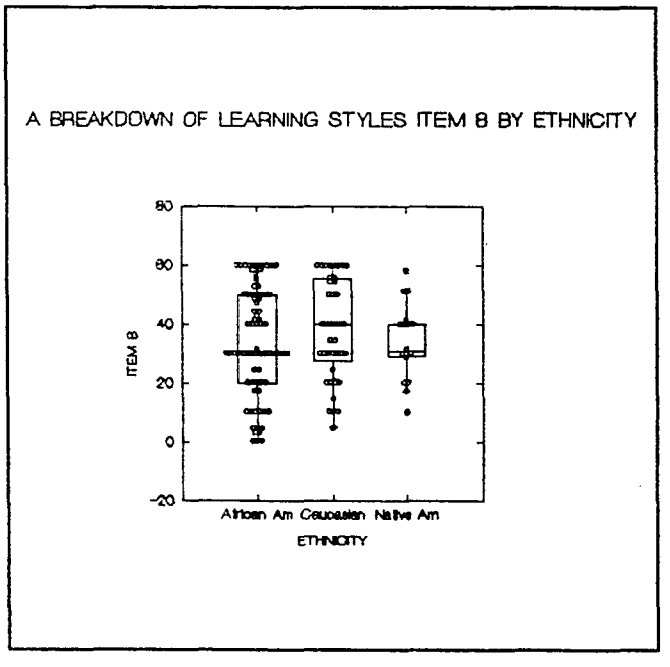
Persistence



Structure



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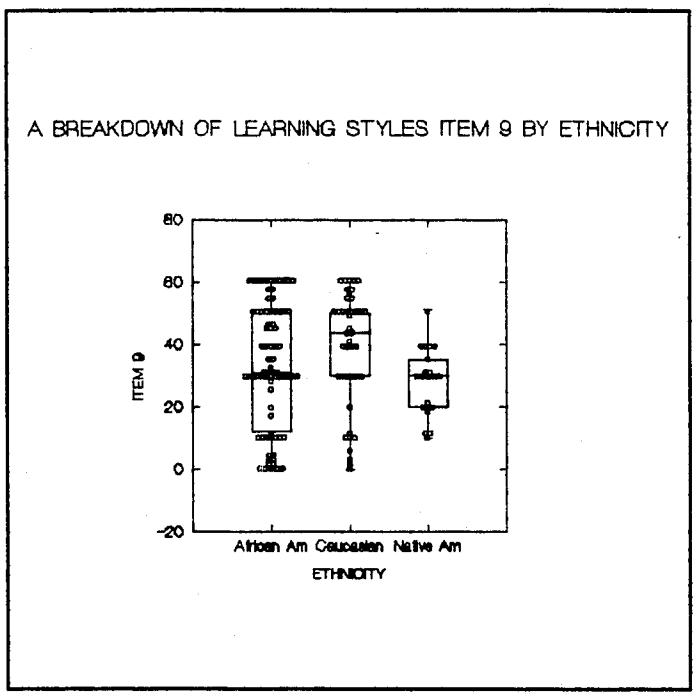
Alone/Peer



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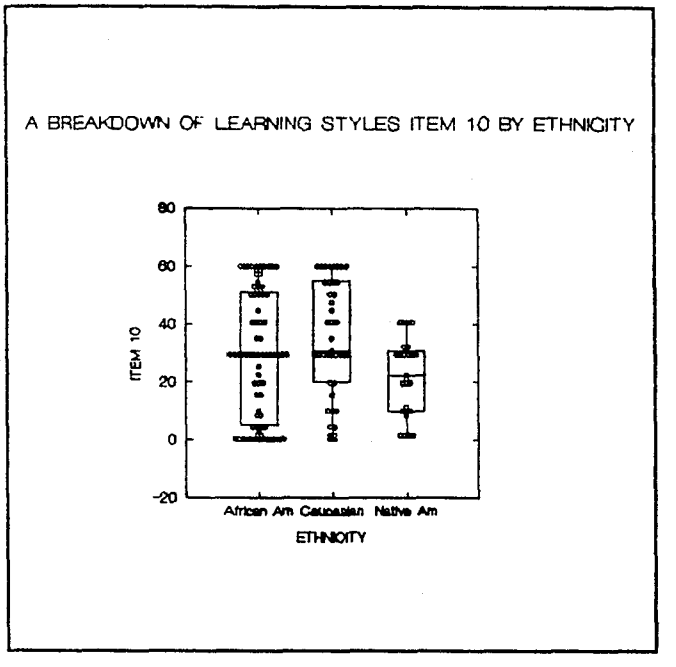
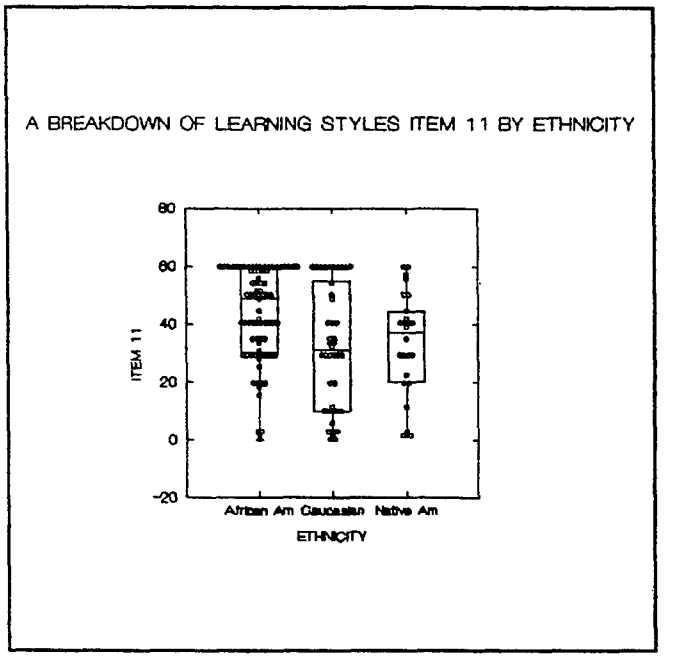
Physical Stimuli - Race/Ethnic Origin

Time of Day



Intake



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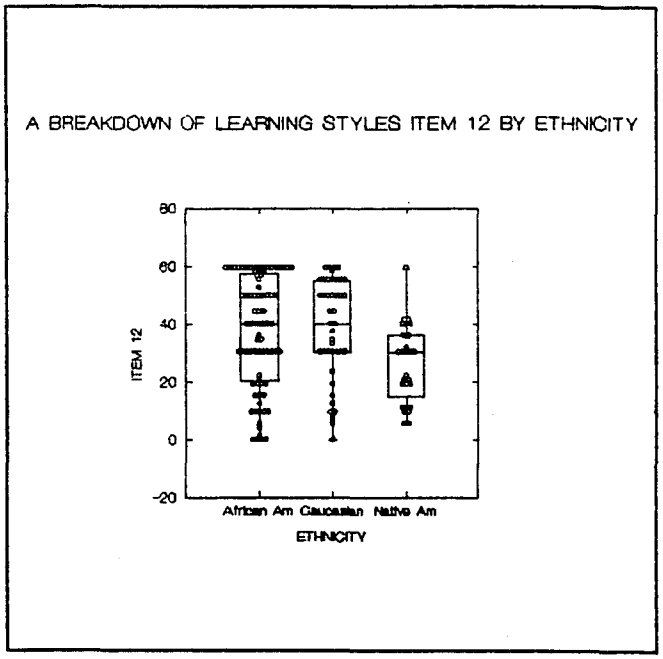
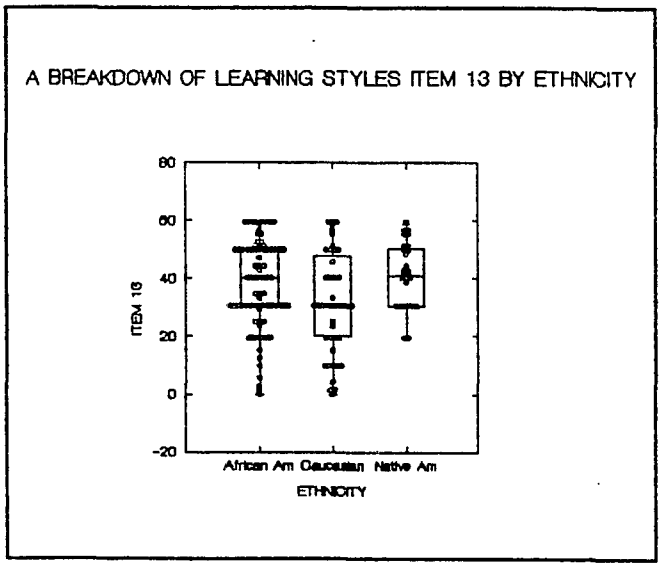
Mobility



Auditory



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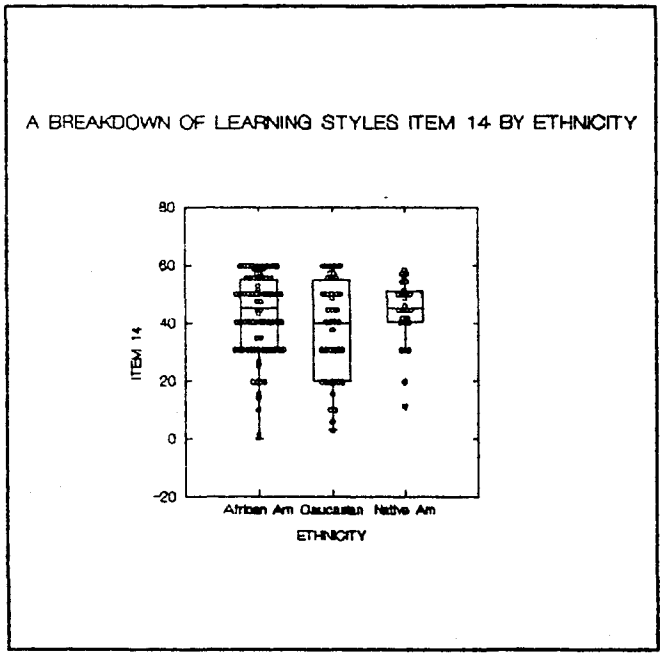
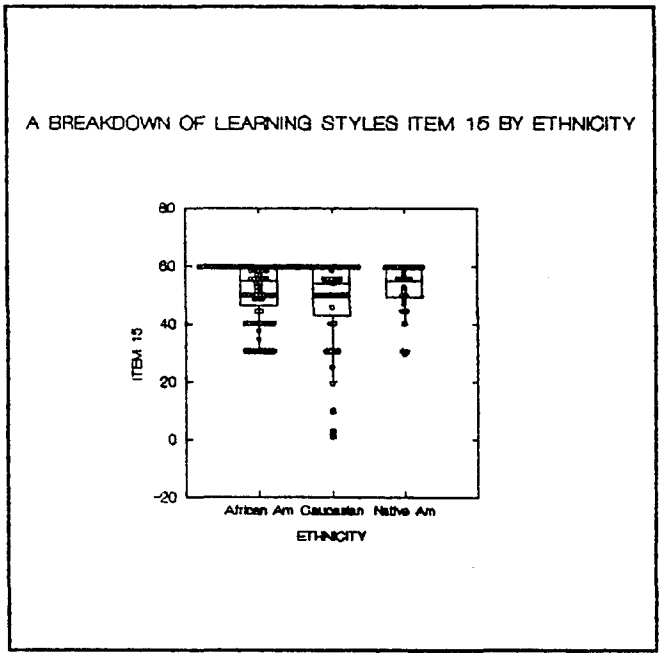
Visual



Tactile/Kinesthetic



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Environmental Stimuli - Age

Noise Level

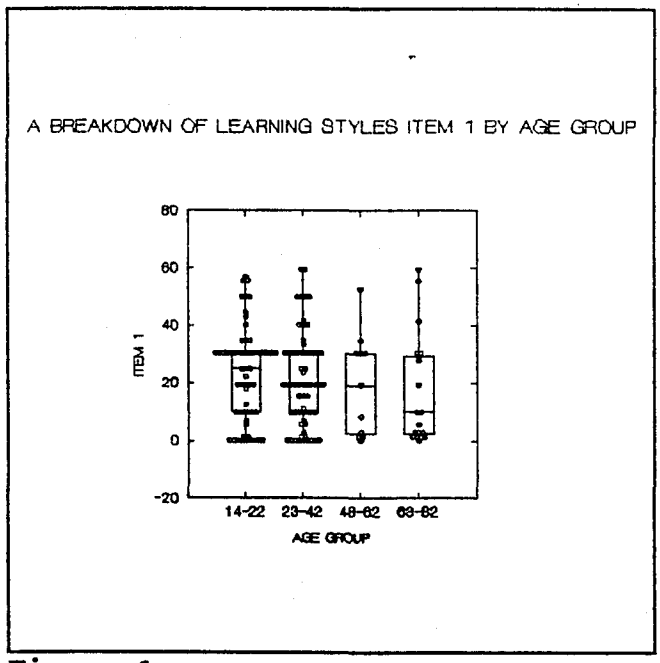


Figure 1

Light

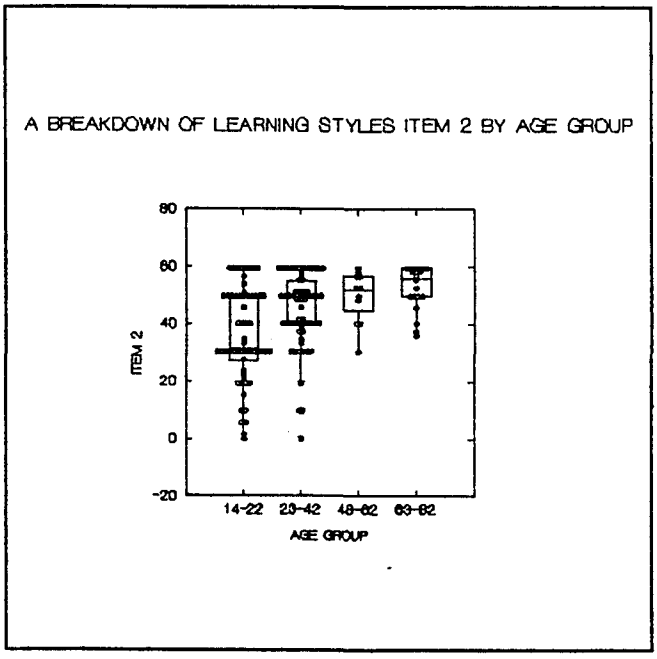
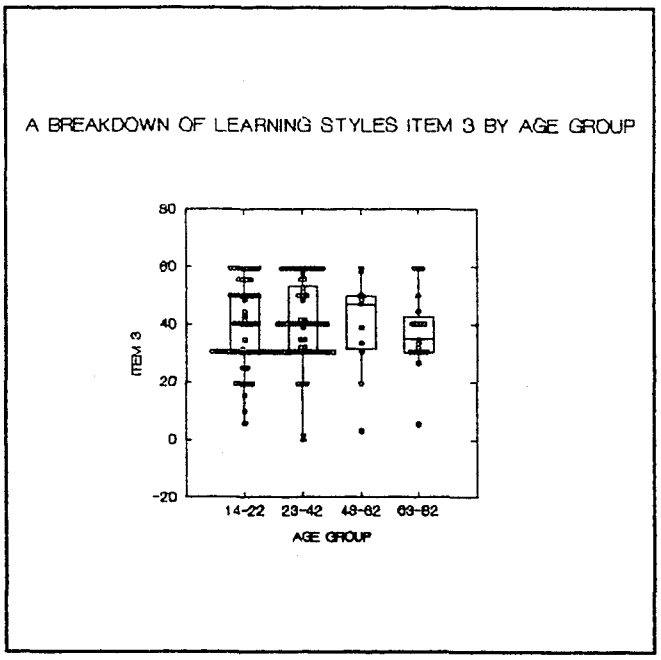
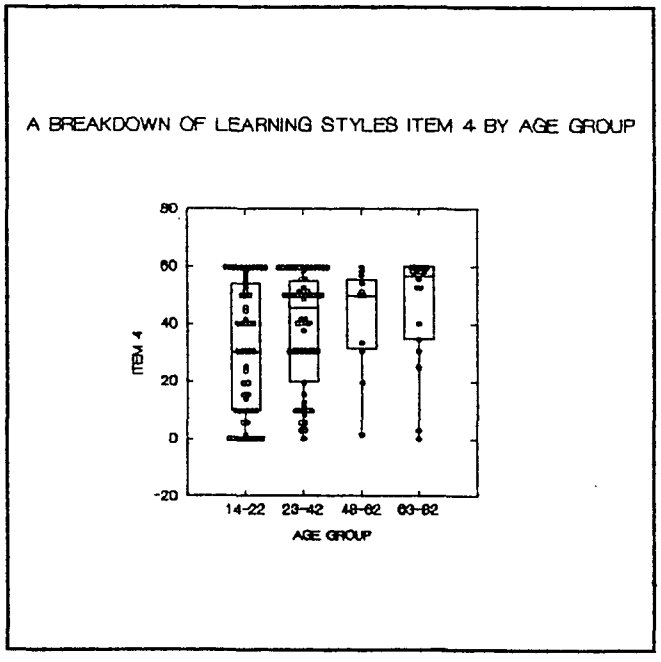


Figure 3. Box-and-whisker plots by age

Temperature



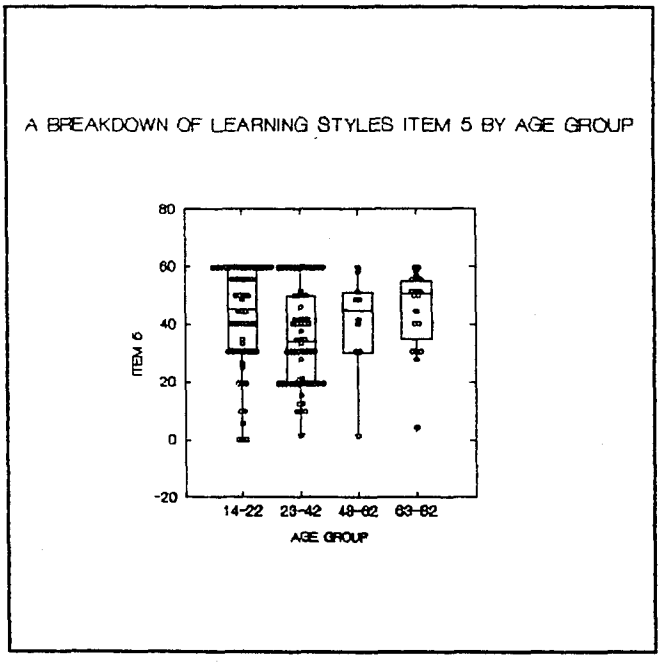
Design



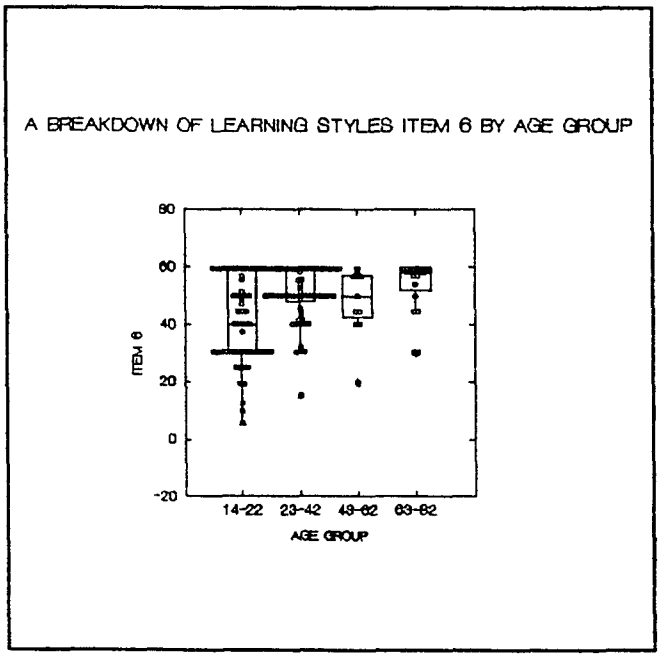
(Figure 3. continued)

Emotional Stimuli - Age

Routine/Variety

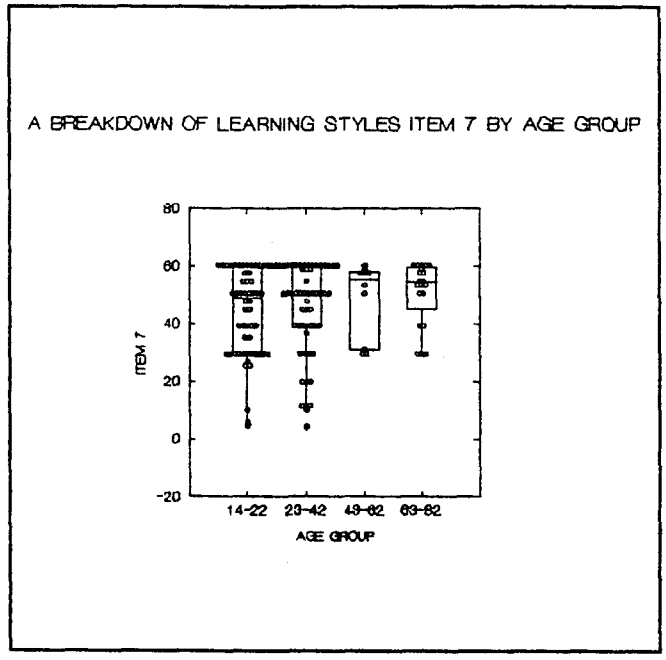


Motivation



(Figure 3. continued)

Persistence



Structure

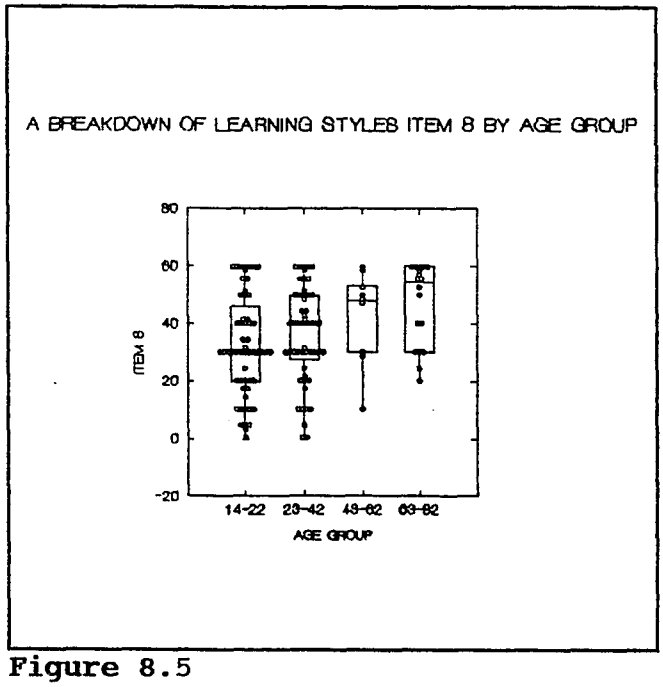
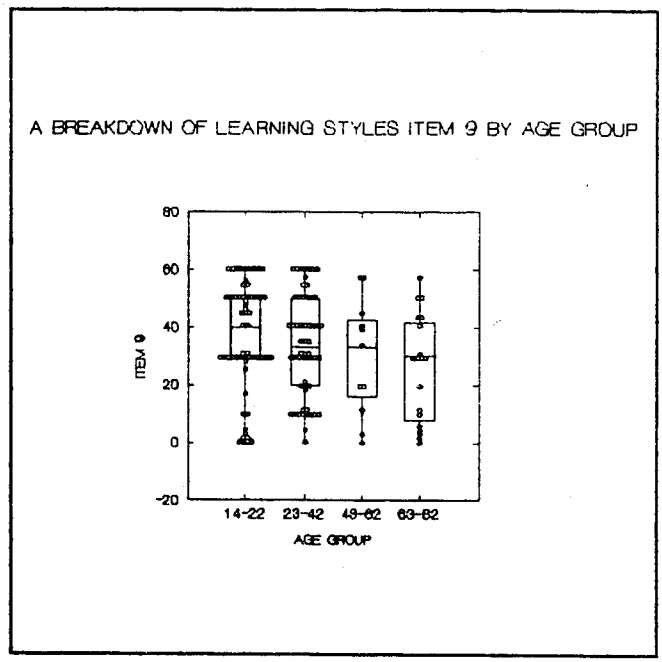


Figure 8.5

(Figure 3. continued)

Sociological Stimuli - Age

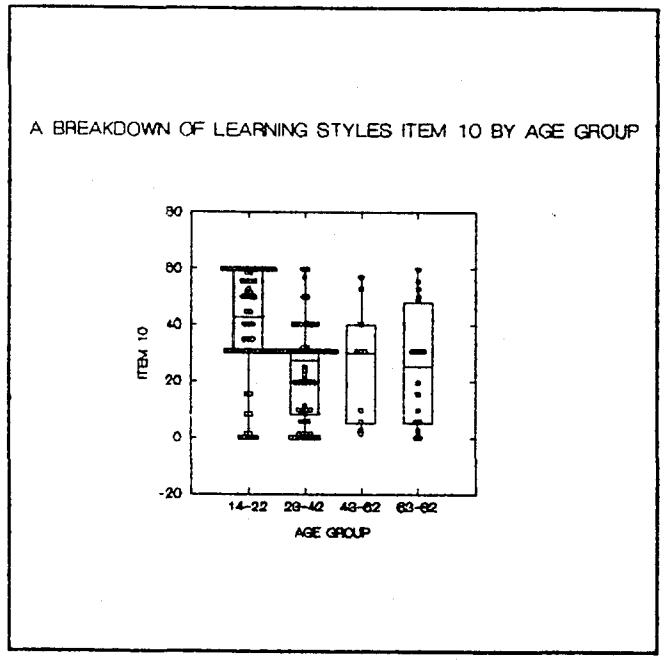
Alone/Peer



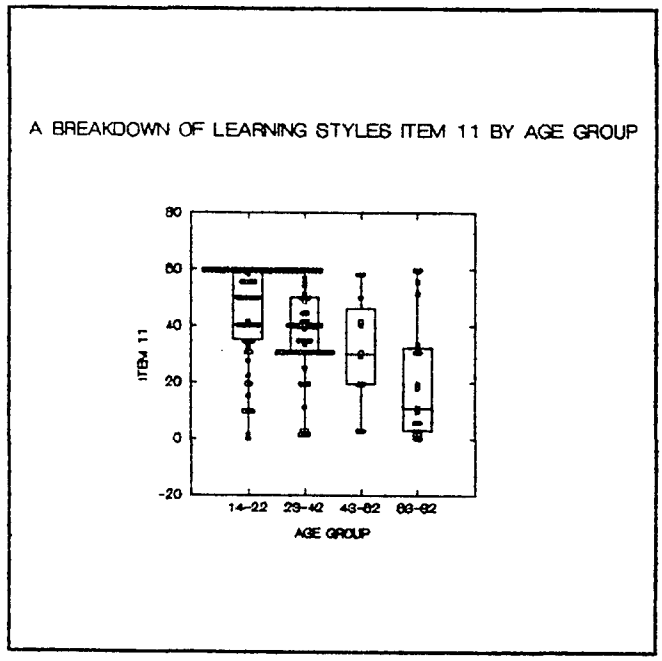
(Figure 3. continued)

Physical Stimuli - Age

Time of Day

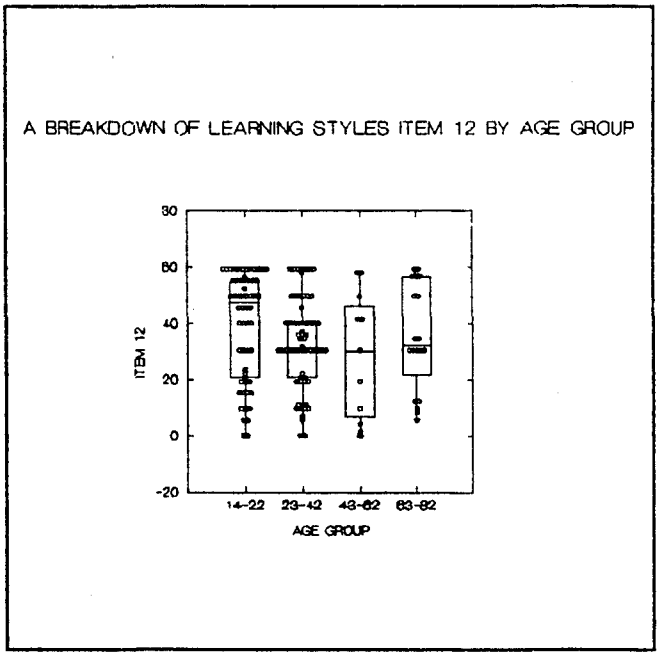


Intake

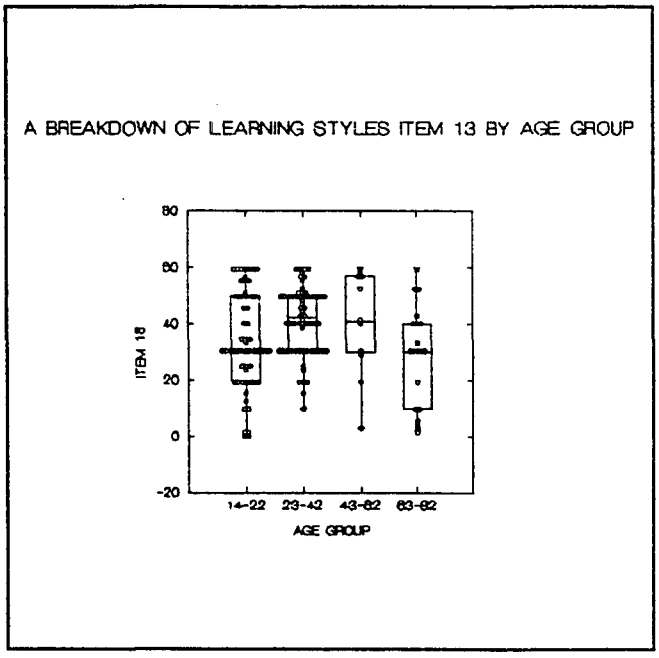


(Figure 3. continued)

Mobility

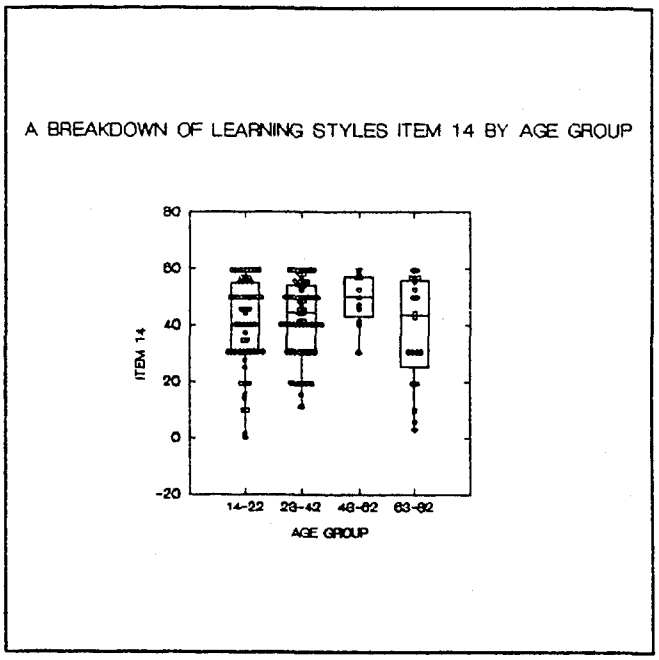


Auditory

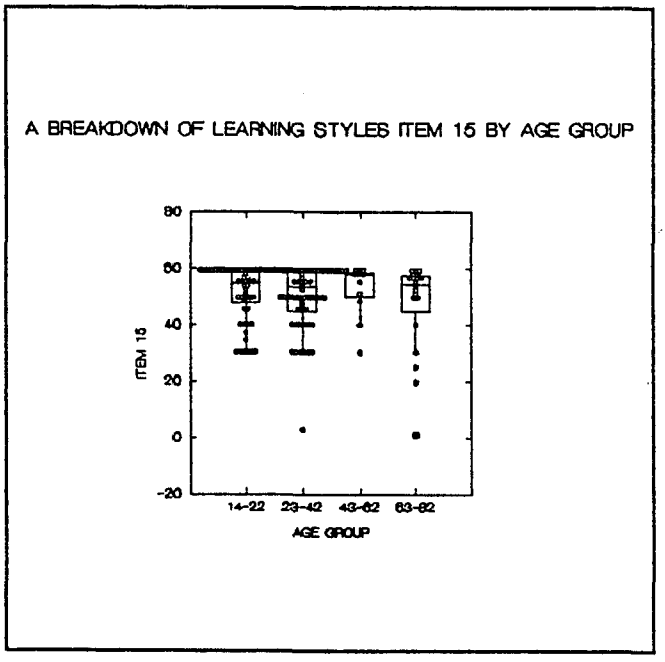


(Figure 3: continued)

Visual

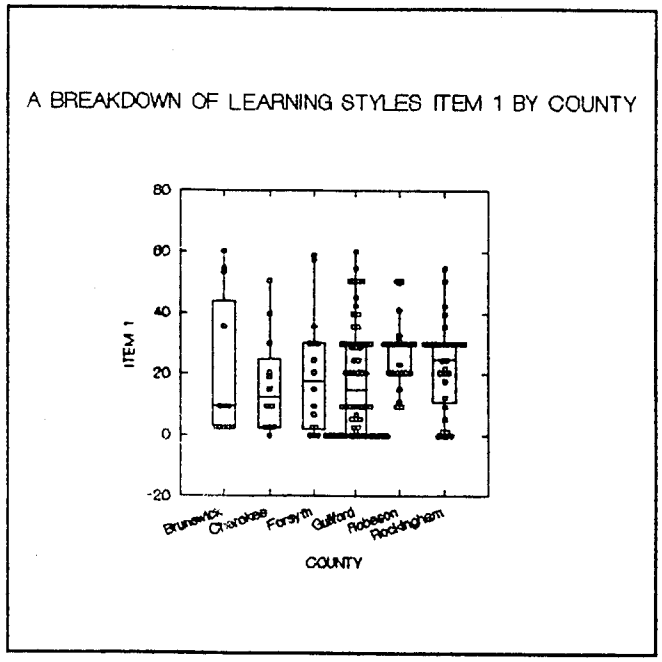


Tactile/Kinesthetic



(Figure 3. continued)

Noise Level



Light

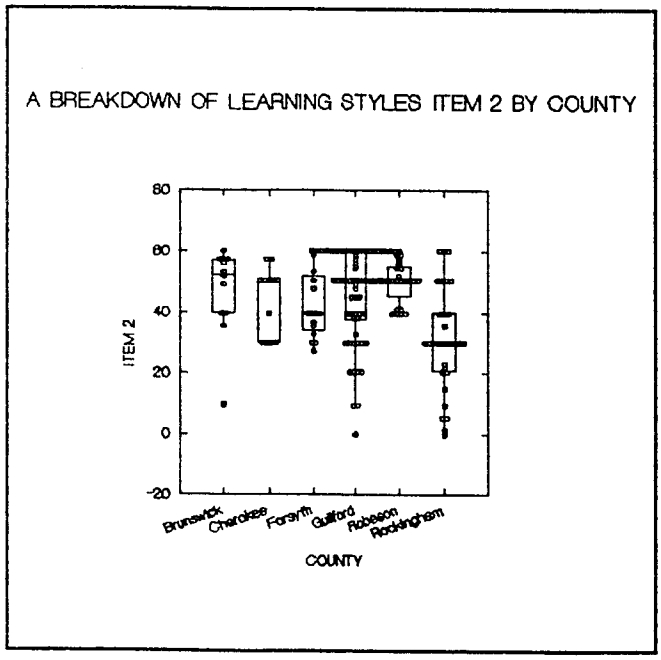
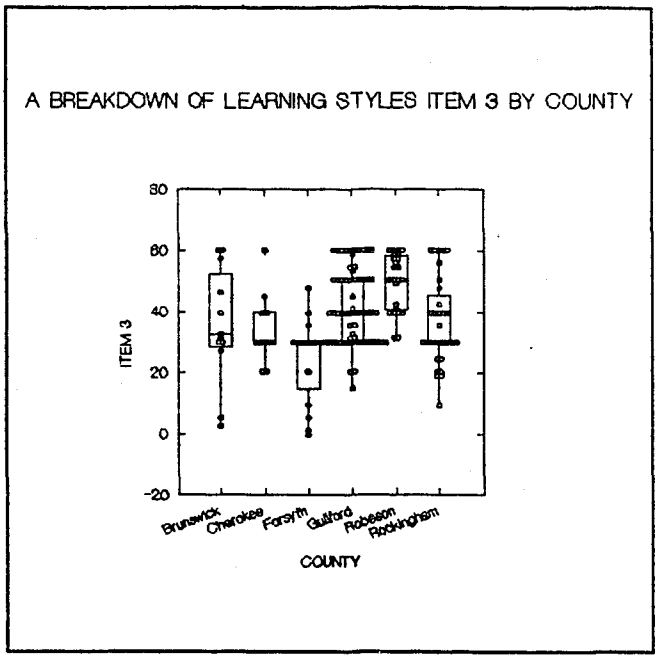
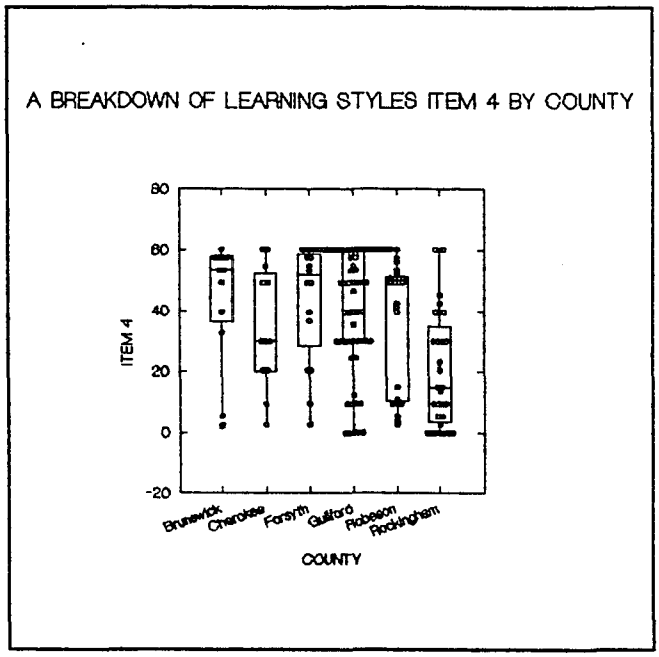


Figure 4. Box-and-whisker plots by county

Temperature



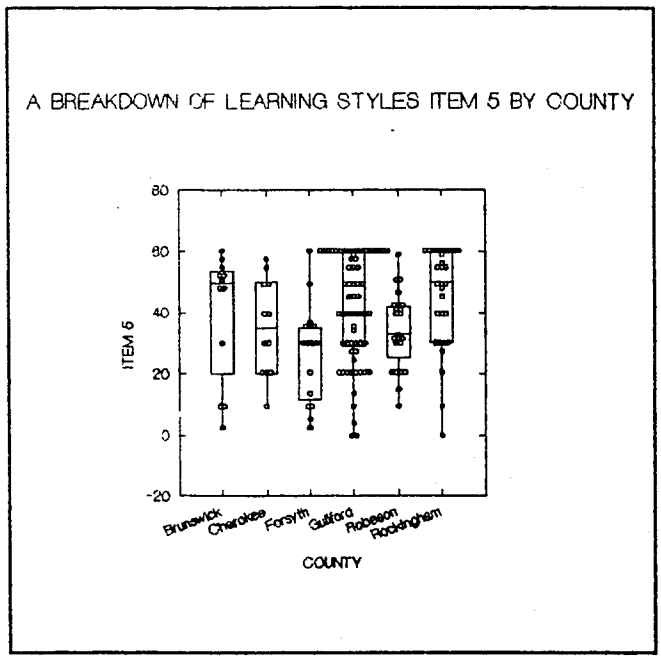
Design



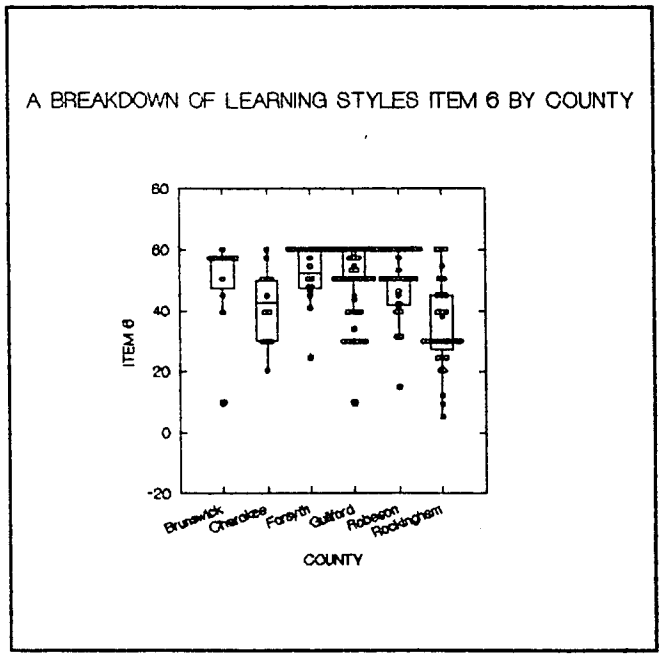
(Figure 4. continued)

Emotional Stimuli - County

Routine/Variety

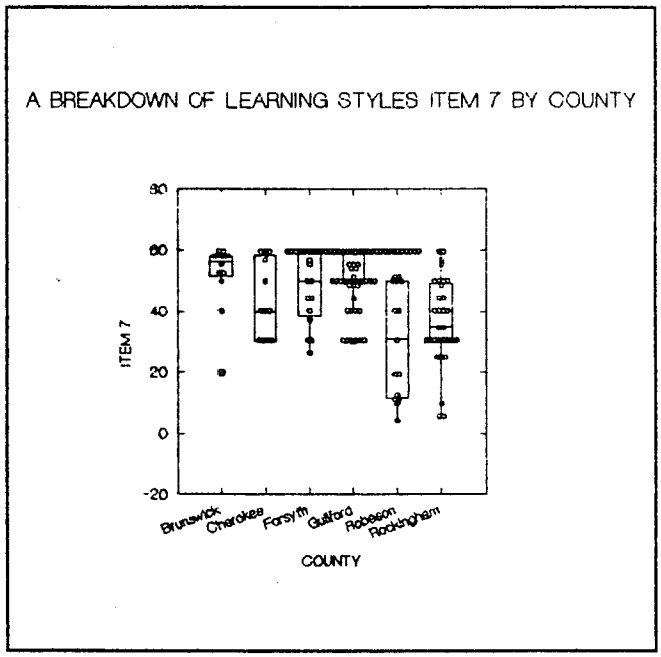


Motivation

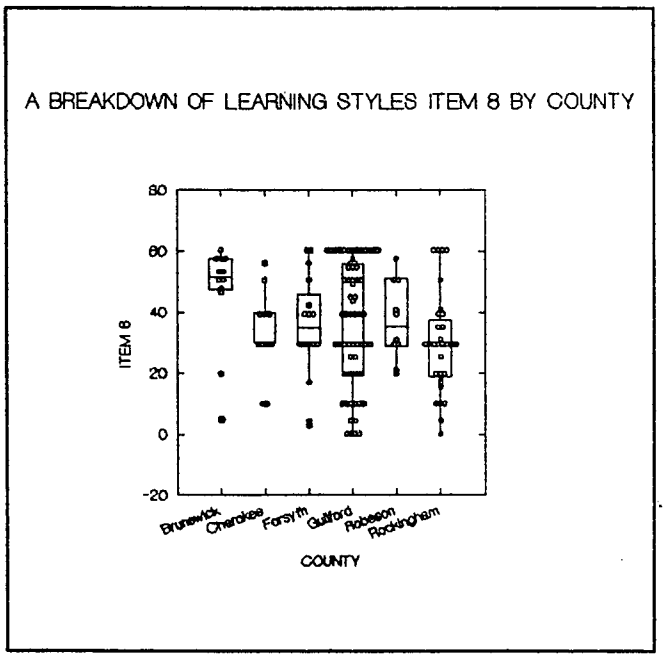


(Figure 4. continued)

Persistence

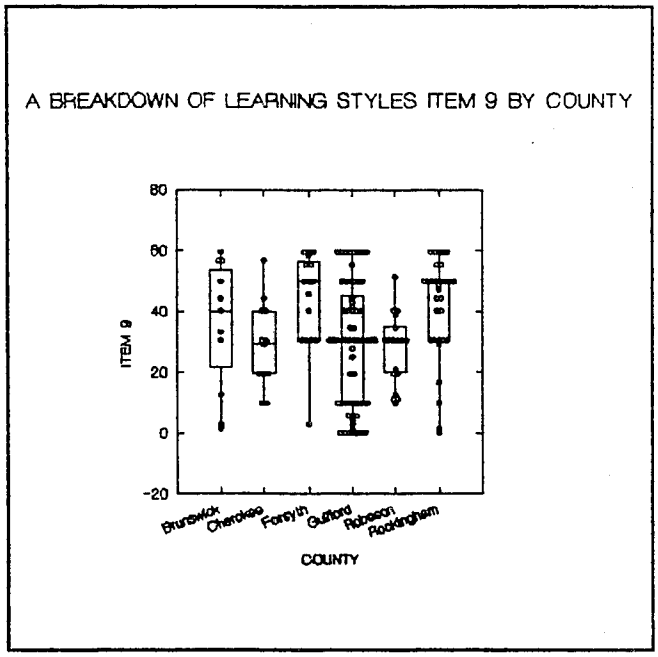


Structure



(Figure 4. continued)

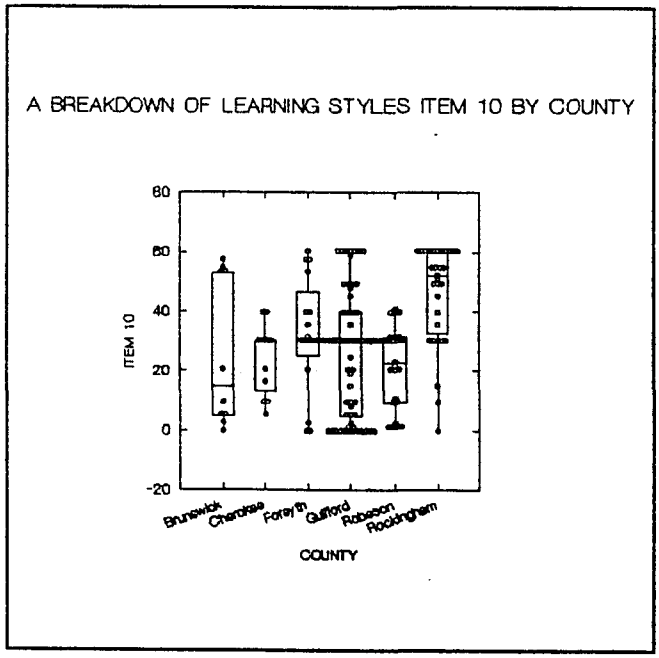
Sociological Stimuli - County



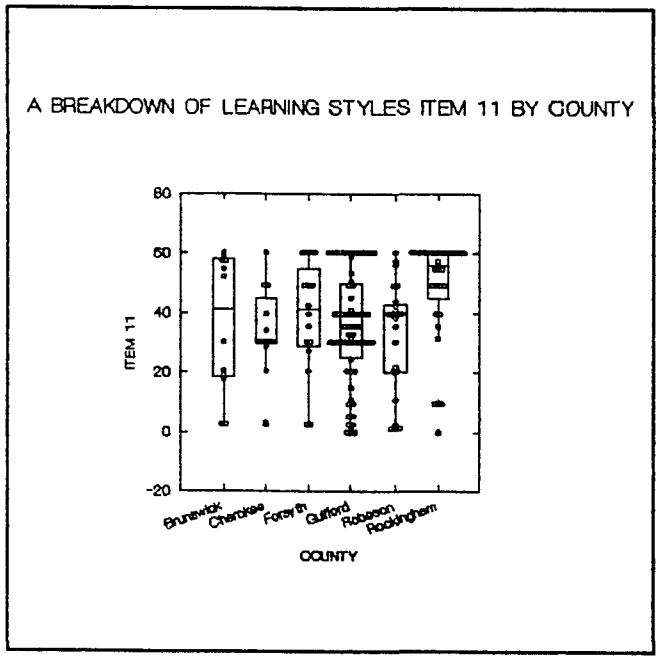
(Figure 4. continued)

Physical Stimuli - County

Time of Day

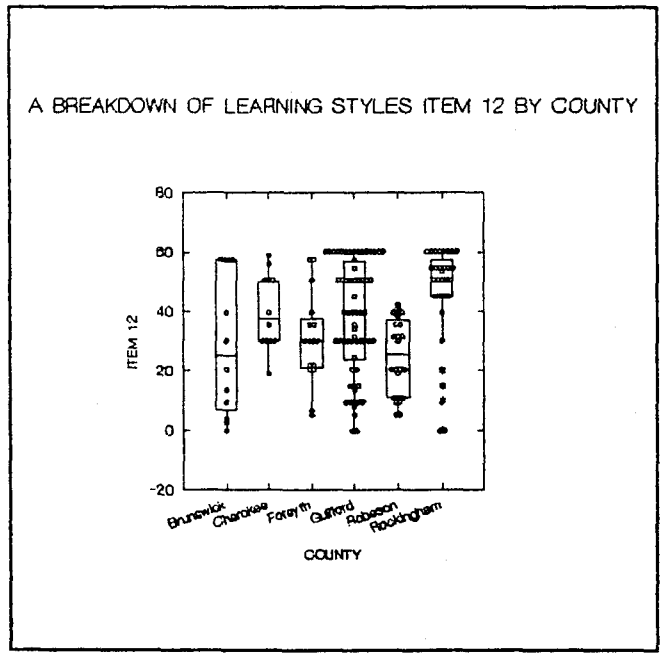


Intake

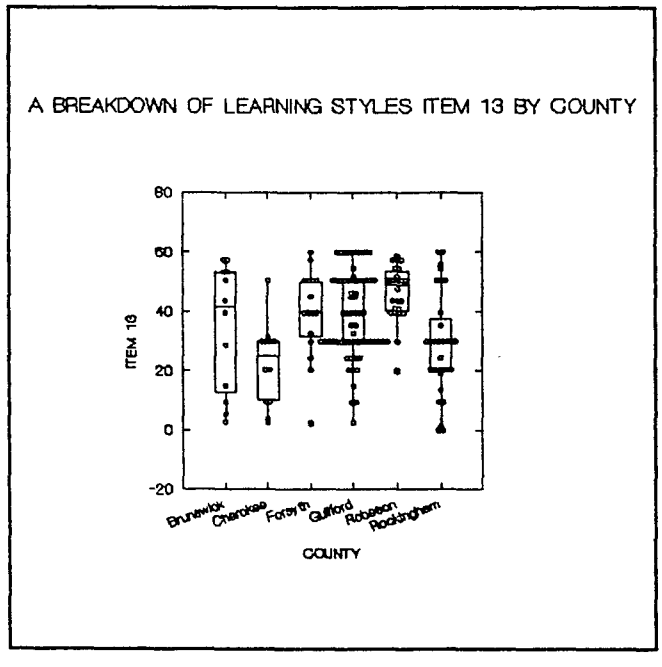


(Figure 4. continued)

Mobility

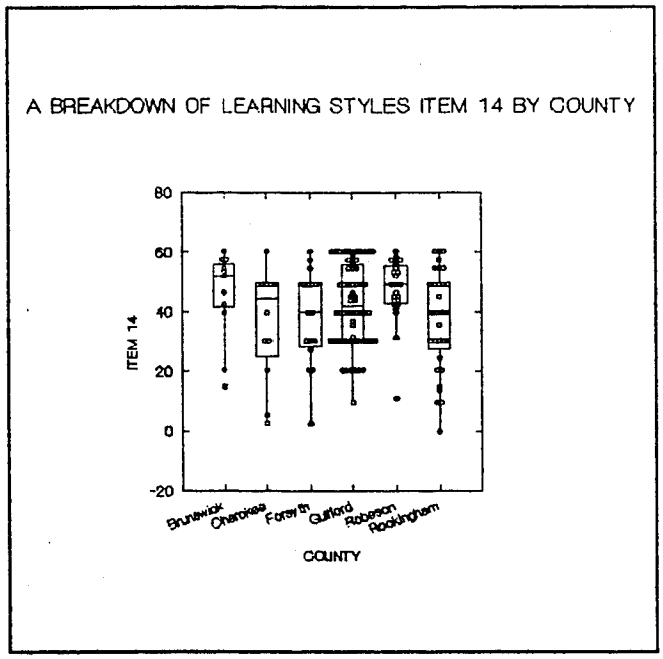


Auditory

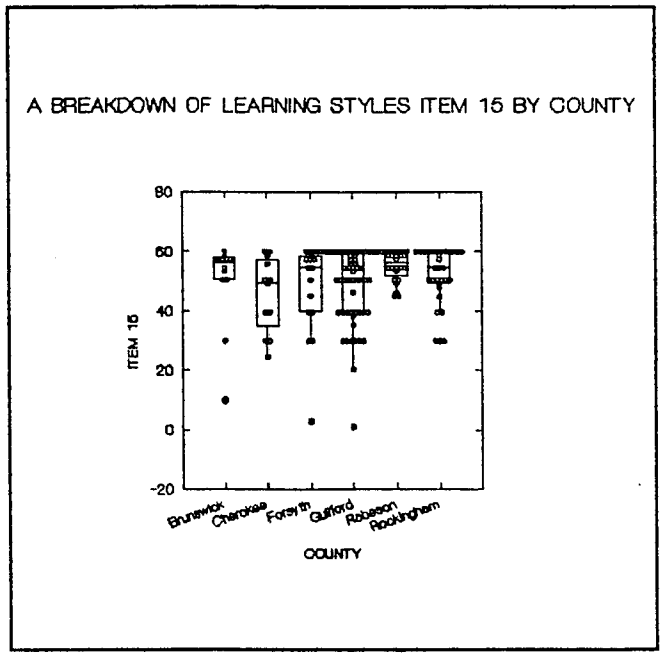


(Figure 4. continued)

Visual



Tactile/Kinesthetic



(Figure 4. continued)

APPENDIX E

TABLES A-O

MEANS, MEDIANS, STANDARD DEVIATIONS, AND χ^2 FOR ELEMENTS ON THE LEARNING STYLE SURVEY

Table A

Means, Medians, Standard Deviations, and χ^2 for Noise Level on the Learning Style Survey

	n	$\bar{X}$	Md	SD	Independence χ^2	Independence Probability	Median Test χ^2	Median Test Probability
Overall	157	20.76	20.0	16.79				
Educational Level					5.612	.4679	3.704	.1569
Beyond High School	22	20.40	19.5	15.68				
High School Diploma	52	17.21	15.0	15.62				
Less than High School	77	23.76	25.0	17.26				
Race/Ethnic Origin					4.806	.5689	0.154	.9257
African American	79	20.16	20.0	17.55				
White	43	19.46	20.0	17.40				
Native American	27	23.59	20.0	12.21				
Age					3.748	.9272	2.537	.4687
14-22	58	22.97	25.0	16.40				
23-42	62	20.82	20.0	16.09				
43-62	11	19.36	19.0	17.52				
63-82	19	17.63	10.0	19.11				
County					24.516	.0568	6.965	.2232
Brunswick	12	20.41	9.5	23.30				
Cherokee	12	16.75	12.5	16.05				
Forsyth	16	20.12	17.5	19.29				
Guilford	62	18.64	15.0	17.53				
Robeson	24	26.41	30.0	10.75				
Rockingham	31	22.64	25.0	15.09				

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05

Table B

Means, Medians, Standard Deviations, and χ^2 for Light on the Learning Style Survey

	n	$\bar{X}$	Md	SD	Independence χ^2	Independence Probability	Median Test χ^2	Median Test Probability
Overall	157	43.20	50.0	15.08				
Educational Level**					9.247	.1601	6.689	.0353
Beyond High School	22	43.72	50.0	14.39				
High School Diploma	53	47.03	50.0	13.00				
Less than High School	76	40.50	40.0	16.11				
Race/Ethnic Origin					9.000	.1736	1.841	.3982
African American	79	41.26	45.0	17.37				
White	43	42.60	48.0	13.78				
Native American	27	48.37	50.0	8.27				
Age***					31.710	.0002	13.955	.0030
14-22	58	36.26	31.5	16.91				
23-42	62	44.66	49.5	13.23				
43-62	11	49.46	52.0	9.25				
63-82	20	52.85	56.0	7.81				
County***					46.713	.0000	18.428	.0025
Brunswick	12	47.33	52.5	14.21				
Cherokee	12	43.83	50.0	11.16				
Forsyth	16	42.68	40.0	11.12				
Guilford	62	45.96	50.0	15.14				
Robeson	24	50.00	51.0	6.07				
Rockingham	31	30.83	30.0	16.86				

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05

Table C

Means, Medians, Standard Deviations, and χ^2 for Temperature on the Learning Style Survey

	n	$\bar{X}$	Md	SD	Independence χ^2	Independence Probability	Median Test χ^2	Median Test Probability
Overall	157	39.18	40.00	14.41				
Educational Level					7.759	.2562	3.021	.2207
Beyond High School	22	38.45	32.50	10.89				
High School Diploma	52	38.94	40.00	16.08				
Less than High School	77	39.84	40.00	14.32				
Race/Ethnic Origin					8.800	.1851	5.144	.0764
African American	79	38.67	40.00	15.29				
White	42	35.69	31.50	12.77				
Native American	27	44.74	42.00	12.08				
Age					10.007	.3500	1.861	.6017
14-22	58	38.69	40.00	14.44				
23-42	62	40.36	40.00	14.11				
43-62	11	39.91	47.00	17.24				
63-82	19	37.74	35.00	13.34				
County***					51.012	.0000	23.872	.0002
Brunswick	12	35.33	32.50	19.04				
Cherokee	11	34.09	30.00	11.58				
Forsyth	16	25.00	30.00	13.82				
Guilford	63	41.57	40.00	12.21				
Robeson	24	49.75	50.00	9.26				
Rockingham	31	36.77	30.00	14.21				

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05

Table D

Means, Medians, Standard Deviations, and χ^2 for Design on the Learning Style Survey

					Independence		Median Test	
	n	$\bar{X}$	Md	SD	χ^2	Probability	χ^2	Probability
Overall	156	36.51	40.00	21.34				
Educational Level***					17.882	.0065	6.819	.0331
Beyond High School	22	41.81	50.00	18.64				
High School Diploma	52	40.90	50.00	20.93				
Less than High School	76	32.89	40.00	21.48				
Race/Ethnic Origin**					4.206	.6487	6.448	.0398
African American	79	38.13	45.00	21.36				
White	42	30.45	30.00	21.45				
Native American	27	39.92	50.00	18.77				
Age					9.083	.4297	7.405	.0600
14-22	58	31.45	30.0	22.65				
23-42	62	38.11	45.5	19.98				
43-62	11	42.27	50.0	18.62				
63-82	18	45.89	56.5	19.64				
County***					40.73	.0004	19.050	.0019
Brunswick	12	44.00	32.50	20.56				
Cherokee	12	34.83	30.00	19.71				
Forsyth	16	43.43	52.00	19.59				
Guilford	61	41.59	50.00	19.93				
Robeson	24	36.37	50.00	20.72				
Rockingham	31	20.83	15.00	19.62				

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05

Table E

Means, Medians, Standard Deviations, and χ^2 for Routine/Variety on the Learning Style Survey

	n	$\bar{X}$	Md	SD	Independence χ^2	Independence Probability	Median Test χ^2	Median Test Probability
Overall	156	38.85	40.00	17.34				
Educational Level					7.096	.3120	3.774	.1515
Beyond High School	22	35.31	35.00	15.27				
High School Diploma	53	36.49	40.00	19.48				
Less than High School	75	42.04	45.00	16.06				
Race/Ethnic Origin					11.059	.0866	1.241	.5375
African American	79	38.87	40.00	18.57				
White	42	40.73	43.50	17.08				
Native American	26	36.23	40.00	12.07				
Age					7.825	.5519	6.488	.0901
14-22	57	41.04	45.00	17.92				
23-42	62	35.23	34.00	16.54				
43-62	10	40.80	44.50	17.04				
63-82	20	45.10	50.50	14.04				
County***					34.308	.0031	14.229	.0142
Brunswick	12	39.66	49.50	20.95				
Cherokee	12	35.25	35.00	15.89				
Forsyth	16	27.06	30.00	15.98				
Guilford	63	40.96	40.00	17.71				
Robeson	23	34.26	33.00	12.49				
Rockingham	30	45.33	50.00	16.50				

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05

Table F

Means, Medians, Standard Deviations, and χ^2 for Motivation on the Learning Style Survey

	n	$\bar{X}$	Md	SD	Independence χ^2	Independence Probability	Median Test χ^2	Median Test Probability
Overall	156	38.85	50.00	38.85				
Educational Level***					28.611	.0001	20.963	.0001
Beyond High School	22	47.72	50.00	8.68				
High School Diploma	52	54.40	58.00	7.63				
Less than High School	77	41.76	45.00	15.59				
Race/Ethnic Origin**					11.971	.0626	6.603	.0368
African American	79	49.00	53.00	13.43				
White	43	43.27	45.00	15.05				
Native American	26	45.69	50.00	10.68				
Age***					32.033	.0002	11.866	.0079
14-22	58	41.33	40.00	15.29				
23-42	61	50.61	50.00	9.72				
43-62	11	48.09	50.00	11.92				
63-82	20	53.90	58.00	9.40				
County***					53.474	.0000	28.344	.0001
Brunswick	12	50.58	57.00	14.17				
Cherokee	12	41.91	42.50	12.45				
Forsyth	16	51.68	52.50	9.63				
Guilford	63	52.17	60.00	11.30				
Robeson	23	46.78	50.00	10.46				
Rockingham	31	34.51	30.00	14.32				

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05

Table G

Means, Medians, Standard Deviations, and χ^2 for Persistence on the Learning Style Survey

	n	$\bar{X}$	Md	SD	Independence χ^2	Independence Probability	Median Test χ^2	Median Test Probability
Overall	149	45.77	50.00	14.64				
Educational Level***					12.960	.0437	12.933	.0016
Beyond High School	22	48.31	50.00	11.17				
High School Diploma	47	51.04	55.00	12.16				
Less than High School	74	41.60	42.50	15.83				
Race/Ethnic Origin***					25.331	.0003	8.847	.0120
African American	79	48.48	51.00	13.75				
White	41	45.29	50.00	12.21				
Native American	20	33.85	38.50	17.49				
Age					7.751	.5594	6.713	.0816
14-22	56	44.00	49.00	15.02				
23-42	56	45.02	50.00	15.91				
43-62	10	48.70	55.50	13.02				
63-82	20	50.80	54.50	10.70				
County***					58.69	.0000	29.832	.0001
Brunswick	12	51.75	56.50	11.37				
Cherokee	12	43.91	40.00	12.81				
Forsyth	16	47.81	50.00	11.90				
Guilford	63	52.71	59.00	9.54				
Robeson	15	30.06	31.00	18.13				
Rockingham	31	36.64	35.00	14.47				

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05

Table H

Means, Medians, Standard Deviations, and χ^2 for Structure on the Learning Style Survey

	n	$\bar{X}$	Md	SD	Independence χ^2	Independence Probability	Median Test χ^2	Median Test Probability
Overall	142	35.62	35.00	18.08				
Educational Level***					13.667	.0336	6.583	.0372
Beyond High School	21	36.33	40.00	16.80				
High School Diploma	44	41.27	47.50	18.40				
Less than High School	71	31.60	30.00	17.49				
Race/Ethnic Origin					7.086	.3130	.1700	.9183
African American	77	35.14	31.00	18.78				
White	40	38.17	40.00	17.13				
Native American	17	34.05	31.00	12.89				
Age**					16.114	.0645	11.611	.0088
14-22	56	32.25	30.00	17.62				
23-42	52	35.92	40.00	16.79				
43-62	9	42.78	48.00	16.42				
63-82	18	46.94	54.50	14.25				
County***					25.510	.0435	13.144	.0221
Brunswick	12	46.58	51.50	16.76				
Cherokee	11	33.27	30.00	14.34				
Forsyth	16	35.12	35.00	17.27				
Guilford	62	36.72	40.00	19.95				
Robeson	10	37.20	35.50	13.13				
Rockingham	31	29.74	30.00	16.28				

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05

Table I

Means, Medians, Standard Deviations, and χ^2 for Alone/Peer on the Learning Style Survey

	n	$\bar{X}$	Md	SD	Independence χ^2	Independence Probability	Median Test χ^2	Median Test Probability
Overall	150	33.44	31.00	18.78				
Educational Level					12.355	.0545	1.992	.3693
Beyond High School	21	27.19	30.00	14.74				
High School Diploma	50	34.04	30.50	21.05				
Less than High School	73	34.65	40.00	18.32				
Race/Ethnic Origin***					17.260	.0084	8.095	.0175
African American	78	32.94	31.00	19.89				
White	42	38.40	43.50	18.71				
Native American	22	28.13	30.00	10.60				
Age					12.091	.2082	1.952	.5825
14-22	58	36.45	40.00	19.21				
23-42	56	33.84	33.00	17.53				
43-62	11	29.64	33.00	20.06				
63-82	19	25.84	30.00	18.49				
County***					40.097	.0004	13.992	.0157
Brunswick	11	35.45	40.00	21.45				
Cherokee	12	29.08	29.50	14.26				
Forsyth	16	44.18	50.00	15.91				
Guilford	62	28.90	30.00	20.27				
Robeson	18	27.44	30.50	11.78				
Rockingham	31	41.41	49.00	16.85				

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05

Table J

Means, Medians, Standard Deviations, and χ^2 for Time of Day on the Learning Style Survey

	n	$\bar{X}$	Md	SD	Independence χ^2	Independence Probability	Median Test χ^2	Median Test Probability
Overall	155	29.78	30.00	20.26				
Educational Level**					11.075	.0861	7.940	.0189
Beyond High School	20	23.80	20.00	20.41				
High School Diploma	52	24.86	30.00	19.71				
Less than High School	77	34.57	31.00	19.83				
Race/Ethnic Origin*					16.120	.0131	3.922	.1407
African American	77	30.02	30.00	21.96				
White	42	34.45	30.50	20.28				
Native American	27	22.03	22.00	13.03				
Age***					27.654	.0011	13.541	.0036
14-22	58	38.93	42.50	20.30				
23-42	62	22.95	27.50	16.52				
43-62	10	26.00	30.00	20.37				
63-82	18	24.78	25.00	21.15				
County***					49.439	.0000	21.389	.0007
Brunswick	10	26.10	15.00	25.03				
Cherokee	11	23.72	30.00	12.19				
Forsyth	16	32.25	30.50	19.61				
Guilford	63	25.93	30.00	20.48				
Robeson	24	21.58	22.50	13.94				
Rockingham	31	46.03	52.00	16.80				

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05

Table K

Means, Medians, Standard Deviations, and χ^2 for Intake on the Learning Style Survey

	n	$\bar{X}$	Md	SD	Independence χ^2	Independence Probability	Median Test χ^2	Median Test Probability
Overall	156	29.78	40.00	20.26				
Educational Level*					16.517	.0112	5.920	.0518
Beyond High School	22	34.40	31.50	14.78				
High School Diploma	52	34.90	37.00	20.34				
Less than High School	76	40.56	41.00	19.31				
Race/Ethnic Origin***					17.313	.0082	7.259	.0265
African American	79	43.07	49.00	16.50				
White	42	31.90	31.00	21.28				
Native American	26	32.80	37.00	18.42				
Age***					40.716	.0000	10.473	.0149
14-22	58	44.97	50.00	17.57				
23-42	61	36.95	39.00	16.07				
43-62	11	32.00	30.00	19.62				
63-82	19	21.05	11.00	21.72				
County***					36.997	.0013	18.832	.0021
Brunswick	12	36.25	41.00	22.90				
Cherokee	12	33.83	30.00	14.98				
Forsyth	16	38.75	41.00	18.91				
Guilford	62	34.59	35.00	18.76				
Robeson	23	32.21	40.00	18.89				
Rockingham	31	48.25	56.00	17.82				

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05

Table L

Means, Medians, Standard Deviations, and χ^2 for Mobility on the Learning Style Survey

	n	$\bar{X}$	Md	SD	Independence χ^2	Independence Probability	Median Test χ^2	Median Test Probability
Overall	157	36.07	38.00	18.56				
Educational Level**					10.762	.0960	11.065	.0040
Beyond High School	22	32.18	30.00	18.68				
High School Diploma	53	31.67	48.00	19.64				
Less than High School	76	40.25	43.50	17.00				
Race/Ethnic Origin***					15.364	.0176	9.414	.0090
African American	79	37.46	40.00	19.64				
White	43	38.02	40.00	17.95				
Native American	27	26.00	30.00	13.51				
Age					15.767	.0719	7.499	.0576
14-22	58	39.71	47.50	19.24				
23-42	62	33.07	31.50	16.48				
43-62	11	28.64	30.00	22.52				
63-82	20	35.80	32.00	19.01				
County***					45.174	.0001	24.242	.0002
Brunswick	12	29.16	25.00	23.97				
Cherokee	12	39.91	37.50	12.73				
Forsyth	16	30.68	30.00	15.35				
Guilford	62	37.64	40.00	18.89				
Robeson	24	25.08	25.50	12.72				
Rockingham	31	45.41	50.00	17.92				

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05

Table M

Means, Medians, Standard Deviations, and χ^2 for Auditory on the Learning Style Survey

	n	$\bar{X}$	Md	SD	Independence χ^2	Independence Probability	Median Test χ^2	Median Test Probability
Overall	158	36.42	40.00	16.19				
Educational Level					5.702	.4573	5.156	.0759
Beyond High School	22	36.68	37.00	14.01				
High School Diploma	53	40.94	48.00	16.77				
Less than High School	77	33.61	33.00	15.94				
Race/Ethnic Origin*					15.915	.0142	5.682	.0584
African American	79	38.02	40.00	15.63				
White	43	31.20	30.00	17.86				
Native American	27	41.70	41.00	11.19				
Age***					19.333	.0225	9.230	.0264
14-22	58	34.12	30.00	17.26				
23-42	62	41.15	42.00	12.19				
43-62	11	40.82	41.00	18.54				
63-82	20	28.30	30.00	17.77				
County***					44.744	.0001	21.405	.0007
Brunswick	12	34.83	41.50	21.17				
Cherokee	12	22.25	25.00	13.94				
Forsyth	16	39.50	40.00	14.89				
Guilford	63	38.57	40.00	14.39				
Robeson	24	46.41	49.00	9.35				
Rockingham	31	28.83	30.00	17.18				

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05

Table N

Means, Medians, Standard Deviations, and χ^2 for Visual on the Learning Style Survey

	n	$\bar{X}$	Md	SD	Independence χ^2	Independence Probability	Median Test χ^2	Median Test Probability
Overall	156	41.57	44.50	15.09				
Educational Level					5.702	.4573	4.478	.1065
Beyond High School	22	43.59	48.00	10.72				
High School Diploma	53	43.98	50.00	15.72				
Less than High School	75	38.88	40.00	15.70				
Race/Ethnic Origin					4.971	.5475	1.168	.5576
African American	79	42.03	45.00	14.78				
White	42	38.35	40.00	17.24				
Native American	27	43.96	45.00	11.46				
Age					9.173	.4214	.8180	.8451
14-22	58	39.81	40.00	16.04				
23-42	62	42.86	44.50	13.11				
43-62	11	48.91	50.00	9.34				
63-82	20	38.10	43.50	18.99				
County					23.695	.0705	4.768	.4448
Brunswick	11	45.45	52.00	15.18				
Cherokee	12	36.41	44.50	18.88				
Forsyth	16	38.18	40.00	16.27				
Guilford	62	42.58	42.00	13.80				
Robeson	24	47.58	49.50	10.69				
Rockingham	31	37.29	40.00	17.04				

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05

Table O

Means, Medians, Standard Deviations, and χ^2 for Tactile/Kinesthetic on the Learning Style Survey

	n	$\bar{X}$	Md	SD	Independence χ^2	Independence Probability	Median Test χ^2	Median Test Probability
Overall	158	50.56	55.00	11.81				
Educational Level**					8.398	.2103	6.695	.0352
Beyond High School	22	48.18	50.00	11.14				
High School Diploma	53	53.01	58.00	9.78				
Less than High School	77	50.36	55.00	11.87				
Race/Ethnic Origin					10.967	.0894	0.597	.7417
African American	79	51.39	55.00	9.99				
White	43	47.34	54.00	16.07				
Native American	27	52.59	55.00	8.56				
Age					4.761	.8546	2.206	.5308
14-22	58	51.85	55.00	10.08				
23-42	62	50.42	53.50	11.27				
43-62	11	52.55	58.00	9.64				
63-82	20	47.45	54.50	16.08				
County					15.995	.3824	1.031	.9600
Brunswick	12	50.00	56.50	14.99				
Cherokee	12	45.75	49.50	12.52				
Forsyth	16	47.43	55.00	15.75				
Guilford	63	49.84	54.00	12.46				
Robeson	24	55.29	56.50	5.03				
Rockingham	31	52.06	55.00	9.49				

* χ^2 test of independence significant at α=.05

** χ^2 median test significant at α=.05

*** Both tests significant at α=.05