A STUDY OF THE LEARNING STYLES OF DALE, OKLAHOMA PUBLIC SCHOOL EMPLOYEES

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in partial fulfillment of the requirements
for the Degree of
DOCTOR OF EDUCATION
December, 1983

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PREFACE

Much of this study was conducted concurrently by six graduate students under the direction of Dr. Waynne B. James, Associate Professor in the School of Occupational and Adult Education. Those six graduate students were Linda Rice, Joe Nix, Bill Russell, Bill Brown, Walt Lucas Jr., and Evelyn Stewart. The studies were conducted while working closely with Dr. Russell L. French, University of Tennessee Professor in the Department of Curriculum and Instruction and Dr. Clarence Cherry, Jr. Air National Guard Instructor, Knoxville, Tennessee.

Parts of this study may be similar to the others because of the close association the group had during the preparation for the research and the collection of data.

ACKNOWLEDGMENTS

Words are not adequate to express the sincere appreciation this writer felt for the many people who assisted and encouraged him during the completion of this project. Those individuals provided more support than anyone could ever repay and each one of them is deeply appreciated.

Special thanks goes to Dr. Russell L. French, University of Tennessee Professor in the Department of Curriculum and Instruction. Dr. French's enthusiasm for this study was conveyed personally in an interview in Oklahoma City, November 4, 1982. The writer was encouraged by the memory of that meeting throughout the research project.

Gratitude is extended to the members of the doctoral committee: Dr. Waynne B. James, Dr. Jerry G. Davis, Dr. H. Gene Smith, and Dr. Jim Seals. Special appreciation is felt for Dr. James, Committee Chairperson, for the countless hours of patient counsel and sage advice given during the project and throughout the doctoral studies.

The Dale School employees who participated so willingly and supported the writer with comments and inquiries are appreciated. The Staff Development Committee, Ms. Audrey Roach, Mr. J. D. Cunningham, Mrs. Debbie Watson, and Mr. Steven Freeman were of great benefit to the researcher in arranging times and dates for the data gathering.

The evaluators, Bill and Mary Jane Hess, Larry Capps, Vicki Haddock, Paul Lewis, Linda Rice, Harold Jones, Donna Hampton,

and Sharon Washburn, who assisted tremendously in administering the MMPALT II subtests were especially helpful and deserve special mention.

The young ladies in the Dale School business department who did much of the draft typing of this study are commended for their fine work. Debbie Dennington, Patricia Pulliam, Gayla Frost, Shelly Burrows, and Brenda Newnam were very gracious in accepting the typing requests and the making of the many changes needed.

I am also much obligated to Kay Porter who did the final copy typing and managed this paper so I could meet the deadlines and standards set by the Graduate College.

I want the family members who motivated me during this study to continue and persevere to its completion, to understand my deep feeling of love and appreciation for such wonderful encouragement. First there is Ray Edward Akins, my brother and his wife, Letta Ann, who came by to visit; often at times when I needed diversion and a lift from the doldrums that come from too much staring at blank paper. Then there are four extremely kind and understanding children, who seem to know the importance of helping Dad at this stage of his life. Julie LoRene Akins, attorney-at-law in Washington, D.C., and my daughter, always asked the right questions and phoned encouragement so many times. Jack W. Akins,Jr., Air Traffic Controller at the Fort Worth Air Traffic Control Center and his wife Teri Lyn, presented me with my first grandson, Bryan David, during this last year of my study; and Timothy Paul Akins, my youngest child, an agriculture economics major at Oklahoma State University, made me feel young enough to be a student on a university campus. But most important of all was the love, devotion, patience, encouragement, and supportive work done by my good wife of

28 years, Alma LoRene. She typed so many, many pages, drove me to class, and said "yes, you can", when I had to hear it. It must be said that their father and husband loves and appreciates each of them very much.

Finally I want to acknowledge the good memories I have because of two wonderful women who died during this period of time I spent doing research for this paper. Mrs. Alma Seckel, September 11, 1900-February 25,1982, accepted me as her son-in-law, welcomed me into her home and loved me. Mrs. Bertha Akins, October 8, 1896-January 18, 1983, gave me life, love and a desire for learning. Both of these women will continue to be missed by me and many others.

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INTRODUCTION

Learning styles are personal ways in which individuals process information in the course of learning new concepts and principles (DeCecco, 1974). Penland (1978) reported that adult learners have individualistic learning patterns, and they prefer to control the pace and character of their own learning. Adult education instructional and administrative personnel who are concerned about the success of their education programs need tools and skills that aid in identifying the individual differences of the adult learners (French, 1981).

The psychology of individual differences has largely been the study of group differences (DeCecco, 1974). Many models have been developed to identify and measure individual differences, but there has been a lack of agreement among the approaches (French, 1981). There is agreement that there are differences in learning styles and those differences affect the way people learn. According to French (1982), individuals differ enormously in the ways they learn. Some do not operate well with verbal symbols; although most of them can read, they simply do not learn easily through reading. Evans (1978) also found a signfiicant portion of the population which does not think well in terms of objects.

According to Cherry (1981), the vast majority of studies that have produced agreement, as well as disagreement, about individual

differences in learning have been with the younger population. Knowles (1978) further substantiates the idea that adults have been overlooked when he refers to the adult learner as a neglected species.

Scarbrough (1977, p. 2) stated that "investigation into learning styles preference has been hampered by the lack of appropriate instruments." Cherry (1981) stated that:

> Other authors have identified at least three major problems with instruments and procedures used to measure the strengths and weaknesses of individual learning styles. The more subjective systems appear to lack validity; the more objective systems are narrow in scope, time consuming, and complex; and each system is generally applied to a narrow population of age and background (p. 5).

Using French's (1975) conceptualization of learning styles, Gilley (1975) developed and tested an objective system for measuring individual differences in perceptual learning style. His "Multi-Modal Paired Associates Learning Test (MMPALT)" was used to measure six of French's perceptual modality elements. He confirmed the validity of his instruments and concluded that his subjects (third grade students) "did receive and process information with differing degrees of efficiency across six sensory modalities" (p. 80). His recommendation for additional research served as guidelines for Cherry's (1981) examination of the measurement of adult learning styles.

Cherry's (1982) study of adult learning styles showed that an assessment could be made of adults' perceptual modality. Such an assessment would seem to be very valuable to employees of a public school system.

Statement of the Problem

Public school employees are expected to continue their education

throughout their careers. In doing so they must receive, assimilate, process and repeat back to others, a variety of information needed to perform skills pertinent to their jobs in the education community. To date, no one has studied the learning styles of the personnel in the entire rural school system. Because of the lack of information there is a need for data to be collected on personal learning styles to help in planning, designing, developing and evaluating adult instructional programs.

Purpose

The purpose of this study was to gather data on the learning styles of the Dale Public School employees using the MMPALT II developed by Cherry (1982). It addressed the same learning styles used by Cherry. The data gathered in this study can be used by the administrators, teachers, teacher's aids, and support personnel in understanding their personal learning styles. In addition, people concerned with adult and continuing education will find the information useful in planning, designing, developing and evaluating adult instructional programs.

Research Questions

The research questions this study intended to answer include:

1. What are the preferred learning styles of the Dale, Oklahoma Public School employees as measured by the MMPALT II?

2. Is there a correlation between the employees' MMPALT II score and the perceived learning styles as measured by PMPS?

3. What are the collective characteristics of the learning styles of the Dale Public School employees?

4. How do the learning style scores differ for administrators, elementary teachers, high school teachers, and support personnel?

5. What are the differences in the learning style measurements of men and women employees at the Dale School?

Significance of the Study

Traditional education programs tend to group students and conduct classes in more or less the same manner for all learners, but learning is an individual activity and requires more levels of individualized instruction. The individualization of instruction is dependent on a knowledge of individual differences in each person. Numerous researchers have concluded that studying learning styles increases individualization, educational effectiveness, and educational efficiency. This study identified general patterns of the Dale Public School employees and examined similarities and differences among various groupings of that population. This new information can be added to the existing knowledge about the individual differences of the adult learner and since no one has studied an intact public school system, this research will be valuable to future studies.

Assumptions

Gilley (1975) developed, tested, and validated the original Multimodal Paired Associated Learning Test (MMPALT). Cherry (1981) revised the MMPALT for his research. All modifications were consistent with the paired-associates learning theory and based on Gilley's recommendations. Also, the construction of the Perceptual Modality Preference Survey (PMPS) was supervised by experts in the field of questionnaire

development (French, 1982).

The assumptions basic to this study were:

1. The MMPALT II was a valid system for objectively measuring individual differences in the perceptual modality elements of adult learning styles.

2. Responses to the Perceptual Modality Preference Survey (PMPS) reflected each subject's subjective opinion of his or her own perceptual modality learning style.

3. Self awareness and instructor awareness of student learning styles will influence the teaching-learning process.

Scope and Limitations

This study was conducted within the following constraints:

1. The population sample was restricted to the Dale Public School employees; therefore, this study's group findings cannot be generalized to other populations.

2. The MMPALT II used a paired associates testing procedure. That procedure measures one's ability to remember and discriminate among information presented within a particular framework. It may not measure all factors which make up one's learning style.

Definitions

The following terms, as used in this study, have these meanings:

Administrator - A person serving in the public school system to facilitate the proper use of resources in accomplishing school goals and objectives.

Adult - "A person over 18 years of age" (Cherry, 1981, p. 15).

Aural (A) - A perceptual learning style that gathers information primarily through listening.

Elementary Teacher - A public school teacher engaged in teaching students in grades Kindergarten through sixth.

Haptic (H) - A perceptual learning style that gathers information primarily through touch and/or holding.

High School Teacher - A public school teacher engaged in teaching students in grades seven through 12.

Interactive (I) - A perceptual learning style that gathers information primarily through discussion and talking with others.

Kinesthetic (K) - A perceptual learning style that gathers information primarily through performance or engaging in body movements.

Learner - "A person engaged in or expressing an interest in the acquisition of new skills or knowledge" (Cherry, 1981, p. 15).

Learning Style - Individual differences in relating to or interacting with the environment for the purpose of learning.

Olfactory (O) - A perceptual learning style that gathers information primarily through the sense of smell.

Perceptual Modality of Learning Style - "The approach which an individual learner uses in gathering information and knowledge from the world about him or her through the five senses. In this study, the seven perceptual style elements identified by French, researched by Gilley, and studied by Cherry were the basis for investigation" (Cherry, 1981, p. 16).

Print (P) - A perceptual learning style that gathers information primarily through the printed word.

Support Personnel - Public School employees engaged in assisting teachers or performing clerical work in the school office.

Trigram - A three letter non-sense word used in the MMPALT II as a stimulus in the Print, Aural and Interactive subtests.

Visual (V) - A perceptual learning style that gathers information primarily through seeing pictures, images, objects and activities.

Organization of the Study

Chapter I has identified the problem, purpose, research questions, significance of the study, assumptions made by the researcher, limitations and scope, and definitions used in the study.

Chapter II presents a review of related literature on individual differences and learning, modalities and elements of learning style, measurement of learning styles, and research findings. Chapter III details the procedures, design, instrumentation, subjects, data collection, and statistical treatment of the study.

Chapter IV gives the findings and analysis of the data. It describes the subjects and factors included in the study.

Chapter V provides the summary, conclusions, and recommendations resulting from the study.

CHAPTER II

REVIEW OF LITERATURE

The distinctive differences in the personal learning styles of individuals is the subject of serious study and research for both psychologists and educators. Cherry (1981) noted that the field of psychology has contributed much to this research. Gilley (1978) recognized the truism "all people learn differently."

French (1982) added a special dimension that made this a study of special interest to this researcher. He spoke of research with a focus on human learners as purposeful actors, not reactors, as being limited.

The literature for this research was reviewed with the purpose of studying learners as actors. The review is presented in four areas relating to the individual learning differences of these actors. These four areas are: (1) differences in the way individuals learn; (2) elements of individual learning styles; (3) individual learning styles measurement; and (4) results of research in the learning styles of individuals.

Differences in the Way Individuals Learn

Gagne' (1965), one of the earliest researchers in the differences in the way individuals learn, felt the learner was first and foremost. He qualified this statement by saying the learner could be an animal;

however, he was considering human learners. He viewed all animals, including the human animal, as near equals in learning styles. He stated that the most important part of any learner is his individual senses, the muscles of his body, and the central nervous system. Gagne' further stated that it is events in the environment of the learner that triggers this special chain of events. He documents the chain as "nervous impulses that are organized by his central nervous system, specifically his brain" (p. 6). According to logic of Gagne', this activity happens in special successions or patterns that change the character of this organized process. This result is manifested as learning.

According to Gagne' the final result of this transformation is action. The learner becomes the actor, not just a reactor. The result of this is a learner response.

This early research by Gagne', however, gave minimum consideration to differences in individual learners. In his 1965 book, The Conditions of Learning, Gagne' appeared to review learning as a simple relationship between a stimulus and a response.

His learning views led him to generalize about teaching. He recommended that teaching progress from simple to complex things. "The individual learns simple things fitst, then more and more complex things, while all this is happening, he is also growing older: (Gagne', 1965, p. 175).

Lowenfeld (1939) was an early opponent of these generalizations. He held the opinion that differences in perception and reaction caused people to display differing creativity. Lowenfeld's (1945) studies showed that he subscribed to the belief that "the distinction which is

true for creative types can also be made among individuals" (p. 100). Ragan (1979) cited Lowenfeld in rejecting the idea that perception is the same for everyone.

Gagne' appeared to change his views shortly after 1965. In his book in 1967, Learning and Individual Differences Gagne' stated that learning is highly an individual matter. By 1970, Gagne questioned earlier learning theories. In a report on the status of learning research, he wrote, "Perhaps the most general description that can be made of these changes is that investigators are shifting from what may be called a connectionist view of learning to an information processing view (p. 468).

Gagne' stated that research on how the individual learns was a highly controversial area. Changes were occurring constantly. The older view was learning as a series of stimuli and responses, but Gagne's view was changing to one of stimuli being processed in various ways by the central nervous system. To understand how the individual learns, the researcher must know how this process works (Gagne', 1970).

Gagne's main idea in the 1970 article was the relationship of these new ideas to instruction. The self-directed learning idea, the learner finding his or her best learning style and using it to learn begins to surface in Gagne's work. The end of this article by Gagne summarized the need to deliberate on individual differences and to individualize the learning processes:

> In the most general sense, instruction becomes not primarily a matter of communicating something that is to be stored. Instead, it is a matter of stimulating the use of capabilities the learner already has at his disposal, and of making sure he has the requisite capabilities for the present learning task, as well as for many more to come (Gagne', 1970, p. 472).

As stated earlier, Gagne' saw the components of the learning process within the individual to be his/her senses, the central nervous system, and the muscular structure. Both Lowenfeld (1945) and Gagne' (1970) felt that the senses were an important part of individual differences and individual learning. These men saw learning no longer a matter of stimulus and response, but a matter of the whole person.

Studying the human senses, as it relates to learning is emphasized in perceptual psychology. Researchers originally distinguished between sensation and perception. Today, perception is no longer accepted as a part of sensation; nor is it seen to include sensation.

According to Van Fiendt (1977), "Sensation," according to early psychologists in the nineteenth century, was thought of as a narrow and special procedure in the nervous system or the organism; "perception" would be the things centrally picked up from the "sensory material." Therefore, these psychologists distinguished between what they called the "sensation" and the "perception." Most modern psychologists share the opinion that this distinction has no significance.

The term "perception" will be preferred here. As Van Fiendt (1977, p. 8) states, "such a term makes it easier to consider the alternatives of 'objective' or 'subjective,' or better, of 'external' and 'internal' detriments of our experienced life space".

Lowenfeld (1945) accepted this distinction between sensation and perception in 1939. He discovered that some partially blind art students would use their limited sight and some would not. Through these simple observations of the partially blind students Lowenfeld determined that some individuals were visually oriented while others were not. Ragan (1979), in later research, verified this determination of Lowenfeld.

Forgus (1966), in his book, Perception, summarized individual differences and learning. He separated the human beings from lower animals, and he identified perception, or extraction of information, from the environment, as the specific major difference between learners.

Evans and Herr (1978) discuss the importance of individual differences in learning as it is addressed in the academic setting. They note that too often these differences are considered from the standpoint of the subject. For instance, academics lean heavily on verbal learning while laboratories tend to treat the students' learning styles differently by "hands-on" approaches. Evans and Herr further suggest, "the fully comprehensive school provides a variety of paths to success and capitalizes on individual differences rather than trying to force all individuals into a common mold" (p. 135).

Elements of Individual Learning Styles

Various approaches to learning styles are dominant in the review of literature dealing with the elements of the individual learning styles. These elements surfaced through a series of studies, however, most tended to relate to the seven perceptual learning styles as initially reported by French (1977).

The available literature regarding these individual learning styles is often confusing due to differences in terminology and concepts among educators. For example, Cherry (1981) wrote that "cognitive style" and "Learning Styles" are often used interchangeably in professional literature. Cherry also cited a group of potential learning style researchers who met weekly at the University of Tennessee, Knoxville, Tennessee in the winter quarter of 1980 to discuss the "general thrust

and results of past research in the area of personal learning style" (Cherry, 1981, p.26). To enable them to use a common vocabulary, the group reviewed the terms used by a variety of researchers, examined definitions, and formed the terms into an acceptable system. Cherry stated that the group decided the most sensible, logical and appropriate term for this field of study was "Learning Style." The Tennessee researchers also concluded that there were at least four subordinates, or secondary, groupings under the broad term "Learning Styles." They called those secondary levels "Modalities." Perceptual, Cognitive, Emotional, and Social were identified as the four original modalities. To Cherry, these modality categories facilitated the organization of all past learning style terminology, and also reflected four areas of human learning activity:

> 1. Information extraction by the senses, (2) mental processing of that information, (3) personal feelings, attitude, personality states which influence information gathering, knowledge building, and knoweldge application, and (4) social sets which enhance or inhibit the learning process for the individual (Cherry, 1981, p.26).

According to Cherry the University of Tennessee group recommended that research be conducted to clearly identify both elements of the modalities and the modalities themselves. Cherry reported that they agreed that there was "dynamic interaction among the various learning style modalities and the elements" (p.28). They did feel, however, that this three-leveled model could serve as a guide for future research about learning style and improved communication among researchers.

Teachers were encouraged by French (1975) to observe their students as the students learned information in different ways. He believed that each individual learner has a personal preference in which she/he is

best oriented to learning in one or more of the sensory-intake styles. French (1975) recognized these differences, suggested comprehensive research to produce the instrument that would effectively measure these differences. French theorized that every learner has an individual preference or orientation related to one or more of the sensory-intake styles.

Gilley (1978) tested and validated six of French's elements by developing the Multi-modal Paired Associates Learning Test (MMPALT). He used the MMPALT to measure these six elements: Print, Aural, Interactive, Visual, Haptic, and Kinesthetic. Gilley found that third grade students possessed individual differences in perceptual learning styles. The two most dominant styles were haptic and visual. Gilley reported that the six elements could be reliably and validly measured by using the MMPALT.

Several authors have reported on the visual, haptic, kinesthetic, and aural learning styles. Riessman (1962) identified seven characteristics of deprived children. He also suggested that one of the characteristics is that deprived children are "physical rather than aural" (p. 73). Lowenfeld (1945) tested over 1,100 subjects and reported that 47 percent were visual learners, 23 percent were haptic learners, with only 30 percent unidentifiable. Barbe and Milone (1981) reported on visual, auditory, and kinesthetic learning styles.

> The most frequent modality strengths are visual or mixed; each accounts for about 30 percent of the population (although mixed modality strengths are more frequent among adults than children). About 25 percent of the population are auditory, the remaining 15 percent are kinesthetic (p. 378).

According to Barbe and Malone (1981), young children tend to learn readily by listening, then seeing, then actions. A shift seems to occur between five and 10 years of age when seeing becomes a more dominant learning style than kinesthetic; listening is no longer a dominant modality. The change continues into adulthood. The early teenager to young adult retain vision as the dominant modality, but auditory is second, and kinesthetic third.

It would appear that style preferences do change with individual learners. Keefe (1979, p. 127) disagrees with one of Barbe and Malone's conclusions: "Perceptual preference seems to evolve for most students from psycho-motor (tactile/kinesthetic) to visual and aural as the learner matures."

There is less information available for the print, olfactory, and interactive styles; however, some authors have included these styles in self-report systems. Hill (1976) included olfactory and savory styles under the heading "qualitative symbol." The Cherry study did not distinguish between taste and smell, as Hill had done. He used objective measurements (MMPALT II); olfactory measurements had not previously been explored. Both print and visual styles were included in the Dunn and Dunn (1978) report; they too, used a self-report system. Self-report approaches used to identify learner preferences have received limited validation against measurements of actual learning styles.

According to Cherry (1981) the seven elements of his study had received varying degrees of emphasis in previous research, and the terms used have been applied to a variety of human skills. Some inconsistencies in mesurement techniques do exist. For example, in some studies, the printed word was used to measure skills under the visual learning

style. Some researchers required their subjects, in the aural measurements, to use both speaking and listening skills, and others required only listening. No study prior to Gilley's (1975), objectively measured the interactive style. Visual learning tends to be one of the more extensively researched areas; however, most studies focused on cognitive processes, not on perceptual approaches. The terms haptic, tactile, and kinesthetic have been used interchangeably; therefore, it is important to use caution in interpreting the results of research. Cherry's (1981) research was the only study discovered by this researcher which objectively measured the olfactory style. Although Cherry recommended additional measurement studies of learning styles, he noted that the seven style elements do display themselves in varying degrees in individual learners.

Toffler (1970) in Future Shock discussed continuing education and man's need for education as a vital part of his life. Technical research will no doubt continue to prove individual learning styles to better serve and educate people.

Lifelong learning is a fact in our technical society. The educator finds his subjects changing and he must constantly be both the student and the educator. The Oklahoma House Bill 1706 mandated the establishment of a continuing staff development program for the certified and licensed teachers. These programs were to be responsive to participants' needs for new knowledge. This makes educators responsible for knowing how they best learn (OEA Leadership Handbook, May, 1981).

Individual Learning Styles Measurement

The field of psychology has produced most of the validated

subjective measurements of individual variances in the learning processes; however, these studies tend to focus on mental processes or cognition (French, 1982). Some of those measurement approaches do provide limited guidance for this study.

Lowenfeld (1948), as reported by Ragan (1979), developed several cognitive style tests that focused on the visual and haptic elements. His testing was largely based on distinctions between visual and haptic. His theory was that while the visual learner had the ability to first see an entirety, then divide it into integral parts and finally to visualize the parts back to the whole; the haptic learners did not have this ability. The haptic learner tends to react to emotions rather than to stimuli as in the case of the visual. The haptic learner does not tend to have the ability to fuse tactile and incomplete experiences while the visual has that tendency and ability.

Cherry (1981) reported that the versions of the Embedded-Figure Test have been used to measure the tactile, auditory, and visual elements of "cognitive style." These tests were found to be influenced by the subject's intellectual ability (Ragan, 1979). Rohwer and Ammon (1971) pointed out that paired-associates testing requires verbatim responses, and Jensen, (according to Rohwer and Ammon) classified verbatim responses as the lowest level of ability. The need to lessen the impact of intellectual ability and cognitive activity on test results tend to support the revisions made in the MMPALT, particularly the 10-item cluster arrangement and a simplified scoring procedure (Cherry, 1981).

As cited by Ragan (1979), Golden developed a group application of the Stroop Color-word Test that required written responses. The results were found to be very reliable. This information, recommendations by

Gilley, and recommendations by Cherry were used to establish response procedures used in the print, aural, and visual elements of the MMPALT II.

According to Cherry, Hill (1976) and his co-workers used a number of tests and inventories to measure individual differences. Computer produced (cognitive maps) were then used to develop personalized programs of instruction. Cherry (1981, p. 34) wrote "Numerous studies have supported the validlity of this system for determining learning style preferences but it has been criticized in some areas. Sailor (1978) indicated that the instrument appeared to include a number of variables which seemed to be of little value in assessing cognitive style and felt that a number of variables should be eliminated. Sherriff (1978) believed that the Hill instrument failed to measure discrete variables. Cogan (1976) supported London's theory that the model received basic psychometric and structural changes. The model was classified as a self-report instrument. This supported the intention of Cherry to examine the correlation between self-reporting (PMPS) and objective measurement (MMPALT II) of individual learning styles.

Hill's (1976) "Learning Styles Questionnaire" was also a self-report instrument. It relied on teacher observations. The correlation of self-reporitng and objective measurement was a concern of this study.

Results of Research in the Learning Styles of Individuals

The researcher in this study relied heavily on the studies of Gilley (1975) and Cherry (1981). Gilley used a population of 24 third graders while Cherry's study was conducted with a sample of 96 adults.

Cherry's (1981) study of the adult population considered those with varied ages from 19 through 68 years. Education was also in a broad range from grade eight through advanced degrees. Cherry's study was conducted using the MMPALT II. The primary learning style strengths as measured by the MMPALT II were in the visual style with secondary strengths demonstrated in the haptic style. Rank order findings were: (1) visual, (2) haptic, (3) aural, (4) interactive, (5) print, (6) kinesthetic, and (7) olfactory.

The third grade students in Gilley's population consisted of 12 high achievers and 12 low achievers, as determined by a standard achievement test. Both high and low achievers demonstrated primary strengths in the haptic style which visual was a secondary strength. Gilley's (1975) rank-order findings were:

High Achievers:	Low Achievers:
1. Haptic	1. Haptic
2. Visual	2. Visual
3. Aural	3. Kinesthetic
4. Print	4. Aural
5. Kinesthetic	5. Interactive
6. Interactive	6. Print (p. 80).

Deprived children were the subjects of a study by Riessman (1962). He reported the children were strongest in the physical (haptic/kinesthetic) styles and he emphasized they should be taught in these styles. Adults, according to the research findings of Lowenfeld (1939), are primarily visual learners. Barbe and Milone (1981) also reported adults were strongest in the visual styles. They also identified visual learning styles as the strongest among primary grade students.

Self-report data by Keefe (1979) infer that younger students are primarily psychomotor (tactile/kinesthetic) learners and adults are primarily visual or aural learners. Dunn and Brice (1977) concluded that

non-gifted children preferred auditory learning using self-report data. Data collected by Dunn and Brice used a population of 170 seventh, eighth, and ninth grade students. Keefe (1979) concluded from that study that most of those tested were not auditory learners. It appeared from the study that many students were tactile/kinesthetic learners. The more mature the learner became, the less these learning styles are perceived as dominant. At least one-third of each high school sample demonstrated these characteristics. Research also indicated high achievers tended to have strong perceptual strengths in several areas. Tactile, visual-tactual, or tactual-kinesthetic were the dominant learning styles of slower learners. Kinesthetic learners needed to move around. Learning was hindered when they were forced to sit and listen for any length of time. The conclusion was that the lecture classroom situation was not a suitable learning environment for the kinesthetic learner.

Summary

Related psychological literature assisted in this study. Specific reports or studies on the perceptual differences of individual learning styles are limited. If individuals have a variety of learning differences, there is a need for individualized instruction. One of these differences is the way people intake or perceive information from their learning environment. The individual's primary means of extracting this inforamtion is the perceptual modality. The literature reviewed revealed that past studies of individual differences have focused primarily on internal cognitive processes or self-reporting instruments. A major question for consideration was the value of subjective self-

reporting instruments. This researcher found no studies directly related to the learning styles of public school employees as a group. The fact that literature was limited on this subject gave support to the need for further study in this area.

CHAPTER III

METHODOLOGY AND PROCEDURES

This chapter describes the methods and procedures of this study. It includes a description and selection of the subjects, instruments, design, collection of data and statistical analysis. The study developed out of a felt need for descriptive data concerning the Dale Public School employees. It was the intent of the study to determine the learning styles preferred by the Dale Public School employees during the school year 1983-1984 and to make this data available to them for use in planning their continuing education programs.

The methods and procedures used to survey the identified subjects are presented in the following pages. The following topics are included: (1) description of subjects, (2) instrumentation, (3) design, (4) collection of data, and (5) statistical analysis.

Description of Subjects

Verbal contact was made with the Dale Public School Staff Development Committee Chairwoman who, in turn, visited with her committee members about the school faculty's willingness to participate in this study. The staff development committee received a positive response from the faculty members so a follow-up visit was made by the researcher with the school administration. The administrators were also eager to participate and indicated that teacher's aides and support personnel

should also be invited to be subjects in the study.

All potential subjects then received a written invitation to participate in the project. No other effort was made to persuade subjects to volunteer. The need for genuine and enthusiastic interest on the part of each subject was considered an important element in securing volunteer subjects.

All subjects received a written invitation, an introduction to learning styles measurement, and a sign-up sheet. Copies of these sheets are included in Appendix A.

To collect demographic and general subject data from each person, the Subjects Record Form was developed. See Appendix B for a copy of the form.

Instrumentation

Each subject participated in two measurements of his or her perceptual modality learning style. The two instruments used in this study were the Multi-Modal Paired Associated Learning Test II and the Perceptual Modality Preference Survey (PMPS). Permission was given by Dr. Russell L. French by letter for this research to use the two instruments. See Appendix C for a copy of the letter.

Multi-Modal Paired Associated Learning Test

This instrument identifies the relative strengths of the seven elements of perceptual style in the person being tested: print, aural, interactive, visual, haptic, kinesthetic, and olfactory. See Appendix D for a copy of the scripts and procedures for the MMPALT II. The test consists of 10 pairs of stimulus and response members for each element.

The subject is presented with all 10 pairs of stimulus and response members in a particular element. Then the person is presented with only the stimulus member of each associated pair in a different order from that used in the initial presentation and asked to recall the correct response member. The seven scores (one for each element tested) for each subject are arranged from high to low to produce a rank ordering of the elements of the subject's perceptual learning style.

Perceptual Modality Preference Survey

The objective of this survey was to secure each subject's intuitive assessment of his or her own strengths and weaknesses in each of the seven perceptual learning styles. The forced choice questionnaire contains 42 response items. Each perceptual style element is contrasted with each of the other style elements twice and in reverse order. A subject responds to each statement by choosing one of four alternatives: always, usually, seldom, or never. To counteract any conflicting responses and evaluate both style elements in each statement, responses are scored with positive (accepting the statement) and negative (rejecting the statement) values.

The scores for the various style elements are then arranged from high to low to produce a strongest (preferred) to weakest rank ordering of the subject's subjective assessment of his or her own learning style. This procedure is based on the Likert method of summated ratings as reported by Best (1959) and others. See Appendix E for copies of the Perceptual Modality Preference Survey and the scoring sheet.

For participation in the MMPALT II styles measurement process, each

subject was scheduled through two stations. At Station A, the subjects received an introduction to the concept of learning styles and an explanation/demonstration of the testing procedures, and then completed the three group-conducted subtests: print, aural and visual. At Station B, the subjects completed four individually conducted evaluation processes. The four MMPALT II subtests measured at Station B were: interactive, haptic, kinesthetic, and olfactory. After all testing was completed, the subjects were given an opportunity to examine their initial test results and discuss those results. See Appendix F for copies of the response sheets for each subtest and the summary report form.

To eliminate first-test, second-test interaction bias in any group results, half of the subjects completed the PMPS as their first activity, and half completed the PMPS as their last activity. PMPS and MMPALT II scores were returned to individual participants at the conclusion of testing for all subjects.

Design of Study

The purpose of this study was to gather data on the learning styles of the Dale Public School employees using the MMPALT II developed by Cherry (1982). The questions the research sought to answer were:

1. What are the preferred learning styles of the Dale, Oklahoma Public School employees as measured by the MMPALT II?

2. Is there a correlation between the employees' MMPALT II score and the perceived learning styles as measured by PMPS?

3. What are the collective characteristics of the learning styles of the Dale Public School employees?

4. How do the learning style scores differ for administrators,

elementary teachers, high school teachers, and support personnel?

5. What are the differences in the learning style measurements of men and women employees at the Dale School?

Specific dates were scheduled for conducting the measurements for the subjects but some individuals requested to be measured at different times. All such requests were honored.

The integrity of the measurement process was assured on all dates and at all locations by processing and measuring in accordance with standardized written instructions. All measurements were conducted by either this researcher or trained evaluators.

Like the subjects, all evaluators were volunteers. As individuals demonstrated a special interest in and understanding of this project, they were invited to assist in future measurements. Twelve volunteer evaluators were used in the project. Objectivity in evaluation was obtained by using standardized assessment/evaluation procedures as well as the training procedures for evaluators.

All evaluators were individually trained by this researcher. The training was conducted in three phases. Phase one of the training consisted of the volunteer evaluator and this researcher mutually deciding which of the MMPALT II elements would be administered by the new evaluator. Each evaluator was trained to administer only one subtest of the total test battery. All print, aural, and visual measurement elements of the MMPALT II were administered by the researcher. Phase two of the training consisted of a new evaluator reading the printed instructions, examining materials, and asking questions. Phase three involved the new evaluator in practicing the

procedures with this researcher or a previously trained evaluator. All evaluators had previous experience in administering various forms of tests in a school environment.

Collection of Data

As the subjects arrived at the measurement location they were first given a copy of the subjects records form (Appendix B). This form was to be returned when subjects completed it. Next each person was directed to Station A. Here it was determined whether each subject has read and understood the learning styles measurement introduction and had completed the necessary sign-up card.

After initial in-processing, the subjects were welcomed by the researcher, and they received a formal introduction to the measurement process. The introduction included a brief discussion of learning styles in general and the seven learning style elements specifically, an explanation of the reasons for measuring learning styles, a full demonstration of the measurement procedures to be used, and a question and answer session. Emphasis was placed on the need to do as well as possible on each of the measurements, but it was also stressed that the procedures were measurements, not pass or fail testing. One of the goals of the introduction was to prepare each subject for the measurements without raising anxieties or reducing motivation and enthusiasm.

At the conclusion of the question and answer period, subjects were given the print, aural, and visual subtests by the researcher. After completing three subtests the subjects were routed to Station B to one of the four subtests sites, i.e. the olfactory, haptic,

kinesthetic or interactive. This process facilitated subject flow through the various measurements.

The complete Station A processing and introduction required approximately 45 minutes, depending on the size of the group, the subjects' past knowledge of learning styles concepts, and their ability to understand the measurement procedures. Station A procedures included three measurement subtests of the MMPALT II: print, aural, and visual. Basically the procedures were taken from Cherry's (1981) study.

Print

After a brief review of the procedures, the subjects were seated in front of a white screen. The subjects were provided response forms and pencils; they were instructed to write their names on the forms. They were spaced to prevent eye contact with one another's response sheets. The evaluator directed the subjects to place their pencils on the table, relax, and concentrate on the screen. Using a Kodak Carousel projector, the evaluator projected 35mm slide pairs of trigrams (nonsense words) and common nouns onto the screen. The trigram was projected on the left half of the screen and the common noun on the right half. Each pair was displayed for seven seconds.

After presenting all 10 pairs, the evaluator instructed the subjects to pick up their pencils and prepare to write their responses by the appropriate number on the response sheets. As the evaluator projected each stimulus trigram on the left half of the screen, he announced the number of that slide, e.g., "number one, number two, etc. . . ." The subjects were allowed 10 seconds to see each trigram and record their responses. After projecting all 10 stimulus trigrams, the evaluator

collected the response sheets and prepared for the next measurement.

Aural

The subjects were again supplied response sheets and pencils. They were instructed to enter their names on the forms and prepare to listen to a tape recording. The evaluator presented the pairs using a cassette tape player. The player speaker was positioned in the midst of the subjects. The tape recording contained a brief introduction to the pairs to allow the subjects to acquaint themselves with the speaker's voice. The tape recording allowed seven seconds between each pair of trigrams and common nouns.

After all pairs were presented, the evaluator played the response test tape. The tape recording contained all other instructions to the subjects and allowed 10 seconds for each written response. When the test was completed, the evaluator stopped the tape player and collected the response sheets.

Visual

The subjects were again supplied response sheets and pencils. They were instructed to write their names on the forms and prepare to watch the screen for pairs of abstract symbol and common object pictures. The evaluator presented the pairs using the Kodak Carousel projector and 35 MM slides and allowed seven seconds between each pair of abstract symbols and common objects. After all pairs were presented, the evaluator showed the abstract symbols from a separate set of slides and allowed 10 seconds for each response. When the

test was completed, the evaluator stopped the projector and collected the response sheets.

Station B included four measurement subtests of the MMPALT II: interactive, haptic, kinesthetic, and olfactory. All measurements were conducted on an individual basis in individual rooms. A coordinator was used to direct subjects through the various measurement rooms.

Interactive

For this measurement, the evaluator welcomed each subject and attempted to make him or her feel relaxed and comfortable. The subject was seated facing the evaluator. The evaluator again explained the measurement procedures and answered questions as necessary. Using the prepared script, the evaluator presented the 10 pairs of trigrams and common nouns to the subject. The subject was encouraged to discuss each pair as it was presented. After a few seconds pause, the evaluator used the randomized list of trigrams and script to conduct the response test. As each trigram was spoken, the subject was allowed 10 seconds to supply the appropriate common noun response. The evaluator scored the response on a prepared answer sheet. The answer sheet was kept out of the subject's view; subjects were not told if the responses were correct or incorrect, and the subjects were not told their final score. At the conclusion of this measurement, the subject was directed to the next measurement area.

Haptic

Again, the subject was welcomed, and it was determined that he or she understood the procedures for this measurement. The subject

was seated across a small table from the evaluator and blindfolded. Without speaking, the evaluator opened the container and proceeded to place each pair of objects in the subject's hands. The subject was allowed 10 seconds to describe or name the appropriate common object of the pair. Scoring was done on a prepared answer sheet by the evaluator. The subject was not informed about the correctness of his or her responses. The blindfold was removed, and the subject was directed to the next area.

Kinesthetic

After the usual welcome and assurance that the procedures were understood, the subject was placed in a standing position near the center of the test area and blindfolded. The evaluator stood behind the subject and guided the subject through the body movement pairs by grasping the subject's shoulders. Spoken directions were used as necessary, but they were kept to a minimum. To minimize confusion and create a clear separation between the pairs, the evaluator would say, "This movement is (stimulus) . . . It is paired with (response) . . ." Upon completing the 10 pairs, the evaluator guided the subject through each of the randomized stimulus only movements. The subject was allowed 10 seconds to respond by describing or performing the appropriate response movement. The evaluator or the assistant scored the responses on the appropriate form, but the subject was not informed of the test results. After removing the blindfold, the subject was directed to the next area.

Olfactory

After the subject received the usual welcome and check for understanding of the procedures, he or she was seated at a small table across from the evaluator and blindfolded. The subject was cautioned to handle the aroma vials carefully, and the evaluator was cautious not to spill the vials. Some spoken directions were used in this measurement. Specifically, the evaluator removed the cap from a stimulus vial, placed the vial in the subject's hand, and said, "This is the first aroma of this pair." The subject lifted the vial to his or her nose for a few seconds and returned it to the evaluator. The evaluator replaced the cap on the first vial, removed the cap from the response vial, placed the vial in the subject's hand, and said, "This is the second aroma in this pair." To assure common terminology, the evaluator stated the name of the second aroma as the subject was smelling it, unless the subject identified it first. The subject then returned the vial to the evaluator who replaced the cap and prepared the next pair.

After all 10 pairs were presented the evaluator conducted the recall test. Each stimulus vial was presented to the subject in randomized order. The subject was allowed 10 seconds to sniff the aroma and state the name of the appropriate response member smell. As in the other measurements, the evaluator scored the responses without indicating to the subject his or her correctness or incorrectness. After removing the blindfold, the subject was directed to the next area.

Coordinating

When multiple subjects were being measured at Station B, the coordinator was responsible for several activities. This person assured that each subject received all four measurements without confusion or delays. Each measurement required between 10 and 15 minutes; the coordinator was responsible for preventing the subjects from talking about the various measurements while they were waiting. The coordinator also was responsible for the collection of score sheets.

Procedures for completing the PMPS were to have the 45 participants answer the 42 questions on the survey sheet by using the number one for always, two for usually, three for seldom and four for never in response to their assessment of their learning styles. The first 22 subjects were asked to complete the PMPS after having taken the MMPALT II and the remaining 23 of the 45 participants were instructed to complete the PMPS prior to the MMPALT II test date. All respondents complied with the request of the researcher. All PMPS responses were collected on or before the last test date, September 14, 1983.

Upon completing all measurements, each subject received a report of his or her MMPALT II results. These reports included the raw scores from each of the seven subtests and the rank order of the seven subtests. Each subject was thanked for participating in the project.

Statistical Analysis

Upon completing the measurements, the raw data consisting of each subject's self-marked PMPS, a score sheet from each of the seven

MMPALT II score sheets for each subject was checked for errors and validated against each subject's final report sheet. Each subject's PMPS response sheet was checked for stray or improper marking. To facilitate machine processing, the data from each subject's final report of MMPALT II subtests and PMPS were transferred to a summary sheet of all 45 participants.

After reviewing all data recorded on the summary sheet for accuracy, and recording and coding all demographic data, the information was given to the University Computer Center to be keypunched.

The next procedure was to process the data. Under the direction of a professional statistician, a program was written to calculate (1) analysis of variance of the four groups of Dale school employees, (2) a t-test to measure significant differences between the female and male employees (the computer also performed a Hartley's F-max to test for equal variances), (3) a Pearson Product Moment to determine the correlation coefficient on the PMPS and MMPALT II scores and the PMPS and MMPALT II ranks, and (4) the total and mean scores of each of the seven learning style subtests surveyed by the PMPS and measured by the MMPALT II.

The final step was to analyze the computer produced data against the research questions asked in Chapter I. That information comprises Chapter IV of the study.

CHAPTER IV

ANALYSIS AND PRESENTATION OF FINDINGS

Five research questions were used as the basic organizational pattern for this chapter. Those questions provided the general criteria for data analysis. In section one, a description of the subjects participating in the study is given. In section two, the preferred learning styles of the Dale Public School employees, as measured by the MMPALT II, are discussed. In section three, the correlation between the PMPS and MMPALT II scores is described. In section four, the collective characteristics of the Dale Public School employees learning styles are discussed. In section five, differences of learning styles, as measured by the MMPALT II, are defined by four groups of the school employees: administrators, high school teachers, elementary teachers, and support personnel. In section six, comparison of male and female learning styles is made to see if a significant difference exists. Section seven contains the researcher's observations.

Description of Subjects

Forty-five Dale Public School employees participated in this study. The 45 employees consisted of five administrators, 16 high school teachers, 15 elementary teachers, and nine support personnel. Thirty of the employees were women and 15 were men. Thirty-nine were married and six were single. Twenty had attained a Master's degree, 16 held

Bachelor's degrees and nine support personnel had no degrees at all. The age range for these adults was 18 to 62 years.

Demographic data shown in Table I include:

1. None of the women employees served in an administrative capacity. Fourteen of the 15 elementary teachers were women; and two-thirds of all the employees were women.

2. Only six of the 45 employees, or 13 percent, were single.

3. Fifteen of the 31 teachers, approximately 60 percent, have attained a Master's degree and all five administrative personnel have completed a Master's degree program. Of the 15 teachers who hold Master's degrees, seven teach in the high school (grades seven - 12) and eight teach in the elementary school (Kindergarten - six). None of the nine support personnel had attained a college degree.

Preferred Learning Styles as Measured by MMPALT II

The results from measuring the learning styles of the Dale Public School employees show some variability of preferred styles. Table II is a summation of the style preferences. The most obvious preference is the visual learning style. Twenty-five of the 45 employee's scores on the MMPALT II showed the visual style as being primary, i.e., they scored higher in the visual subtest than in any other subtest.

Nineteen of the 45 showed a strong preference for the haptic style, as evidenced by their rank order of two or above in that style.

The interactive style also was a strong preference or a back-up learning style. Thirty-two employees showed a rank order of 3.5 or above.

TABLE I

DEMOGRAPHIC DATA OF DALE PUBLIC SCHOOL EMPLOYEES

	Position Held	Sex		Marital Status		Educational Level Achieved		
		Women	Men	Married	Single	M.S. Degree	B.S. Degree	No Degree
	N	N	N	N	N	N	N	N
Administrative	5	0	5	5	0	5	0	0
High School Teacher	16	9	7	13	3	7	9	0
Elementary Teacher	15	14	1	14	1	8	7	0
Support Personnel	9	7	2	7	2	0	0	9
Total	45	30	15	39	6	20	16	9

TABLE II

SUMMATION OF LEARNING STYLE STRENGTHS DEMONSTRATED BY MMPALT II RANKINGS OF DALE PUBLIC SCHOOL EMPLOYEES

Rank Order	Subtests						
	Print	Aural	Interactive	Visual	Haptic	Kinesthetic	Olfactory
	N	N	N	N	N	N	N
1	1	1	4	25	4	0	0
1.5	2	1	1	4	4	0	0
2	2	3	10	6	11	1	0
2.5	3	5	6	3	4	2	0
3	3	5	5	1	3	4	0
3.5	2	3	6	2	5	4	0
4	7	8	3	2	2	6	0
4.5	5	5	3	0	0	2	1
5	4	8	2	1	3	7	1
5.5	3	3	1	0	6	5	2
6	1	1	2	1	1	8	5
6.5	6	2	1	0	1	5	13
7	6	0	1	0	1	1	23
Total Subjects	45	45	45	45	45	45	45

The olfactory learning style was the least preferred style according to the MMPALT II scores. Forty-one of the 45 employees showed a rank of six or below.

Table III, Summation of the MMPALT II Test Scores, further bears out the preference for the visual learning style. Thirty-two of the 45 scored eight or above on the visual subtest and 18 scored a perfect 10. The mean score for the visual subtest was 8.09; the highest of the means.

Twenty-nine of the 45 scored six or higher in both the haptic and interactive subtests. The means for these two learning style subtests were 6.24 and 6.18 respectively.

The summation of MMPALT II scores showed the same lack of preference for the olfactory learning style as did the MMPALT II ranks. No employee scored above four on the olfactory subtest and the mean was 1.71.

Correlation of the PMPS and MMPALT II Scores

A summary of the PMPS scores is presented in Table IV. The possible scores have been arbitrarily grouped into seven intervals to facilitate understanding the clustering of scores throughout the range. There seems to be a clustering of these scores in four of the seven intervals; i.e., between the rank of -16 to +27, in six of the seven learning styles. Only the olfactory style is clustered toward the lower extreme of the broad range of -36 to +36. Forty-three of the 45 subjects scored their perceived preference as -6 or lower. The olfactory PMPS scores' mean was -20.89.

The highest PMPS mean score of the seven learning styles was the kinesthetic style. Print and interactive and visual styles were

TABLE III

SUMMATION OF MMPALT II SUBTEST SCORES FOR DALE PUBLIC SCHOOL EMPLOYEES

Subtest		Scores Made on Subtests 0	1	2	3	4	5	6	7	8	9	10	Range	Mean
Print	N*	5	3	7	1	5	5	4	5	3	1	4	0-10	4.60
Aural	N	1	1	2	5	4	4	13	6	2	0	4	0-10	5.31
Inter-Active	N	0	1	0	7	5	5	3	10	8	5	3	1-10	6.81
Visual	N	0	1	1	0	2	2	3	3	7	7	18	1-10	8.09
Haptic	N	0	1	4	1	7	7	6	5	6	7	5	1-10	6.24
Kines-thetic	N	0	2	3	15	7	7	7	2	0	1	0	1-9	4.16
Olfactory	N	7	14	14	5	5	5	2	0	0	0	0	0-4	1.71

*N=Number of subjects making score

TABLE IV

SUMMARY OF PMPS SCORES FOR DALE PUBLIC SCHOOL EMPLOYEES

Learning Style	Subject Distribution by Score Categories (Intervals) (-36 -28) N	(-27 -17) N	(-16 -6) N	(-5 +5) N	(+6 +16) N	(+17 +27) N	(+28 +36) N	Range	Mean
Print	0	0	14	10	5	10	5	-14 +33	6.02
Aural	0	3	13	14	12	3	0	-23 +21	1.38
Inter-Active	0	1	5	14	16	7	2	-19 +31	5.98
Visual	0	0	4	19	18	4	0	- 8 +22	5.38
Haptic	0	1	20	11	10	3	0	-21 +20	-2.00
Kines-thetic	0	4	8	6	15	9	3	-26 +32	6.62
Olfactory	11	22	10	1	1	0	0	-35 +11	-20.89

perceived as being strong. These three styles had means of 6.02, 5.98 and 5.38 respectively. Neither the haptic nor the aural styles was perceived as being a preferred learning style by the group.

A low or negligible correlation between the MMPALT II subtest scores and the perceived preferred learing styles surveyed by the PMPS is shown in Figure 1. A Pearson r was calculated on the two measurement results. The machine formula:

$$r = \frac{N\Sigma XY - X\Sigma Y}{\sqrt{N\Sigma X^2 - (\Sigma X)^2}\ \sqrt{N\Sigma Y^2 - (\Sigma Y)^2}}$$

(Bartz, 1981, p. 191).

was used to calculate the correlation. The categories of correlation used were:

Coefficient	Relationship
00 to ± .20	negligible
±.20 to ± .40	low or slight
±.40 to ± .60	moderate
±.60 to ± .80	substantial or marked
±.80 to ±1.00	high to very high (Best, 1959, p. 240).

The same lack of correlation between the two results is shown in Figure 2. The ranking of the seven subtests by the subjects on both the MMPALT II and the PMPS resulted in low or negligible correlations. In summary, it can be concluded that no meaningful correlations between the MMPALT II subtest scores and the perceived preference of learning styles as shown by the PMPS.

Collective Characteristics of the Dale Public School Employees Learning Style Subtest Scores

Figure 3 is a graphic display of the total scores of the total

		SUBTESTS						
		PRINT	AURAL	INTERACTIVE	VISUAL	HAPTIC	KINESTHETIC	OLFACTORY
PMPS SCORES	Print	.36 (low)						
	Aural		-.07 (negligible)					
	Interactive			-.15 (negligible)				
	Visual				.30 (low)			
	Haptic					.10 (negligible)		
	Kinesthetic						-.0 (negligible)	
	Olfactory							-.35 (low)

Figure 1. Correlation of MMPALT II Subtest Scores with the Correpondent PMPS Subtest Scores

		SUBTESTS						
		PRINT	AURAL	INTERACTIVE	VISUAL	HAPTIC	KINESTHETIC	OLFACTORY
	Print	.35 (low)						
P	Aural		.23 (low)					
M								
P	Interactive			-.02 (negligible)				
S								
	Visual				.09 (negligible)			
R								
A	Haptic					.18 (negligible)		
N								
K	Kinesthetic						.33 (low)	
S								
	Olfactory							.07 (negligible)

Figure 2. Correlation of MMPALT II Subtest Ranks with the Correspondent PMPS Subtest Ranks

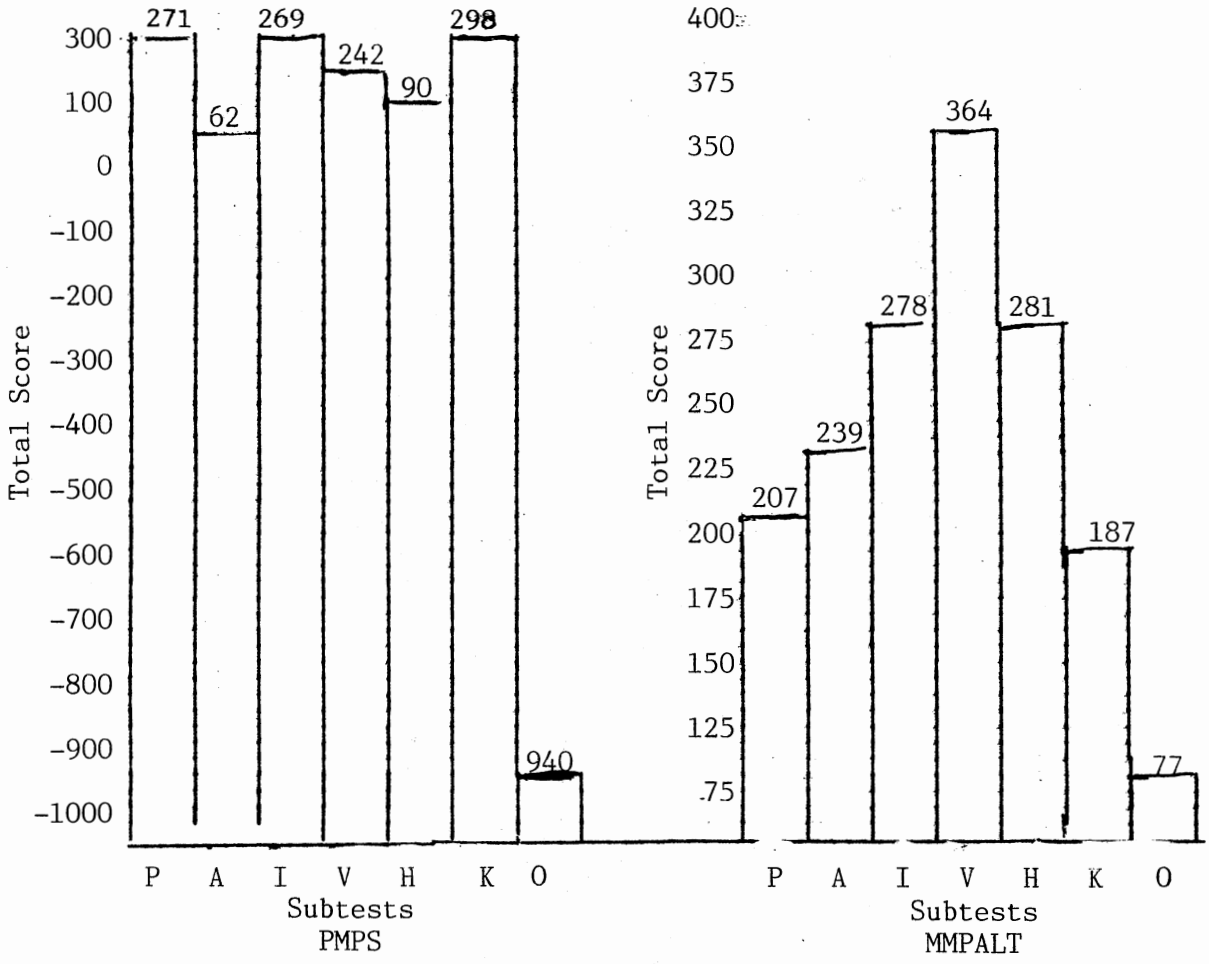

Figure 3. Total Scores for Dale Public School Employees Measured by the PMPS and MMPALT

population. The relationship of expressed preferences to measured preferences is shown in the figure. Collectively, the most frequently expressed preferences were kinesthetic, print, interactive, and visual.

Differences in Learning Styles by Group

The 45 subtests were grouped into four distinct positions, i.e. administrators, elementary teachers, high school teachers, and support personnel. A one-way analysis of variance was performed on the MMPALT II subtest scores using position as the classification variable. The results of the one-way analysis of variance are displayed in Table V. These results show that there was no significant difference between groups at the Dale School.

Comparison of Female and Male Learning Styles

A t-test was computed to determine if a significant difference existed between the learning style subtest scores of female and male subjects as measured by the MMPALT II. The computer executed the Hartley's F-max to test for equal variances. The results showed scores for both equal and unequal variances. The results of the t-test comparison are displayed in Table VI. Although the female subjects mean scores exceeded the male mean score in all seven of the subtests there was no significant difference at the .05 level.

Researcher's Observation

Additional information uncovered but not researched revealed that only four of the 45 subjects tested with the MMPALT II were smokers.

TABLE V

ANALYSIS OF VARIANCE ON MMPALT II SUBTEST SCORES BY GROUPS

Source	df	ss	ms	f
Print				
Model	3	14.31	4.77	.52
Error	41	377.70	9.21	
Total	44	392.00		
Aural				
Model	3	110.16	36.72	.47
Error	41	3187.48	77.74	
Total	44	3297.64		
Interactive				
Model	3	5.35	1.78	.38
Error	41	236.29	5.76	
Total	44	241.64		
Visual				
Model	3	14.77	4.92	.91
Error	41	222.87	5.44	
Total	44	237.64		
Haptic				
Model	3	.82	7.16	.04
Error	41	293.76		
Total	44	294.58		
Kinesthetic				
Model	3	.78	.30	.09
Error	41	122.42	2.99	
Total	44	123.20		
Olfactory				
Model	3	7.15	2.38	1.74
Error	41	56.09	1.37	
Total	44	63.24		

TABLE VI

A COMPARISON OF MMPALT II SUBTEST SCORES
BY SEX USING THE t-TEST

Subtest	N	$\overline{X}$	S.D.	t
Print				
Female	30	5.30	2.69	2.09
Male	15	3.40	3.22	
Aural				
Female	30	7.33	10.13	.57[a]
Male	15	6.06	4.65	
Interactive				
Female	30	6.40	2.53	.36
Male	15	6.13	2.00	
Visual				
Female	30	8.40	1.81	1.08[a]
Male	15	7.47	3.09	
Haptic				
Female	30	6.70	2.51	1.19
Male	15	5.73	2.71	
Kinesthetic				
Female	30	4.17	1.68	.19
Male	15	4.07	1.71	
Olfactory				
Female	30	2.00	1.08	2.41
Male	15	1.13	1.25	

a = t value utilized was corrected for unequal variances as tested by F max.

All four scored below the olfactory mean score of 1.71. Although there were not enough smokers to do a comparative study of smokers and non-smokers in this population, the question could be raised as to whether smoking deteriorates the sense of smell to the extent that it cannot be as beneficial as a learning style for the smoker as it could be if he/she did not smoke.

Two of the 45 subjects were left handed. One scored above and one below the mean score for the haptic subtest. There was no identification that handedness had an effect on the haptic scores.

The Dale Public School is a small rural school system. Fourteen or 31 percent of the subjects indicated they were born and reared in an urban environment. This study did not attempt to determine if a significant difference existed between learning style scores for public school employees born and reared in a rural environment and those born and reared in an urban environment.

None of the 35 employees holding university or college degrees received them from institutions with an enrollment of over 30,000. Ten of the 36 received degrees from universities with enrollments of 20,000 or more. No effort was made to determine if learning style differences existed in groups who attended smaller universities from groups who attended large or medium universities.

The total family income for 31 of the 45 subjects was over $30,000. Since 39 of the 45 were married, most of the subjects had more income for their families than the salaries paid by the school.

Thirty-six of the 45 were parents. No attempt was made to determine if those with children scored differently than those with no offspring. Neither was an attempt made to find out if marital status

had any effect on learning styles.

Two of the subjects reported having a hearing handicap but their MMPALT II aural scores were seven and five. The aural mean score was 5.31. The two subjects also scored one above and one below the PMPS aural mean. No conclusion could be drawn from these results as far as hearing impairment affecting the aural scores.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The discussion in this chapter is divided into three sections. The first section presents a summary of the study. The second section contains the conclusions. The recommendations for research and practice are defined in the final section of the chapter.

Summary

This research focused on the measurement of adult learning styles; specifically it studied the learning styles of the employees of the Dale, Oklahoma Public School. Additionally this study examined the correlation of the PMPS subtest scores and the MMPALT II subtest scores.

The subject population consisted of 45 school employees; 15 male and 30 female. They ranged in age from 18 to 62 years. Five of the employees were administrators, 15 were elementary teachers, 16 were high school teachers and nine were support personnel.

Each subject was required to complete the seven part MMPALT II and the PMPS questionnaire. All the data was key punched and computed by the Oklahoma State University Computer Center.

Total scores and mean scores were figured for each subtest. Significance tests used were the t-test and analysis of variance. A Pearson r was computed to determine correlation coefficients.

Five study questions were addressed: (1) what are the preferred

learning styles of the Dale, Oklahoma Public School employees as measured by the MMPALT II? (2) Is there a correlation between the employees' MMPALT II results and the perceived learning styles as measured by the PMPS? (3) What are the collective characteristics of the learning styles of the Dale Public School employees? (4) How do the learning style scores differ for administrators, elementary teachers, high school teachers, and support personnel? (5) What are the individual differences in the learning style measurements of the men and women employees at the Dale Public School?

Conclusions

The conclusions of this study are stated as they related to each of the five research questions. 1. What are the preferred learning styles of the Dale, Oklahoma Public School employees?

The primary learning style of 25 of the 45 subjects was the visual style. The secondary or back-up styles, according to the subtest scores, were the haptic and interactive styles.

2. Is there a correlation between the employees' MMPALT II results and the perceived learning styles as measured by the PMPS?

There were no meaningful correlations between the MMPALT II subtests and the PMPS results. A Pearson r was computed for both the subtest scores and ranks. All correlations were negligible or low. This research concludes that the PMPS scores do not correlate with the MMPALT II subtest scores.

3. What are the collective characteristics of the learning styles of the Dale School employees?

The most frequently expressed preferences on the self-assessment

PMPS were the kinesthetic, print, interactive, and visual. The learning styles with the greatest strength on the objective MMPALT II subtests were the visual, haptic, and interactive. The olfactory learning style was the least preferred according to scores from both instruments.

4. How do the learning style scores differ for administrators, elementary teachers, high school teachers, and support personnel?

An analysis of variance of the four groups showed that there was no significant difference in the scores of the subtests for any of the groups.

5. What are the differences in the learning style measurements of the men and women employees at the Dale Public School?

The t-test computation on each of the MMPALT II subtests showed there were no significant differences between the sexes learning styles. Since there were no significant differences between groups in the population, the conclusion may be drawn that differences within the groups relate only to individual differences in learning styles.

Recommendations

Recommendations for practice were:

1. Since the majority of adult learning is individualized and self-directed, it is recommended that the Dale Public School employees use the assessment of their personal strengths as shown by the MMPALT II in the planning of individual learning projects.

2. It is recommended that the Dale Public School Staff Development Committee plan for or present staff development programs that make use of the visual learning style and that in such programs, allowance be made for the use of the interactive and haptic styles.

3. It is recommended that the Dale Public School employees not rely upon self-assessment of learning style preferences.

Recommendations for future research are:

1. Additional studies should be conducted to determine if other self-assessment instruments can measure the adult learning styles. Use of such instruments is efficient in use of time and money, however the results of this study showed that the PMPS instrument is not useful for determining the strongest learning styles. Therefore, it is recommended that other instruments be developed and researched to see if self-assessment can be used to validly measure adult's learning styles.

2. It is recommended that the olfactory measurement be conducted with a population that includes a sizeable number of both smokers and non-smokers to see if a significant difference exists in their respective learning styles.

3. It is recommended that learning style studies be conducted to compare rural and urban adult populations to see if there is indeed a difference between these two groups as to their learning style strengths.

4. It is recommended that research studies be conducted in a variety of adult learning programs to determine the extent of learning styles usage in presenting adult instruction. This study implies the instructional strategies rich in visual, haptic, and interactive techniques would benefit the adult learner.

5. It is recommended that research be conducted with learning disabled adults to determine if their disabilities extend to other styles besides the print, visual, and aural; or to see if learning success would be greater if the haptic style is included in their education program.

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APPENDIXES

APPENDIX A

CORRESPONDENCE TO SUBJECTS

September 1, 1983

TO: Dale School Faculty

FROM: Jack W. Akins

SUBJECT: Measurement of Individual Learning Styles

As part of my graduate studies at Oklahoma State University, I'm conducting measurements of individual learning styles. This project can be beneficial to both you and me. To complete my studies, I'll need to measure the learning styles of approximately 50 adults. The personal information which you can receive from this project can help you in your teaching and learning projects. Because of this potential benefit, the Staff Development Committee has authorized me to invite you to participate in this project.

Participation is voluntary, and I would not expect you to participate without specific information and certain guarantees. I've, therefore, enclosed an introduction to learning styles measurement and this project. Please read that information before making your decision.

Looking forward to your favorable decision, I've also enclosed a sign-up sheet.

Thank you for your time and consideration.

Jack W. Akins

Approved:

Audrey Roach, Chairman
Dale Staff Development Committee

LEARNING STYLES MEASUREMENT

INTRODUCTION

What are learning styles, and why should we measure them?

As people are left handed or right handed they also have different ways of learning. Some learn best by reading, touching, seeing, or hearing; others learn best by talking with friends, actively doing things, or even smelling things. The measurement of learning styles is not a matter of finding good or bad, or determining pass or fail; it is a matter of discovering individual differences. When a student's style is measured, he or she can use the measurement results to plan and conduct his/her individual study programs.

How will this measurement program be conducted?

After an explanation of the concept of learning styles and an introduction to the measurement procedures, each participant will receive seven practical measurements and complete a written survey. For the practical measurement, the participants will be asked to remember pairs of words, pictures, objects, smells, or movements. The number of pairs remembered will indicate the participant's strengths in each of seven learning styles: print, aural, interactive, visual, haptic, kinesthetic, and olfactory. The written survey asks the particpant's opinion on various methods for learning. A summary of thoseopinions indicates the participant's preferred method for learning.

When, where, and how long?

Two locations will be used, and individual measurements will be conducted.

Jack Akins' Home
Dale, Oklahoma September 3, 5, 1983

Dale Public School
September 12, 14, 1983

It will take two to three hours for each participant to complete the process. Individuals will be scheduled to start the activities at 8 AM or 1:30 PM.

Because this is part of a research project, the learning styles measurement will be conducted under a rigid set of rules:

1. Participation is on a voluntary basis and individuals may withdraw from the project at anytime.

2. Individual privacy will be fully protected.

3. Published results will not identify individual participants.

4. No participant will be subjected to any physical, psychological, or social risk or injury.

For additional information or sign-up contact:

Jack W. Akins
Box 683
Dale, Oklahoma 74838
(405) 964-2825

SIGN-UP SHEET

TO: Jack W. Akins
Box 683
Dale, Oklahoma 74838

I have read the introduction to the learning styles measurement project, and I would like to be a participant in the project.

Name:_____

Address:_____

_____

Telephone Number: _____

Signature:_____

APPENDIX B

SUBJECTS RECORD FORM

_____ _____

Name Subject Number

POSITION: Administrator_____; H.S. Teacher_____; Elem. Teacher_____;

Teacher Aide_____; Support Person _____

If Teacher, what subject do you teach_____

How long have you taught this subject _____

AGE _____ SEX_____ SINGLE_____ MARRIED

WHERE WERE YOU BORN_____: RURAL_____: URBAN_____: SUBURBAN_____

WHERE WERE YOU RAISED _____: RURAL_____: URBAN_____: SUBURBAN_____

DO YOU HAVE ANY OF THE FOLLOWING PHYSICAL HANDICAPS: Visual_____; Hearing_____; Physical_

EDUCATION COMPLETED

___1. Some High School

___2. High School Diploma

___3. Some College

___4. Bachelor's Degree

___5. Master's Degree

___6. Doctor's Degree

Where did you get degrees?_____

_____

Are You Right Handed_____Left Handed_____

Do You Smoke?_____

Are you currently enrolled in any adult learning program. If so, what_____

_____, Where_____

TOTAL FAMILY INCOME
(specify number of contributors)

1. _____ below $20,000.
2. _____ below $25,000.
3. _____ below $30,000.
4. _____ below $40,000.
5. _____ below $50,000.
6. _____ above $50,000.

NUMBER OF CHILDREN

1. _____ None
2. _____ Under 6 yrs old
3. _____ 6 - 12 yrs old
4. _____12 - 17 yrs old
5. _____18 - 22 yrs old
6. _____Over 22 yrs old

APPENDIX C

PERMISSION TO USE MMPALT II AND PMPS

Robert L. McElrath
COMMISSIONER

TENNESSEE
STATE DEPARTMENT OF EDUCATION
100 CORDELL HULL BUILDING
NASHVILLE 37219

November 23, 1983

Dr. Waynne James
Occupational and Adult Education
406 Classroom Building
Oklahoma State University
Stillwater, Oklahoma 74074

Dear Waynne:

I am writing to confirm that you have permission of the authors of The MMPACT-II Learning Style Test, to administer the tests, and use the results in a series of doctoral dissertations to be conducted at Oklahoma State University. We are pleased that you are furthering our research. We shall look forward to obtaining the results of your research.

Cordially,

Russell L. French

For the Authors: Russell L. French and Edwin Cherry

RLF:clh

APPENDIX D

SCRIPTS AND PROCEDURES FOR MMPALT II

STATION #1
INTRODUCTION AND GROUP TESTS
(PRINT, AURAL, VISUAL)

REQUIREMENTS:

PEOPLE: 2 trained evaluators

EQUIPMENT: 1 35 mm Kodak Carousel Slide projector

1 projection screen

1 audiotape cassette recorder

MMPLAT-II MATERIALS: Tray of slides (Print, Visual Tests)

Audio-cassette (Aural Test)

Demonstration materials: wooden block and baseball, two vials, blindfold

Pencils

Response Sheets: Print, Aural, Visual

PROCEDURES:

A. INTRODUCTION:
1) Welcome subjects
2) Introduce concept of learning styles
3) Explain and demonstrate measurement procedures
4) Organize test groups (groups of 4)
5) Respond to Questions

B. PRINT TEST:
1) Be sure subjects can all see screen clearly
2) Distribute response sheets (face down) and pencils
3) Give directions and show sample pair
4) Display stimulus/response pairs at 7 second intervals
5) Instruct subjects to turn response sheets over and pick up pencils
6) Announce number of response and display each stimulus slide for 10 seconds. (For example: "Number one (wait 10 seconds), Number two (wait 10 seconds) etc..."
7) Collect response sheets

NOTE: Pairings and sequence of stimulus/response pairs should be as follows:
Sample: hez/sister

1) biv/cat
2) ceq/party
3) puq/name
4) dup/bed
5) xib/box
6) cyc/horse
7) koy/rain
8) wuq/robin
9) lez/paper
10) nyh/coat

Sequence for stimulus only display:

1) dup
2) cyc
3) koy
4) biv
5) xib
6) nyh
7) ceq
8) lez
9) puq
10) wuq

C. AURAL TEST: 1) Be sure subjects can all hear audiotape well.

2) Distribute response sheets face down.

3) Give directions for the test and demonstrate stimulus/response pair.

4) Play audiotape containing stimulus/response pairs.

5) Instruct subjects to turn response sheets over and prepare to respond.

6) Play audiotape containing stimulus member only (2nd section of audiocassette).

NOTE: Pairings and sequence of stimulus/response pairs should be as follows:

1) vom/apple
2) und/baby
3) tud/kitten
4) sul/shoe
5) roz/duck
6) poh/leg
7) omp/bread
8) mog/table
9) kiv/rabbit
10) jus/bird

Sequence for stimulus only presentation:

1) poh
2) omp
3) jus
4) vom
5) tud
6) mog
7) und
8) sul
9) kiv
10) roz

D. VISUAL TEST: 1) Be sure subjects can all see the screen well.

2) Distribute response sheets (face down).

3) Give directions and show sample pair.

4) Display stimulus/response pairs at 7 second intervals.

5) Instruct subjects to turn response sheets over and prepare to respond.

6) Announce number of response and display each stimulus member for 10 seconds. (For example: "Number one (ten seconds), etc..."

7) Collect answer sheets and pencils.

NOTE: Pairing and sequence of stimulus/response pairs should be as follows:

1) square/tree
2) circle/hat
3) triangle/chair
4) rectangle/boot
5) plus sign/window
6) star/boat
7) oval/flower
8) asterisk/umbrella
9) diamond/scissors
10) infinity sign/eyeglasses

Sequence for stimulus only display:

1) asterisk
2) circle
3) plus sign
4) rectangle
5) infinity sign
6) oval
7) diamond
8) square
9) star
10) triangle

DISMISSAL: 1) Be sure subjects have their group assignments.

2) Direct subject groups to next location(s).

STATION #2

INTERACTIVE TEST

REQUIREMENTS:

PEOPLE: 1-2 trained evaluators

EQUIPMENT: This document and response sheets.

PROCEDURES:

1. Seat subject where he/she is at the same level and face to face with primary evaluator. If a secondary evaluator is used, he/she should sit to one side and prepare to score the responses. Scoring must be accomplished without distracting or prompting the subject.

2. Try to put the subject at ease, but do not waste too much time in pleasantries.

3. Assure subject that procedures are identical to those already encountered in the group tests and give him/her directions for the test:

   EVALUATOR: IN A MOMENT YOU WILL BE BLINDFOLDED, THEN YOU WILL BE GIVEN TEN PAIRS OF WORDS. EACH PAIR CONTAINS A NONSENSE WORD AND A COMMON WORD. AFTER PRESENTING EACH PAIR, I SHALL GIVE YOU AN OPPORTUNITY TO TALK ABOUT HOW YOU INTEND TO REMEMBER THIS PAIRING. AFTER ALL TEN PAIRS OF WORDS HAVE BEEN PRESENTED AND YOU HAVE COMMENTED ON EACH, I SHALL PRESENT YOU ONLY THE STIMULUS OR NONSENSE WORDS AND ASK YOU TO SUPPLY THE COMMON WORD WHICH WAS PAIRED WITH EACH. DO YOU UNDERSTAND THE PROCEDURE?

4. Present stimulus/response pairs using the following script:

   THE NONSENSE WORD IN THIS PAIR IS (STIMULUS), AND THE COMMON WORD IS (RESPONSE). PLEASE REPEAT BOTH WORDS.

   (Repeat as necessary until subject can say both words.)

   How will you remember this pair of words? (you may need to prompt the subject to be sure that he/she will verbalize these words)

   (Allow ten (10) seconds for subject to respond to question.)
   (Do not comment on subject's reply.)

NOTE: Pairings and sequence of stimulus/response pairs should be as follows:

1) zed/wind	6) pex/floor
2) fai/tooth	7) chi/egg
3) ces/ball	8) jec/dog
4) hez/Christmas	9) toz/milk
5) sci/fire	10) zon/toy

5. Present stimulus words and ask the subject to state response words. Use the following script:

THE NONSENSE WORD IS (STIMULUS). WHAT WAS (STIMULUS) PAIRED WITH?

(Allow 10 seconds for the response.)

NOTE: Sequence for stimulus only presentation:

1) hez	6) jec
2) zed	7) toz
3) sci	8) ces
4) chi	9) pex
5) fai	10) zon

6. Primary or secondary evaluator completes scoring without reporting results to subject.

7. Be sure subject's correct name or number is on the score sheet.

8. Instruct subject to move to his/her next station or return to the coordinator for reassignment.

STATION #3

HAPTIC TEST

REQUIREMENTS:

PEOPLE: 1-2 trained evaluators

EQUIPMENT: Small desk or table
Box of 20 stimulus/response items
Blindfold
Response sheets

PROCEDURES:

1. Arrange items on table and cover before subject enters.

2. Seat subject across table from primary evaluator. If a secondary evaluator is used, he/she should sit to one side and prepare to score the responses. Scoring must be accomplished without distracting or prompting the subject.

3. Try to put the subject at ease, but do not waste too much time on pleasantries.

4. Assure subject that procedures are the same as for all of the other tests and give him/her directions as follows:

   EVALUATOR: IN A MOMENT YOU WILL BE BLINDFOLDED. THEN I SHALL PRESENT YOU WITH TEN PAIRS OF ITEMS. EACH PAIR CONTAINS A NONSENSE ITEM AND A COMMON ITEM. NONE OF THE ITEMS WILL HURT YOU NOR FEEL TERRIBLE TO YOU. I SHALL ALWAYS PLACE THE NONSENSE ITEM OF EACH PAIR IN YOUR LEFT HAND, AND THE COMMON ITEM IN YOUR RIGHT HAND. FEEL THE TWO ITEMS IN EACH PAIR CAREFULLY SO THAT YOU WILL BE ABLE TO REMEMBER WHAT THINGS ARE ASSOCIATED WITH EACH OTHER. I WILL MAKE SURE THAT YOU CAN IDENTIFY THE COMMON ITEM. AFTER ALL TEN PAIRS HAVE BEEN PRESENTED, I SHALL PRESENT YOU ONLY THE STIMULUS OR NONSENSE ITEMS AND ASK YOU TO IDENTIFY THE COMMON ITEM WHICH WAS PAIRED WITH EACH. DO YOU UNDERSTAND THE PROCEDURE?

5. Blindfold subject and uncover items on the table.

6. Place stimulus member of each pair in subject's left hand; then place corresponding response item in subject's right hand. Allow the subject 7 seconds to handle both objects, then take them from him/her and repeat the procedure with the next pair of items. Be sure subject can identify the common item. He/she will have to name it later.

7. After presenting all ten stimulus/response pairs, instruct the subject that the test is about to begin.

8. Place each stimulus member in the subjects left hand and ask him/her to identify the paired response item:

   PLEASE NAME OR DESCRIBE THE OBJECT WITH WHICH THIS ITEM WAS PAIRED?

(Allow ten (10) seconds for the subject to reply. Do not comment on the subject's reply.)

9. Score is kept without reporting results to the subject.

NOTE: Pairings and sequence of stimulus/response pairs should be as follows:

1) carpet/lightbulb
2) rock/pencil
3) table leg/tennis ball
4) hose coupling/paint brush
5) wood rectangle/table fork
6) bushing/key ring
7) metal tube/scissors
8) odd shaped wood/yo yo
9) plastic golf ball/padlock
10) door knob/drinking glass

Sequence for stimulus only presentation:

1) carpet
2) golf ball
3) odd shaped wood
4) bushing
5) table leg
6) wood rectangle
7) rock
8) door knob
9) metal tube
10) hose coupling

10. Be sure that subject's correct name or number is on response sheet.

11. Instruct subject to move to his/her next station or to return to coordinator for reassignment.

STATION #4

KINESTHETIC TEST

REQUIREMENTS:

PEOPLE: 1-2 Trained evaluators

EQUIPMENT: This document
blindfold
response sheet

PROCEDURES:

1. Seat subject for a few minutes while explaining test. If a secondary evaluator is used, he/she should sit to one side and prepare to score the responses. Scoring must be accomplished without distracting or prompting the subject.

2. Try to put the subject at ease, but do not waste too much time on pleasantries.

3. Assure subject that procedures are the same as for all other tests and give him/her directions as follows:

   EVALUATOR: THIS TEST INVOLVES BODY MOVEMENT: THERE WILL BE LIMITED SPOKEN DIRECTIONS DURING THIS PROCEDURE. FROM THIS (IDENTIFY) STARTING POINT, I'LL GUIDE AND DIRECT YOU THROUGH TEN PAIRS OF BODY MOVEMENTS. YOU WILL BE BLINDFOLDED: THEREFORE I'LL STAY CLOSE BY YOU TO KEEP YOU STEADY AND PREVENT ANY ACCIDENTS. AFTER WE HAVE COMPLETED THE TEN PAIRS OF MOVEMENTS, I'LL GUIDE AND DIRECT YOU THROUGH THE FIRST MOVEMENT OF EACH PAIR. YOU ARE TO RESPOND BY PERFORMING OR DESCRIBING THE MOVEMENT WITH WHICH THE FIRST MOVEMENT WAS PAIRED. DO YOU UNDERSTAND THE PROCEDURE?

4. Blindfold the subject;

5. Move subject through the 10 stimulus/response pairs. As necessary, use the following spoken directions:

   THE FIRST MOVEMENT IS (STIMULUS). IT IS PAIRED WITH (RESPONSE)

   Start each movement by gently placing your hands on the subject's shoulders. The various movements will require gentle movement of the subject's arms and legs. This must be accomplished without alarming the subject in any way. As necessary, you may use additional verbal directions, but those directions must not detract from the actual movements.

6. Move the subject through the various stimulus movements and allow 10 seconds for the subject to respond by performing or describing the paired movements. It may be necessary to say:
   THIS MOVEMENT IS (STIMULUS). WHAT WAS IT PAIRED WITH?

7. Score responses without reporting results to the subject.

8. Be sure that the subject's correct name or number is on the response sheet.

9. Instruct subject to move to his/her next station or to return to coordinator for reassignment.

NOTE: Pairings and sequence pairs should be as follows:

STIMULUS	RESPONSE
1) Move diagonally across room and back	1) Stoop
2) Stand on one leg	2) Raise both hands into air
3) Rotate left arm	3) Bend forward at waist
4) Hands on hips	4) Alternate raising both legs
5) Wrap left arm over head	5) Walk in circle
6) Clasp hands above head then lower to sides	6) Take two steps forward and return
7) Twist body in circle	7) Clasp hands in front of body
8) With right arm, draw a circle in the air	8) Stand with legs spread far apart
9) Cross arms over head	9) Clasp hands behind neck
10) Get on hands and knees	10) Stand at attention (rigid body position)

Sequence for stimulus only presentation:

1) Stand on one leg
2) Get on hands and knees
3) With right arm, draw circle in air
4) Cross arms over head
5) Hands on hips
6) Move diagonally across room and return
7) Clasp hands above head then lower to sides
8) Left arm above head
9) Twist body in circle
10) Rotate left arm

STATION #5

OLFACTORY TEST

REQUIREMENTS:

PEOPLE: 1-2 trained evaluators

EQUIPMENT: Small desk or table
Aroma vials or bottles (20)
Blindfold
Response sheets

PROCEDURES:

1. Arrange aroma bottles on table and cover.

2. Seat subject across table from primary evaluator. If a secondary evaluator is used, he/she should sit to one side and prepare to score the responses. Scoring must be accomplished without distracting or prompting the subject.

3. Try to put the subject at ease, but do not waste too much time on pleasantries.

4. Assure subject that procedures are the same as for all other tests and give him/her directions as follows:

   EVALUATOR: FOR THIS TEST YOU WILL BE BLINDFOLDED AND GIVEN BOTTLES CONTAINING DIFFERENT AROMAS. FIRST, YOU WILL BE PRESENTED WITH PAIRS OF AROMAS. THE FIRST BOTTLE OF EACH PAIR CONTAINS AN ABSTRACT AROMA WHICH WILL NOT BE IDENTIFIED. THE SECOND BOTTLE CONTAINS A COMMON AROMA, AND I WILL IDENTIFY IT FOR YOU. YOUR TASK IS TO REMEMBER WHICH PAIRS OF AROMAS GO TOGETHER. AFTER EXAMINING ALL TEN PAIRS, YOU WILL BE GIVEN THE BOTTLE CONTAINING THE FIRST AROMA IN EACH PAIR. YOU ARE TO IDENTIFY THE NAME OF THE AROMA WITH WHICH IT WAS PAIRED. DO YOU UNDERSTAND THE PROCEDURE?

5. Blindfold the subject.

6. Present the stimulus/response pairs as follows:

   THIS IS THE FIRST AROMA OF THIS PAIR. (Give bottle to subject; help him/her lift it to nose.) THIS IS THE SECOND AROMA OF THIS PAIR (Same procedure).

   Allow the subject 7 seconds to examine each pair of aromas.

7. Present subject with stimulus member bottle of each pair and allow him/her 10 seconds to identify the appropriate response aroma. It may be necessary to say:

   THIS ONE OF THE ABSTRACT AROMAS; WHAT WAS IT PAIRED WITH?

8. Score responses without reporting results to the subject.

9. Be sure subject's correct name or number is on the response sheet.

10. Instruct subject to move to his/her next station or to return to coordinator for reassignment.

NOTE: Pairings and sequence of stimulus/response pairs should be as follows:

1) Cherry
2) Vanilla
3) Almond
4) Raspberry
5) Pineapple
6) Brandy
7) Rum
8) Banana
9) Maple
10) Wintergreen
11) Peppermint
12) Strawberry
13) Orange
14) Butter
15) Chocolate
16) Coconut
17) Anise (licorice)
18) Cloves
19) Lemon
20) Cinnamon

Sequence for stimulus only presentation:

1) Vanilla (#2)
2) Raspberry (#4)
3) Maple (#9)
4) Banana (#8)
5) Cherry (#1)
6) Almond (#3)
7) Pineapple (#5)
8) Rum (#7)
9) Brandy (#6)
10) Wintergreen (#10)

APPENDIX E

PERCEPTUAL MODALITY PREFERENCE SURVEY

This survey is designed to help you identify your style of learning. It specifically deals with how you best receive new information or knowledge. The results of this survey will help you plan your future learning experiences.

You will be responding to forty-two statements concerning how you learn best. This is not a test; there are no right or wrong answers. When making your responses, you should consider your past learning experiences and your own intuitions about your learning style.

The response choices are: ALWAYS, USUALLY, SELDOM, and NEVER. The always response indicates that the statement is a strong representation of your learning style preference. If the statement is a good way for you to learn, but not your most preferred, you should mark "usually." If the statement indicates a way you can learn, but you would prefer other methods, mark your response as "seldom." The never response indicates that you reject that statement as a way for you to learn.

The construction of the survey requires that you respond to all statements in the order presented. Therefore, do not omit responses or skip statements.

If you are using the machine scored response sheet, mark column 1 for always, column 2 for usually, column 3 for seldom, and column 4 for never.

1	2	3	4	5
ALWAYS	USUALLY	SELDOM	NEVER	DO NOT MARK

1. I can learn better by reading than by listening.
2. I can learn better by listening than by talking with others.
3. I can learn better by talking with others than by looking at things like movies and slides.
4. I can learn better by looking at things like movies and slides than by touching or holding objects.
5. I can learn better by touching or holding objects than by physically participating in activities such as sports or games.
6. I can learn better by physically participating in activities such as sports and games than by smelling things.
7. I can learn better by smelling things than by reading.
8. I can learn better by reading than by talking with others.
9. I can learn better by talking with others than by touching or holding objects.
10. I can learn better by touching or holding objects than by smelling things.
11. I can learn better by smelling things than by listening.
12. I can learn better by listening than by looking at things like movies and slides.
13. I can learn better by looking at things like movies and slides than by physically participating in activities such as sports and games.
14. I can learn better by physically participating in activities such as sports and games than by reading.
15. I can learn better by reading than by looking at things like movies and slides.
16. I can learn better by looking at things like movies and slides than by smelling things.
17. I can learn better by smelling things than by talking with others.
18. I can learn better by talking with others than by physically participating in activities such as sports and games.
19. I can learn better by physically participating in activities such as sports and games than by listening.
20. I can learn better by listening than by touching or holding objects.

1	2	3	4	5
Always	Usually	Seldom	Never	Do Not Mark

21. I can learn better by touching or holding objects than by reading.

22. I can learn better by reading than by smelling things.

23. I can learn better by smelling things than by physically participating in activities such as sports and games.

24. I can learn better by physically participating in activities such as sports and games than by touching or holding objects.

25. I can learn better by touching or holding objects than by looking at things like movies and slides.

26. I can learn better by looking at things like movies and slides than by talking with others.

27. I can learn better by talking with others than by listening.

28. I can learn better by listening than by reading.

29. I can learn better by reading than by physically participating in activities such as sports and games.

30. I can learn better by physically participating in activities such as sports and games than by looking at things like movies and slides.

31. I can learn better by looking at things like movies and slides than by listening.

32. I can learn better by listening than by smelling things.

33. I can learn better by smelling things than by touching or holding objects.

34. I can learn better by touching or holding objects than by talking with others.

35. I can learn better by talking with others than by reading.

36. I can learn by reading than by touching or holding objects.

37. I can learn better by touching or holding objects than by listening.

38. I can learn better by listening than by physically participating in activities such as sports and games.

39. I can learn better by physically participating in activities such as sports and games than by talking with others.

40. I can learn better by talking with others than by smelling things.

41. I can learn better by smelling things than by looking at things like movies and slides.

42. I can learn better by looking at things like movies and slides than by reading.

WORKSHEET FOR HAND-SCORING
PERCEPTUAL MODALITY SURVEY

Print:		Aural:		Interactive:	
A 1	28	I 2	27	V 3	26
I 8	35	V 12	31	H 9	34
V 15	42	H 20	37	K 18	39
H 36	21	K 38	19	O 40	17
K 29	14	O 32	11	P 35	8
O 22 ___	7 ___ =	P 28 ___	1 ___ =	A 27 ___	2 ___ =

Visual:		Haptic:		Kinesthetic:	
H 4	25	K 5	24	O 6	23
K 13	30	O 10	33	P 14	29
O 16	41	P 21	36	A 19	38
P 42	15	A 37	20	I 39	18
A 31	12	I 34	9	V 30	13
I 26 ___	3 ___ =	V 25 ___	4 ___ =	H 24 ___	5 ___ =

Olfactory:		Style:	Survey Results: Score:	Rank:	MMPALT Results: Score:	Rank:
P 7	22	Print				
A 11	32	Aural				
I 17	40	Interactive				
V 41	16	Visual				
H 33	10	Haptic				
K 23 ___	6 ___ =	Kinesthetic				
		Olfactory				

Primary Position: Always +4, Usually +2, Seldom -2, Never -4

Secondary Position: Always -2, Usually -1, Seldom +1, Never +2

APPENDIX F

RESPONSE SHEETS FOR MMPALT II

RESPONSE SHEET A
PRINT
LEARNING STYLE

SUBJECT NAME/NUMBER:_____

NONSENSE WORD NUMBER:	COMMON WORD:
1.	_____
2.	_____
3.	_____
4.	_____
5.	_____
6.	_____
7.	_____
8.	_____
9.	_____
10.	_____

RESPONSE SHEET B
AURAL
LEARNING STYLE

SUBJECT NAME/NUMBER:_____

NONSENSE WORD NUMBER:	COMMON WORD:
1.	_____
2.	_____
3.	_____
4.	_____
5.	_____
6.	_____
7.	_____
8.	_____
9.	_____
10.	_____

RESPONSE SHEET C
VISUAL
LEARNING STYLE

SUBJECT NAME/NUMBER: _____

SYMBOL NUMBER:	PICTURE:
1.	_____
2.	_____
3.	_____
4.	_____
5.	_____
6.	_____
7.	_____
8.	_____
9.	_____
10.	_____

TOTAL CORRECT: _____

RESPONSE SHEET
INTERACTIVE D
LEARNING STYLE

SUBJECT NAME/NUMBER: _____

NONSENSE WORD:	COMMON WORD:	SUBJECT CORRECT	RESPONSE INCORRECT
hez			
zed			
sci			
chi			
fai			
jec			
toz			
ces			
pex			
zon			

TOTAL CORRECT: _____

RESPONSE SHEET E
HAPTIC
LEARNING STYLE
SUBJECT NAME/NUMBER:_____

STIMULUS MEMBER:	RESPONSE MEMBER:	SUBJECT CORRECT	RESPONSE INCORRECT
PIECE OF CARPET	LIGHT BULB		
PLASTIC GOLF BALL	PADLOCK		
ODD SHAPED PIECE OF WOOD	YO YO		
BUSHING	KEY RING		
TABLE LEG	TENNIS BALL		
WOODEN RECTANGLE	TABLE FORK		
ROCK	PENCIL		
DOOR KNOB	DRINKING GLASS		
METAL TUBE	SCISSORS		
HOSE COUPLING	PAINT BRUSH		

TOTAL CORRECT: _____

RESPONSE SHEET F
KINESTHETIC
LEARNING STYLE
SUBJECT NAME/NUMBER:_____

STIMULUS MEMBER:	RESPONSE MEMBER:	SUBJECT CORRECT	RESPONSE INCORRECT
STAND ON ONE LEG	HANDS IN AIR		
GET ON HANDS AND KNEES	STAND AT ATTENTION		
WITH RIGHT ARM, DRAW AN 'O' IN THE AIR	STAND SPREAD EAGLE		
CROSS ARMS OVER HEAD	HANDS BEHIND HEAD		
HANDS ON HIPS	RAISE BOTH LEGS (ALT.)		
MOVE DIAGONALLY ACROSS ROOM AND RETURN	STOOP		
CLASP HANDS OVER HEAD, LOWER TO SIDE	TAKE TWO STEPS FWD AND RETURN		
LEFT ARM OVER HEAD	WALK IN A CIRCLE		
TWIST BODY IN CIRCLE	CLASP IN FRONT		
ROTATE LEFT ARM	BEND OVER FORWARD		

TOTAL CORRECT: _____

RESPONSE SHEET G
OLFACTORY
LEARNING STYLE
SUBJECT NAME/NUMBER:_____

STIMULUS NUMBER:	RESPONSE AROMA:	SUBJECT CORRECT	RESPONSE INCORRECT
2	STRAWBERRY		
4	BUTTER		
9	LEMON		
8	OIL OF CLOVES		
1	PEPPERMINT		
3	ORANGE (OIL)		
5	CHOCOLATE		
7	LICORICE		
6	COCONUT		
10	CINNAMON		

TOTAL CORRECT: _____

RESPONSE SHEET H
PARTICIPANT'S INITIAL REPORT
SUBJECT NUMBER:_____

The individual survey tests have been scored, and your results on the MMPALT are as follows.

LEARNING STYLE	SCORE	RANK ORDER
PRINT	_____	_____
AURAL	_____	_____
INTERACTIVE	_____	_____
VISUAL	_____	_____
HAPTIC	_____	_____
KINESTHETIC	_____	_____
OLFACTORY	_____	_____

If these results are a true reflection of your strengths as a learner, the style ranked #1 is your best method for studying and learning. Therefore, you might consider using that style as much as possible, and, at the same time, improve your skills in the other styles. Example: If aural is #1, you can learn best by listening. If print is #7, try to improve your reading skills.

Comments:

VITA

JACK WALTON AKINS

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Doctor of Education

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