

AN INVESTIGATION OF THE RELATIONSHIPS AMONG PHYSICAL AND
EMOTIONAL LEARNING STYLE PREFERENCES AND PERCEPTUAL
MODALITY STRENGTHS OF GIFTED FIRST GRADE STUDENTS

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Dissertation submitted to the Faculty
of the Virginia Polytechnic Institute and
State University in partial fulfillment of the
requirements for the degree of

DOCTOR OF EDUCATION

in

Curriculum and Instruction

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December, 1988

Blacksburg, Virginia

188-4-5-89
HGD 5-4-89

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(ABSTRACT)

Little research has been conducted on the learning styles of very young children and on the planning of specific instructional strategies to incorporate those styles. This is especially true regarding the learning styles of gifted primary grade students. Incorporating learning style information into the curriculum for the gifted is a means of providing differentiated instruction to identified children.

The purpose of this study was to determine whether first grade students identified as gifted display different learning style preferences and modality strengths from nongifted first grade students. Two instruments, the Learning Style Inventory: Primary (LSI:P) and the Swassing-Barbe Modality Index (SBMI), were administered to two groups of first grade students, gifted and nongifted.

The findings of this study indicated that first grade students identified as gifted differed from nongifted students on the following variables: mobility, perception, structure, and short term memory. The groups were similar on the following variables: intake, time, motivation, responsibility and persistence, and modality strength. The study also indicated no relationship between perceptual modality preference and strength for first grade students.

ACKNOWLEDGEMENTS

The researcher expresses her sincere appreciation to all who gave their time and expertise to the successful completion of this dissertation. I want to acknowledge:

Dr. Thomas Gatewood for sharing his extensive knowledge and expertise on the subject of learning styles and for his patient support in critiquing and editing this study.

Dr. Gabriella Belli for her genius in statistical procedures and her willingness to share her knowledge and to assist whenever needed.

Dr. Ronald McKeen for his assistance and valuable suggestions throughout this study.

Dr. Larry Weber for his suggestions and willingness to serve as a committee member.

Dr. Nancy Doda for her professional advice and willingness to serve on the committee.

Dr. William Cox and Gail Hubbard for their approval of the study.

The Gifted Education Resource Staff members for their expertise in data collection assistance.

who typed this dissertation with much skill and enthusiasm.

for her dedication to those seeking postgraduate degrees and her assistance with resource materials.

This dissertation is dedicated to the
memory of my parents who would have been
proud of the accomplishment.

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CHAPTER I

Introduction

As we come to understand more about learning and teaching styles and how the mind operates, I believe we will improve mental health and self understanding as well as increase learning. Learning styles and teaching styles have already revealed much to us and continued research will undoubtedly reveal more. This thrust can lead to the revitalization of "the noblest of professions". (Gregorc, 1979, p. 236)

Background of the Study

A key function of educators is to maximize the learning opportunity for all students. Numerous research studies support the idea that one crucial element for maximizing the learning opportunity for all children is the identification of learning styles (Carbo, 1980; Griggs and Price, 1980; Dunn, Dunn and Griggs, 1981; Barbe and Milone, 1982; and Perrin, 1984). Keefe (1982) stated the

following:

Ultimately education must come to grips with the different learning needs of the individual learner. The key to effective schooling is to understand the range of student learning styles and to design instruction and materials that respond directly to individual learning needs.

(p. 43)

Gorham (1986) found that conclusions and recommendations throughout the learning style literature reflect several common themes:

Individuals prefer to learn differently;
individual learning styles are identifiable;
teachers and institutions have a responsibility to consider learning style in instructional delivery;
students' recognition of their own learning styles can help them make useful decisions regarding their approaches to selecting and processing information; and matching and mismatching learning style and instructional technique has significant implications for cognitive and affective learning.

(p. 411)

Recent studies indicate an improvement in academic achievement for elementary students when given instruction commensurate with their learning styles (Burton, 1980; Carbo, 1980; Pizzo, 1981; Krinsky, 1982; Perrin, 1984). Very recently Dunn and Dunn (1987) stated, "We have found that when teachers expand their instruction to respond to students' individual learning styles, it takes as little as six weeks to see increased achievement and a decrease in discipline problems" (p. 55).

The term "learning styles" is used by educators generically as an overall name or concept for the recognition of individual learning differences. Learning style is also a complex field of study incorporating numerous branches of theoretical interests and operational models. The various models stem from different perspectives on how the human mind operates. Some models are broadly based while others serve specialized populations and different points of view (Butler, 1984, 1986).

Among educational practitioners, it is believed that learning style is made up of three broad categories of style - cognitive, affective, and physiological. According to a national task force on learning styles formed by the

National Association of Secondary School Principals, the definition of learning styles is as follows:

The composite of characteristic cognitive, affective, and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment. Learning style is demonstrated in that pattern of behavior and performance by which an individual approaches educational experiences. Its basis lies in the structure of neural organization and personality which molds and is molded by human development and the learning experiences of home, school and society. (Keefe, 1985, p. 140-141)

Cognitive styles are information processing habits representing a person's normal mode of thinking, perceiving, problem solving and remembering (Messick, 1976). Affective styles are motivational processes such as attention, expectancy, and incentive. These are viewed as the learner's typical modes of arousing, directing, and sustaining behavior (Keefe, 1979). Physiological styles are "biologically based modes of response founded on sex related differences, personal nutrition and health, and

accustomed reaction to the physical environment" (Keefe, 1985, p. 141). It is the gestalt of cognitive, affective, and physiological elements that is termed learning style (Keefe, 1988).

Giftedness

In 1983, the National Commission on Excellence in Education reported in the section on indicators of risk in A Nation at Risk that, "Over half the population of gifted students do not match their tested ability with comparable achievement in school" (p. 8). This statement has implications for all those concerned with the instruction of the gifted. Gifted students are a unique population and require a curriculum that is qualitatively different from that provided nongifted students (Maker, 1982).

The findings of a number of studies on learning styles of gifted elementary students indicate that their learning styles are different from students in the general population (Dunn and Price, 1980; Griggs and Price, 1980; Price, Dunn, Dunn and Griggs, 1981; Stewart, 1981; Barbe and Milone, 1982; Cody, 1983; Boultinghouse, 1984; Ricca, 1984). In students from grades four through eight, these differences are pronounced in the learning style elements

of physical and emotional stimuli and in modality strengths (Dunn and Price, 1980; Griggs and Price, 1980; Ricca, 1984; Barbe and Milone, 1982).

Statement of the Problem

Numerous studies have been conducted on learning styles of elementary, middle, and high school students. There is limited research on learning styles of gifted students in primary grades. According to Stewart (1981), the planning and development of differentiated programming for young gifted children has been neglected. Farcosky (1977) found that not identifying gifted students at very early ages and providing appropriate programs denies these children years of developing high level thinking skills. Perrin (1984) states, "Interest in the learning styles of gifted students and specific instructional strategies to accommodate those styles have not been extended to the primary grades" (p. 16).

The present study is an investigation of: (1) physical and emotional elements of learning style preferences of first grade students and (2) perceptual modality strengths of first grade students.

The purpose of this study is to determine whether first grade students identified as gifted in a Virginia school system display different learning style preferences and modality strengths from nongifted first grade students. Answers to the following questions will be sought:

1. Do gifted first grade students have learning style preferences regarding physical and emotional stimuli that are different from those of nongifted first grade students?
2. Are there differences between gifted and nongifted first grade students in regard to modality strength?
3. Is there a relationship between preference for the visual, auditory or kinesthetic mode and measured modality strength in first grade students?

Definitions

In order to clarify specific terms in the present study, the following definitions are included:

1. Learning Style Preference - The way different elements from certain basic stimuli affect an individual's ability to perceive, interact with, and respond to the learning environment (Dunn and Dunn, 1978).
2. Physical Stimuli - The learning style elements regarding intake, time, mobility, and perceptual

modalities.

3. Emotional Stimuli - The learning style elements of motivation, responsibility and persistence, and structure.
4. Intake - The need for intake of food while learning.
5. Time - Preferences regarding learning in the morning, afternoon, or evening.
6. Mobility - Differences in learner need for change in posture and location while learning.
7. Perceptual Modality Preference - Preferences for learning in either the visual, auditory, or kinesthetic mode or a combination of these modes.
8. Motivation - Variations in commitment to internal and external standards of excellence.
9. Responsibility and Persistence - Variations in learner willingness to sustain work needed to complete an assignment or project.
10. Structure - Amount of teacher direction and specific rules for working on and completing assignments.
11. Modality Strength - The ability of an individual to perform an academically relevant task in each of the major modalities, i.e., visual, auditory, and kinesthetic (Barbe, Swassing, and Milone, 1979).

12. Dominant Modality - The modality through which an individual processes information most efficiently.
13. Gifted First Grade Student - A first grade student who scores between the 97th and the 99th percentile using age norms on both the verbal and quantitative sections of the Cognitive Abilities Test (Thorndike and Hagen, 1986).
14. Nongifted First Grade Student - A first grade student who scores between the 40th and 60th percentiles using age norms on both the verbal and quantitative sections of the Cognitive Abilities Test.

Assumptions of the Study

The students participating in this study were identified as gifted or nongifted on the basis of a well known abilities test; therefore, the assumption is made that the subjects have been appropriately identified as gifted or nongifted. A second assumption is that the subjects' learning style preferences and modality strengths remained constant during the period of this study. This assumption was based on research which indicates that learning styles change gradually and developmentally (Barbe and Swassing, 1979; Price, 1982).

Delimitations

Only students from a Virginia school system during the 1987-1988 school year participated in this study. The conclusions inferred will be based solely on the respondents' answers to the Learning Style Inventory: Primary and the Swassing-Barbe Modality Index.

Limitations of the Study

Young children are anxious to please the adults in their lives, especially their parents and teachers. Because of this children may attempt to respond to questions on the Learning Style Inventory: Primary with what they believe to be preferences of parents and teachers rather than their own. The researcher is giving special consideration to this factor in preparing children taking the inventory.

Organization of the Study

This research study is presented in five chapters. In Chapter I was provided background information on learning styles and giftedness, and the purpose and rationale of the study. Perspectives on gifted education, historical perspectives of style, conceptions and

approaches to learning style, and a review of related literature and research are presented in Chapter II. The third chapter contains the outline of the selection of the sample, procedure, instrumentation, and the analysis of the data. The fourth chapter contains a description of the results of the study. The fifth chapter contains the summary, conclusions, and recommendations of the study.

CHAPTER II

Review of the Literature

Perspectives on Gifted Education

In Genetic Studies of Genius, begun in 1922 by Lewis M. Terman, can be found "the largest-scale test of the hypothesis that there is a developmental linkage between identification as predication of giftedness and its nurturance leading to superior performance..." (Passow, 1985, p.26). Terman theorized that mental traits could be identified in an IQ score early in life, and that those scoring in the highest percentiles are the gifted (Passow, 1985). Terman's conclusions that potential giftedness reveals itself in early childhood, and that there is a need for special programming for the gifted, are important to the present study.

According to Karnes, Linnemeyer, and Denton-Ade (1983), "Of all children, the gifted and talented may well be the most neglected in terms of educational programming. The earlier the gifts and talents of the young are nurtured, the better their chances for optimal development..." (p. 1). Perrin (1984) stated, "The lack of

substantive evidence comparing the effectiveness of different approaches preferred by younger children has been a major delimiting factor to the development of programs designed to respond to their unique needs" (p. 3). It is the belief of the present researcher that identifying learning style preferences and modality strengths of primary children and providing educational experiences consistent with the findings will enhance differentiated programming. It will be a positive way of helping gifted young children reach their maximum potential.

Gifted primary age children are a unique population. Webb, Meckstroth, and Tolan (1982) have identified intellectual characteristics which distinguish gifted from nongifted children:

1. Ability to read early
2. Large vocabularies for their age
3. Ability to comprehend subtleties of language
4. Longer attention span
5. Intense concentration and persistence
6. A wide range of interests
7. Ability to learn basic skills quickly
8. Interest in finding novel ways of doing things
9. Immense curiosity

10. Endless supply of questions
11. Divergent thinking
12. Ability to retain much information
13. An unusual sense of humor

In general, gifted children tend to have many of the same intellectual characteristics. It is important, however, to remember that individually these children differ greatly, and a list of traits can be misleading.

Because of their uniqueness, gifted students require a curricular program which is qualitatively different from that of the nongifted (Maker, 1982; Stewart, 1981). A differentiated curriculum according to Maker (1982) means a program designed to enhance those special qualities which differentiate gifted from nongifted children. Maker (1982) states, "If they are considered different enough (in needs, learning styles, cognitive styles, and motivational characteristics) to need a special program, then the curriculum must be built around the characteristics that make the program necessary" (p. 3).

According to the U.S. Office of Education's Office of the Gifted and Talented (1976), differentiated education means:

That process of instruction which is capable of being integrated into the school program and is adaptable to varying levels of individual learning response in the education of the gifted and talented and includes but is not limited to:

(1) A differentiated curriculum embodying a high level of cognitive and affective concepts and processes beyond those normally provided in the regular curriculum of the local educational agency:

(2) Instructional strategies which accommodate the unique learning styles of the gifted and talented: and

(3) Flexible administrative arrangements for instruction both in and out of school, such as special classes, seminars, resource rooms, independent study, student internships, mentorships, research field trips, library media research centers and other appropriate arrangements. (p. 18,665-18,666)

Sumption, Norris, and Terman (1952) noted that an appropriate curriculum included emphasis on creative effort, intellectual stimulation, critical thinking skills,

social adjustment and responsibility, and the development of leadership qualities. Renzulli (1977) recommended a curriculum above and beyond the regular curriculum where... "students will have the opportunity to pursue their own interests to whatever depth and extent they desire; and they will be allowed to pursue these interests in a manner that is consistent with their own preferred styles of learning" (p. 5). Renzulli further believed these criteria apply to preschool as well as elementary and secondary curricula.

Historical Perspectives of Style

"The way each of us perceives the world governs how we think, make judgments, and form values about experiences and people...This unique aspect of our humanness is what we call style" (Guild and Garger, 1985, p.2).

The recognition of individual patterns of behavior and personality styles has been a challenge to philosophers, psychologists, and educators throughout history. Perhaps the interest began with the Greek physician Hippocrates who identified the Sanguine, Choleric, Melancholy, and Phlegmata personalities (Guild and Garger, 1985). Carl Jung (1923) observed and wrote about individual and typical

differences, and explained human behavior patterns extensively in Psychological Types or the Psychology of Individuation. A psychologically healthy person adapts his/her behavior to fit a variety of situations depending on the circumstances. However, each develops comfortable patterns which cause him/her to behave in predictable ways. These predictable qualities reveal one's personality style.

Gordon Allport (1937, 1961) coined the term "cognitive style" referring to consistent patterns appearing in individuals. He defined cognitive style very simply as, "distinctive ways of living in the world" (p. 267).

Thurstone (1947) and Guilford (1967) conducted research on the identification of the factors of perceptual speed and flexibility which were believed to be related to personality style.

The psychologists Witkin, Goodenough, and Cox (1977) contributed a vast amount of research on cognitive style. Witkin proposed the existence of differing perceptual tendencies among individuals associated with the way they viewed and used their immediate environments. He concentrated on the concept of "field dependence-independence", which meant responding to the environment in either global terms or in analytical terms.

Messick (1976) defined cognitive styles as, "habitual modes of information processing" (p. 6). These represent the learner's typical mode of remembering, thinking, perceiving, and problem solving. Under cognitive style, Messick included the following dimensions: field independence versus dependence, cognitive complexity versus simplicity, reflection versus impulsivity, risk taking versus cautiousness, and sensory modality preferences (visual, auditory, and kinesthetic). Learning style, a term first used by Thelen (1954), and cognitive style have been used interchangeably in the literature. Some theorists see one as a subset of the other; others believe they are mutually exclusive (Davidman and Chiarelott, (1987). Learning style in the present study is a broad term which includes cognitive, affective, and physiological styles (Keefe, 1987).

A plethora of learning style models and assessment instruments have emerged from the work of psychologists and educators. As the different learning style theories have developed, both agreement and diversity have resulted among the definitions, concepts, applications, and instruments. For clarity Davidman and Chiarelott (1987) prefer to make a distinction between a learning style "conception" and a

learning style "approach". A conception is the theorist's definition and his/her perception on learning styles. An approach refers to the diagnostic procedures, instructional prescriptions, and materials relating conception to instructional practice.

Referring to the many theorists, Dunn, DeBallo, Brennan, Krinsky, and Murrain (1981) state the following:

The studies of each of these writers - no matter how similar or different will contribute substantially to understanding how students learn. In the future, when others translate current research and add what will emerge over the next decade, the many different parts will form newer, better ways of helping students achieve more easily through, rather than in spite of their many individual differences. (p. 374)

The differing models and their accompanying instruments assess aspects of cognitive, affective, and physiological styles. Cornett (1983) classifies learning style instruments as multidimensional, cognitive, affective, and perceptual. The multidimensional instruments diagnose a combination of cognitive, affective, and perceptual styles. Lawrence (1982) believes that all

conceptions of learning style must pass the ultimate test of practicality. One must decide if the construct helps teachers and students attend to the complex factors that affect learning or if it swamps them with too many variations and complexities.

Conceptions and Approaches to Learning Style

The Group Embedded Figures Test and the Embedded Figures Test for Children (Oltman, Raskin, and Witkin, 1971) represent a cognitive style approach. According to Guild and Garger (1985), "... experiments led Witkin and his associates to define two extreme indicators of the extent to which the surrounding organized field influences an observer's perception of an item within it" (p. 28). A person who has a mode of perception strongly influenced by the prevailing field is said to be "field-dependent". Field-dependent learners perceive globally, make broad, general distinctions among concepts and see relationships, have a social orientation to the world, need organization, and learn material relevant to their own experiences most efficiently.

One who experiences items as separate from the surrounding field is said to be "field-independent". A field-independent learner perceives analytically, makes specific concept distinctions, sees little overlap, is impersonally oriented to the world, has self-defined goals and reinforcements, structures situations, uses hypothesis testing approaches to gain concepts, and experiences in an articulated fashion (Guild and Garger, 1985). Witkin advises educators to respond to cognitive style differences, to use knowledge of field-dependence/independence to foster their own and their students' strengths and to develop diverse teaching-learning strategies.

An affective style approach to learning style is that of David Hunt (1981). Hunt defines learning style in terms of one characteristic, "conceptual level". Conceptual level is defined as the amount of structure a student needs in order to learn best. Hunt believes learning styles are "assessability characteristics" that can give necessary information for working with students more effectively. He relies on teacher observation as the primary source of diagnostic data for students in kindergarten through grade two. He believes that teachers can competently diagnose the learning styles of their students if they have insight

into their own learning styles, and if they have an understanding of conceptual levels. The teacher assesses learning style by observing student reactions to systematic teacher-introduced changes in the amount of structure in the learning situation (Dunn, DeBallo, et al., 1981). A student's learning style consists of the educational conditions under which he/she is most likely to learn and the amount of structure needed. The applications and implications of Hunt's conceptual level approach according to Dunn, DeBallo, et al., (1981) are as follows:

Matching educational approaches to student learning style facilitates academic achievement. Conceptual level, in terms of learning style, is a developmental phenomena which ranges from the "unsocialized" to the "independent". Knowledge of learning style can influence and enhance the development of conceptual level. (p. 375)

Gregorc (1979) defines learning style perceptually as "distinctive behaviors which serve as indicators of how a person learns from and adapts to his environment" (p. 234). A perceptual style approach to learning style is the Gregorc Style Delineator (Gregorc, 1978, 1982). This instrument is a self analysis tool which assesses a

person's perceptual and ordering mediation abilities. A matrix profiles learners on four distinct learning patterns:

Concrete Sequential - One who perceives in a concrete way and orders with a sequential pattern.

Concrete Random - One who perceives in a concrete way and orders that which has been perceived in a random way.

Abstract Sequential - One who perceives in an abstract way and orders sequentially.

Abstract Random - One who perceives in an abstract way and orders in a random way.

The Gregorc Style Delineator is used mainly as a tool to help teachers identify their teaching styles and to make use of the diversity of teachers' differences. Each teacher works with his/her own strengths and the diversity among staff members is used in curriculum planning and in decision making. Students are placed with teachers having like styles at appropriate times while at other times offering them the opportunity to learn from teachers of different styles (Guild and Garger, 1985; Keefe, 1987).

Determining preferences for certain stimuli in the learning environment and for specific instructional strategies is a multidimensional approach to learning

style. Among the multidimensional instruments for use with elementary school students are: the Learning Styles Inventory (Renzulli and Smith, 1978), the Learning Style Inventory (Dunn, Dunn, and Price, 1975, 1978, 1980), and the Learning Style Inventory: Primary (Perrin, 1979, 1981, 1982). The Learning Styles Inventory by Renzulli and Smith measures students' preferences for various instructional strategies as they interact with curricular materials. Learning styles are considered to be preferences for one or more of the following instructional strategies: projects, drill and recitation, peer teaching, discussion, teaching games, independent study, programmed instruction, lecture and simulation.

The Learning Style Inventory (LSI) by Dunn, Dunn and Price is a self-report instrument which defines learning style in terms of preferences regarding four learning stimuli and eighteen elements. According to Dunn and Dunn (1978), research data over a long period of time has yielded the following basic stimuli believed to affect the learner: environmental, emotional, sociological, and physiological. In using the LSI students complete a 104 item questionnaire which identifies learning style preferences related to elements of the four basic stimuli.

Elements categorized as environmental are sound, light, temperature, and design. Emotional elements are motivation, persistence, responsibility, and structure. The sociological elements are preferences for self-oriented, colleague-oriented, authority-oriented, and peer-oriented learning, or varied learning. The physiological category includes perceptual modality preferences, intake, time, and mobility. The LSI is appropriate for use with students in grades three through twelve.

The Learning Style Inventory: Primary (LSI:P) by Perrin is based on the LSI and is appropriate for use with children in kindergarten through grade two. Perrin (1984) states that, "to date the LSI:P is the only instrument designed to assess the multidimensional aspects of learning styles among young children" (p. 47). The LSI:P defines learning style in terms of preference regarding the same four basic stimuli identified by Dunn, Dunn, and Price, but consists of 12 instead of 18 elements. Environmental elements are sound, light, temperature, and design. Emotional elements are responsibility and persistence, motivation, and preferences related to the amount of structure in the learning environment. Sociological

elements are preferences regarding learning alone, with peers or with an adult. Physical elements are preferences regarding time of day for learning, mobility, intake, and the perceptual modalities. The LSI:P is administered individually and requires that the teacher read the questions to the students and also mark responses on the student profile form.

Determining modality strengths is a perceptual style approach to learning styles. Barbe and Swassing (1979) define learning style as follows:

The modalities are the channels through which individuals receive and retain information, and comprise three elements - sensation, perception, and memory. The educationally relevant modalities are the visual, auditory, and kinesthetic channels. The first two of these correspond to the senses of vision and audition, but the third is more simply the sense of touch, and consists of large muscle, small muscle, and tactile abilities. (p. 71)

The Swassing-Barbe Modality Index (SBMI) (Barbe and Swassing, 1979) is an instrument for measuring modality strength. During a factor analysis for determining construct validity of the SBMI, it was found that the

instrument measures short term memory in addition to modality strength. It is appropriate for use with learners of any age. This instrument is a match-to-sample task in which the respondent is presented the stimulus, a sequence of shapes and asked to duplicate it. The stimulus is presented through each of the modalities. A dominant modality is determined by identifying the modality or modalities through which the individual processes information most efficiently. Barbe and Milone (1982) believe determining modality strengths and accommodating them in the learning environment is vital to the education of gifted children. They state:

The potential for great achievement is present in all gifted children, but if this potential is to be realized, teaching techniques that are brought into play must be consistent with gifted children's learning styles. One of the most fundamental categories of learning styles is modality strengths. (p. 2)

Barbe and Milone (1982) have drawn some conclusions regarding the modality characteristics of gifted children based on research using the SBMI. Preschool and primary grade school children in general rely on the auditory

modality, while gifted children tend to learn best through the visual modality. Gifted children in general have visual and mixed modality strengths and to a lesser extent, kinesthetic strengths. The shift toward modality integration occurring developmentally in most children begins earlier in gifted children. The most significant modality characteristic of gifted children is that they exhibit neither auditory preferences nor auditory strengths. The gifted child who relies most exclusively on a single modality may never reach his/her potential.

The following comments concerning modalities are offered by Barbe and Milone (1981, p. 378-379) based on research of group averages:

1. Students vary with respect to their modality strengths.
2. Modality strength is not a fixed characteristic.
3. The modalities become more integrated with age.
4. There is no clear difference between the modality characteristics of boys and girls.
5. Handedness and modality strengths do not seem to be related.
6. Race and modality strengths are independent.

Barbe and Milone (1981) make a distinction between modality preference and modality strength. They believe, "A modality strength implies superior functioning in one or more perceptual channels and is assessed through a task of some kind..." (p. 378). A modality preference is an individual's opinion regarding the modality through which he or she learns most efficiently and is measured with a self report instrument such as the Learning Style Inventory by Dunn, Dunn, and Price and the Learning Style Inventory: Primary by Perrin. Barbe and Swassing (1979) acknowledge the existence of modality preferences, but they believe that the way an individual receives information most comfortably is not always the way in which information is most efficiently received and processed. They believe a modality preference is not completely reliable because an individual lacks the ability to be a trained observer of his or her own behavior. His or her judgment is inconsistent and reflects an immediate situation rather than behavior over a long period of time.

Davidman's (1981) belief that student opinions about learning styles are speculative tends to be supportive of Barbe. In a study by Ramirez (1982), results indicated that determining modality preference using the Learning

Style Inventory and measuring modality strength using the SBMI are two different dimensions.

Dunn and Carbo (1981) believe that students are able to identify their preferences accurately. They believe that academic achievement increases when students are taught through their perceptual preferences. Perrin (1984) stated the following:

The professional controversy concerning whether or not learning style preferences are identical with students' strengths, has achieved additional verification in the affirmative. Because the students' preferences consistently correlated with increased academic achievement in matched situations, it has been further confirmed that, indeed, a preference is a strength - as verified in research by Della Valle (1983), Pizzo (1981), Shea (1983) and Virostko (1983). (p. 121)

The present study will add to the information concerning modality preferences and strengths.

Related Studies

Numerous studies reflecting a variety of learning style conceptions and approaches have been conducted with gifted

students in kindergarten through the twelfth-grade. Griggs and Price (1980) conducted a study of gifted versus average ability students in grades seven through nine. The findings, using the Learning Style Inventory (Dunn, Dunn and Price, 1975, 1978, 1980), indicated that gifted junior high students were more persistent, nonconforming, and perceptually stronger than nongifted. In a similar study, Cody (1983), using the same instrument, compared average, gifted, and highly gifted students in grades five through twelve on the elements of sound, temperature, time, structure, and motivation. The results revealed that average students had less motivation, preferred a quiet, warm environment, a structured learning situation and preferred to learn during the late part of the day. Gifted students preferred a quiet environment, moderate temperature, and learning in the morning. Highly gifted students had the most distinct preferences: cooler temperature, evening time for study, sound in the learning environment, the least amount of structure, and were the most highly motivated.

Price, Dunn, Dunn, and Griggs (1981), using the Learning Style Inventory, found in their study of gifted and nongifted students in grades four through twelve that gifted

students were more self-motivated, persistent, nonconforming, and perceptually stronger. Dunn and Price (1980) found similar results in their study of gifted and nongifted students in grades four through twelve. Gifted students preferred a formal learning atmosphere, needed less structure, and were more persistent, but were less responsible. Gifted students preferred to learn through tactile and kinesthetic modalities and had a low preference for the auditory modality. Nongifted students preferred informal design for learning, required structure, were more responsible, but were less persistent, and preferred the auditory modality to the tactile and kinesthetic. The elements which discriminated most were design, structure, and responsibility.

Ricca (1984) studied both learning style preferences and preferred instructional strategies of gifted and nongifted students in grades four through six using the Learning Style Inventory by Dunn, Dunn, and Price and the Learning Styles Inventory (Renzulli and Smith, 1978). Gifted students were found to be more highly motivated, persistent, adult and teacher motivated, preferred learning alone, and preferred the tactual modality. In contrast to the Dunn and Price (1980) study, Ricca found gifted students

to be more responsible than the nongifted. The nongifted group preferred structure, peer-oriented learning, auditory and visual modalities, mobility, and learning with an authority figure nearby. Nongifted students demonstrated a greater tolerance for late morning learning and were more neutral to time preferences than the nongifted group. In regard to instructional strategies, the gifted students demonstrated a greater preference for independent study than did the nongifted. Nongifted students were more tolerant of instruction through lecture.

Stewart (1981) conducted a study to assess the differences in preferred learning styles between gifted and nongifted fourth, fifth, and sixth graders. Using the Renzulli and Smith Inventory and the Norwicki-Strickland Locus of Control Scale for Children (Norwicki and Strickland (1973), Stewart found that the factors of grade level, sex, favorite subject, and IQ affect learning style preferences. Other findings were that gifted students preferred independent study; the nongifted preferred more structured instruction such as lecture and projects. These findings were consistent with Ricca's (1984) findings.

Kirchoff (1981) studied the perceptual modalities of intellectually gifted children in grades one through six.

Results indicated significant differences between gifted and nongifted subjects. Gifted students' scores indicated a higher incidence of visual modality strength and a lower incidence of auditory and kinesthetic dominance as compared to the nongifted group. Further differences were found between the gifted and nongifted children on mean raw scores using a modality measuring instrument. The gifted group scored higher on each subtest than the nongifted group.

Perrin (1984) investigated sociological learning style preference of gifted and nongifted primary school children using the Learning Style Inventory: Primary Version. The findings indicated significant differences when subjects were matched and mismatched with instructional strategies consistent and nonconsistent with their sociological preferences, instructional strategies, and intelligence level. Other findings indicated that when gifted students were placed in a homogeneous group, they showed higher achievement than when placed in a heterogeneous group.

Reiff (1984) examined learning style preferences of first and second grade youngsters. Using the Picture Learning Style Inventory (Perrin, 1980), Reiff found visual learning to be preferred by most children in these grade levels. Most preferred learning in the afternoon, no sound

while learning, and structure in the learning situation. The majority believed they were responsible, persistent and adult motivated. Reiff recommended identifying and accommodating learning style differences in primary level classrooms.

Carbo (1980) studied the effects of selected reading treatments on the learning of basic sight word vocabulary of kindergarten children. Findings revealed a significant interaction effect between modality preferences and the word stimulus method of sight word instruction. In later studies Carbo (1985), reported that beginning reading programs need tactual and kinesthetic resources and young children need opportunities for mobility and intake of food.

Burton (1980) examined the interaction of field dependent/independent learning styles and word type as they affect word recognition among kindergarten children. Using the Children's Embedded Figures Test, it was determined that field dependent/independent cognitive learning style preferences affected word recognition scores of kindergarten children. Burton recommended that teachers identify learning styles of very young children and use congruent instructional techniques.

Price (1980) found that very young children learn most easily through the tactual and kinesthetic modalities. Visual modality strength develops at a later time. Children in grades five and six tend to learn easily through their auditory sense. Keefe (1979) reported the same findings in his studies of perceptual modalities.

Summary

Identifying learning style preferences and modality strengths of primary grade gifted children and providing educational experiences consistent with the findings is a way of enhancing differentiated programming. Although there is an abundance of research on the learning styles of gifted students in grades three through twelve, there is need for information regarding students in grades kindergarten through two.

As can be seen from this chapter, the study of learning styles has a long history, and there exists a wide variety of philosophies and theories regarding style. Educational researchers and practitioners agree that learning style consists of three broad categories: cognitive, affective, and physiological. Most theories are based on one or more of these categories. Knowledge of many theories enables the

educator to determine which philosophy meets the needs of a particular group of students.

CHAPTER III

Method

The purpose of this study was to determine whether first grade students identified as gifted display different learning style preferences and modality strengths from nongifted first grade students. Learning style in the present study was operationally defined as:

1. Preferences regarding physical and emotional stimuli as diagnosed by the Learning Style Inventory: Primary (Perrin, 1979, 1981, 1982). The elements of physical stimuli are (a) intake, (b) time, (c) mobility and (d) perceptual modality preferences: tactual, visual, auditory, and kinesthetic. The elements of emotional stimuli are: (a) motivation, (b) responsibility and persistence, and (c) structure.
2. Perceptual modality strength: visual, auditory, and kinesthetic as measured by the Swassing-Barbe Modality Index (Barbe and Swassing, 1979).

Specifically, answers to the following research questions were sought:

1. Do gifted first grade students have learning style preferences regarding physical and emotional stimuli that are different from those of nongifted students?
2. Are there differences between gifted and nongifted first grade students in regard to modality strength?
3. Is there a relationship between preference for the visual, auditory, or kinesthetic mode and measured modality strength in first grade students?

Data were collected from a population of first grade gifted students and from a sample of nongifted first grade students during the second semester of the 1987-1988 school year. The groups were compared and statistical tests were employed to determine differences and/or similarities in the learning styles of gifted and nongifted students.

Population and Sample

This study took place in a suburban Virginia school system. The schools located within this school system reflected a range of demographics from rural areas to large shopping complexes. The majority of the population was

middle to upper middle class with a median income of \$44,889 per year.

In the fall of 1987, all first grade students (3,169) were given the Cognitive Abilities Test (Thorndike and Hagen, 1986) as a part of the school wide testing program. After receiving appropriate training, each teacher administered the test to his/her class. The test was designed to assess the development of cognitive abilities related to verbal, quantitative, and nonverbal reasoning and problem solving. The test was based on the premise that:

Individuals of the same age vary greatly in the kinds of information they have and are able to use efficiently in mastering learning tasks and problem solving, and in their preferences for and skills in working with verbal, quantitative, and geometric symbols. (Thorndike and Hagen, 1987, p.3)

For the purpose of the present study, two groups were identified. The first consisted of the population of gifted students. First grade children meeting the criterion for giftedness in the present study were found in 22 of the 33 elementary schools in the system. This

population numbered 76 (35 male and 41 female) students. The criterion for giftedness was scoring between the 97th and 99th percentiles using age norms on both the verbal and quantitative sections of the Cognitive Abilities Test. The second group consisted of a sample of 77 (41 males and 36 females) nongifted students randomly selected from the 22 elementary schools from which the population of gifted students was obtained. The criterion for nongifted student was scoring between the 40th and 60th percentiles using age norms on both the verbal and quantitative sections of the aforementioned abilities test.

Instrumentation

Two data gathering instruments were used in this study: the Learning Style Inventory: Primary (LSI:P) (Perrin, 1979, 1981, 1982) and the Swassing-Barbe Modality Index (SBMI) (Barbe and Swassing, 1979). The former was used to determine the relationship between giftedness and learning style preferences of first grade students regarding physical and emotional stimuli. The latter was used to determine differences in perceptual modality strengths of gifted and nongifted first grade students. Both instruments were used to determine if there was a

relationship between perceptual modality preference and perceptual modality strength. Data concerning scores on the Cognitive Abilities Test were obtained from students' files. A description of the instruments follows:

Learning Style Inventory: Primary (LSI:P)

The LSI:P is an individually administered inventory consisting of 12 subscales (sound, light, temperature, design, sociological, intake, structure, time, responsibility and persistence, mobility, motivation, and perception), each a distinct learning style element. The inventory also contains individual profile forms. According to Perrin (1983), administering all 12 subscales takes approximately 20 minutes. For the purpose of the present study, seven subscales were administered and used to compare gifted and nongifted first grade students. Of the seven, four related to physical stimuli (intake, time, mobility and perception) and three related to emotional stimuli (motivation, responsibility and persistence, and structure). It was the experience of this researcher that preparing the individual student and administering seven subscales took at least 20 minutes. Timing and speed were not important to this inventory; however, it was important that the child be comfortable and answer honestly.

The scoring process is explained using the intake scale. For this portion of the instrument, the student is presented with a card which has two pictures on it: one of a child reading and eating an apple, and one of a child reading and not eating. The student is asked five questions with the pictures used as a visual aid. As an example, the following two questions taken from the intake card are presented:

1. If you could have a snack any time you wanted in school would you want it:
 - 1 when you are finished your work?
 - 2 while you are doing your work?
2. If you could eat or nibble on something while you did your schoolwork would it be:
 - 1 harder for you to do your work?
 - 2 easier for you to do your work?

For each of the five questions, a score of one is received in either of two categories: "Does not require" (category 1) and "Requires" (category 2). Totals in each category are then computed and two ratios formed, dividing each total by the number of questions (for this element, five). These two fractional values are compared. The fraction closer to unity indicates the child's preference

for food intake. If the fractions are close (for example, $2/5$ and $3/5$), the intake element is categorized as "Undecided".

The subscales of structure, mobility, and responsibility/persistence are scored in the same manner. The subscales of time, motivation and perception are scored in the same manner, with the exception that the largest fraction is considered the preference for that element (Perrin, 1983; see Appendix B). If the largest fractions occur in more than one area, the element is categorized as "Mixed". The student profile that contains the scoring form is in Appendix A.

Reliability and validity studies for the LSI:P were conducted with 34 kindergarten, first, and second grade students (Perrin, 1983; see Appendix B). Testing on the seven subscales for percentage of students who did not change their preference from initial test to retest revealed a range of percentages from 65% on perception to 90% on responsibility and persistence. Spearman Brown reliability coefficients ranged from .61 on perception to .80 on time and structure. The results of a correlation of responses of third grade students on the Learning Style

Inventory: Primary and the Learning Style Inventory (Dunn, Dunn, and Price, 1975, 1978, 1980) are in Appendix B.

Swassing-Barbe Modality Index (SBMI)

The SBMI is an individually administered test for assessing modality strength. It has been determined that it is also a measure of short term memory. It takes approximately 20 minutes to administer this test. The student is presented with a pattern consisting of a set of shapes in sequences of increasing length. He/she is asked to reconstruct the pattern. See Appendix C for the record sheet for individual student scoring. The patterns are presented in the three educationally relevant modalities: visual, auditory, and kinesthetic. For the visual portion of the test, the student looks at the pattern for a specified number of seconds before it is removed. He/she is then asked to remember and reconstruct it. For the auditory portion, the student listens to a verbal description of the pattern and is asked to reconstruct it. For the kinesthetic portion, the student feels the pattern and then reconstructs it.

The student's performance in each of the modalities is tallied for use in scoring. Raw scores are the number of shapes correctly placed in sequence. Testing is stopped when the student fails to reproduce the pattern correctly on two successive trials for that modality (Ramirez, 1982). Tallies or raw scores in each modality are converted to percentage scores by dividing the raw score by the total raw score of the three modalities. Barbe and Swassing (1979) offer the following information concerning the interpretation of percentage scores:

The interpretation of scores is based on our observation that a difference between modality percentages of about five points corresponds to an educationally relevant difference... If one modality is five percentage points greater than each of the remaining modalities, it is the dominant modality. (p. 40)

The standardization sample for the SBMI consisted of over 600 students from a large southern California elementary school district. These students ranged from kindergarten through grade six. Males in the sample slightly outnumbered females. The test-retest reliabilities for the SBMI ranged from .58 to .67, falling

within the acceptable range for an instrument of this type. The subtests resembled a Guttman scale. The coefficients of reproducibility for the subtests were all above .90. The coefficients of scalability for the subtests approached or exceeded .60. Construct validity was measured through factor analysis. The three subtests (visual, auditory, and kinesthetic) emerged as clear and unrelated factors. Through factor analysis it was also found that the instrument measured short term memory (Barbe and Swassing, 1979).

Procedure

The LSI:P and the SBMI were administered individually to the 76 gifted and the 77 nongifted students during the months of April, May and part of June, 1988. The inventories were given at separate times in order not to tire the child. The present researcher administered most of the inventories. However, assistance was received from five other gifted education resource teachers. The five teachers were trained by the present researcher to administer both inventories. Special care was taken to insure consistency.

The teachers were trained to prepare students for the LSI:P following the recommendations and guidelines of the test's author. Perrin (1983) stated:

Young children ordinarily want to please the adults in their lives and therefore may answer the way they believe you want them to. Before administering the LSI:P it is important to let the students know what learning style is, why you want to know what their style is, and that there is nothing right or wrong about anybody's style.

(p. 8)

As Perrin recommended, before the inventory was given the teacher said the following:

Today I am going to learn something I want to know. Do you like ice cream? Now I want to know which flavor of ice cream you prefer (or like better) - vanilla or chocolate. You must choose only one flavor, either vanilla or chocolate. They are both good - but which one do you like better? The choice is up to you, but you must choose only one. (p. 9)

This exercise was repeated using such items as favorite color, season, or game until the examiner was

confident that the child understood there were no right or wrong answers. The examiner also briefly discussed learning style with the child and explained that the information obtained would be used to assist the child in learning.

The gifted education resource teachers were also trained to administer the SBMI following the author's recommendations and guidelines. Barbe and Swassing strongly recommended that prior to administering the SBMI, the examiner become thoroughly familiar with the components of the test and administration procedure. Practicing the administration of the test was the best way of familiarizing oneself with the instrument. The teachers were given the test by the present researcher and in turn administered it to each other until they felt comfortable. Prior to gathering data or training others, this researcher practiced by administering the test individually to six children not participating in this study.

Analysis of Data

Data were analyzed using the Number Cruncher Statistical System (NCSS) for personal computers (Hintze, 1988). Three research questions were investigated in the

study. The first question was related to whether first grade students have learning style preferences regarding seven physical and emotional stimuli that are different from those of nongifted first grade students.

Given the categorical nature of the data, chi-square statistics were used in seven cross tabulations to determine the existence of relationships between giftedness and preferences.

The second research question related to differences between gifted and nongifted first grade students in regard to modality strength. In order to answer this question, two statistical procedures were conducted on data obtained from the SBMI instrument. The first procedure consisted of a two by four crosstabulation to compute chi-square statistics. Percentage scores were converted into the categories of visual, auditory, kinesthetic, or mixed. The second statistical procedure consisted of a series of four independent t-tests performed to determine if there were significant differences between the gifted and nongifted samples on visual, auditory, kinesthetic, and total mean raw scores.

Research question three was related to determining whether a relationship existed between preference for the

visual, auditory, or kinesthetic mode and measured modality strength in first grade students. To answer the third question, three analyses of variance (Anova) were conducted. The independent variable in each analysis was obtained from the LSI:P. It consisted of perceptual modality preference, a factor with four levels: visual, auditory, kinesthetic, and mixed. The dependent variables were the visual, auditory, and kinesthetic percentage scores from the SBMI.

To further explore the relationship between modality preference and strength, chi-square statistics were conducted on data from the gifted and nongifted groups together and separately.

Summary

This comparative study was conducted on data collected from 153 subjects (76 gifted and 77 nongifted first grade students). The Learning Style Inventory: Primary was the instrument used to determine physical and emotional learning style preferences of the two groups. The Swassing-Barbe Modality Index was used to determine perceptual modality strengths of the two groups. Data were analyzed using these statistical procedures: chi-square,

t-tests, and analysis of variance. Results are reported in Chapter IV. The summary, discussion, conclusions, and recommendations will be presented in Chapter V.

CHAPTER IV

Results

The purpose of this chapter is to present data relative to the research questions of the study. The first section provides results regarding the physical and emotional learning style preferences of the gifted and nongifted groups. These are related to research question one. Next, data are presented for question two, relative to perceptual modality strengths of the two groups. The last section presents data relative to question three, regarding the relationship between perceptual modality preference and measured modality strength.

Elements of Physical and Emotional Learning Style Preferences

Research Question 1. Do gifted first grade students have learning style preferences regarding physical and emotional stimuli that are different from those of nongifted first grade students?

In order to answer this research question, seven contingency tables were constructed and chi-square

statistics were calculated using data obtained from the Learning Style Inventory: Primary. These analyses are presented in Table 1.

Table 1
Chi-Square Results of
Relationships Between Groups By
Physical and Emotional Stimuli

Variable	χ^2	df	p-value	Cramer's V
<u>Physical Stimuli</u>				
<u>Intake</u>	1.828	2	.4008	-
<u>Time</u>	3.389	3	.3354	-
<u>Mobility</u>	10.481	2	.0053**	.26
<u>Perception</u>	10.102	4	.0387**	.26
<u>Emotional Stimuli</u>				
<u>Motivation</u>	4.495	4	.3431	-
<u>Responsibility and Persistence</u>	3.765	2	.1522	-
<u>Structure</u>	4.710	2	.0949*	.18

**p<.05

*p<.10

Only two of the seven stimuli produced a significant chi-square result at the .05 level. Both were physical stimuli: mobility and perception (perceptual modality preference). However, in both cases the relationship was weak (Cramer's V=.26). The emotional stimulus of structure achieved significance at the .10 level. The relationship in this case was weak also (Cramer's V=.18).

Presented in Table 2 are data relative to frequency and percent of the physical learning style elements for the gifted and nongifted groups. Although no significant relationship was found between the element intake and giftedness, it is interesting to note that in both the gifted and the nongifted groups the majority (62%) did not require intake of food while learning.

No significant relationship was found between the element time and giftedness. Almost half of the children in both groups (46%) preferred learning in the afternoon. This was followed by a preference for learning in the morning (22%) and a mixed preference (22%).

The weak relationship between mobility and giftedness seems to be primarily evident in that 12 of the gifted group (16%) required mobility in the learning environment, whereas only one of the nongifted children required mobility. However, the majority of the gifted (72%) and nongifted (87%) groups did not require mobility. Regarding perceptual preferences, half of the gifted children (51%) preferred the visual modality. The preferences of the nongifted were fairly evenly spread over the visual, kinesthetic, and mixed modalities.

Table 2

Frequency and Percent of Physical Stimuli
by Groups

Variable	Gifted (N=76)	Nongifted (N=77)	Total (N=153)
<u>Intake</u>			
<u>Does not require</u>	46 (60.5%)	49 (63.6%)	95 (62.1%)
<u>Requires</u>	19 (25.0%)	13 (16.9%)	32 (20.9%)
<u>Undecided</u>	11 (14.5%)	15 (19.5%)	26 (17.0%)
<u>Time</u>			
<u>Morning</u>	16 (21.1%)	18 (23.4%)	34 (22.2%)
<u>Afternoon</u>	37 (48.7%)	34 (44.2%)	71 (46.4%)
<u>Evening</u>	10 (13.2%)	5 (6.5%)	15 (9.8%)
<u>Mixed</u>	13 (17.1%)	20 (26.0%)	33 (21.6%)
<u>Mobility</u>			
<u>Does not require</u>	55 (72.4%)	67 (87.0%)	122 (79.7%)
<u>Requires</u>	12 (15.8%)	1 (1.3%)	13 (8.5%)
<u>Undecided</u>	9 (11.8%)	9 (11.7%)	18 (11.8%)
<u>Perception</u>			
<u>Tactual</u>	7 (9.2%)	5 (6.5%)	12 (7.85%)
<u>Auditory</u>	5 (6.6%)	9 (11.7%)	14 (9.15%)
<u>Visual</u>	39 (51.3%)	22 (28.6%)	61 (39.9%)
<u>Kinesthetic</u>	12 (15.8%)	19 (24.7%)	31 (20.2%)
<u>Mixed</u>	13 (17.1%)	22 (28.6%)	35 (22.8%)

Presented in Table 3 are data relative to frequency and percent of the emotional learning style elements for the gifted and nongifted groups. No significant relationship was found between giftedness and the element motivation. In each of the two groups, the category containing the largest percent was that of adult motivated (34% for the gifted children and 43% for the nongifted children). This was followed by teacher motivated and self motivated.

There was no significant relationship found between giftedness and the element responsibility and persistence for the two groups. The majority of children in both groups (69%) were found to be responsible and persistent. Of interest is the fact that one third of the gifted children were undecided about this element as opposed to 20% of the nongifted group.

A significant relationship between the element structure and giftedness was found at the .10 level. For this element the gifted and nongifted groups expressed opposite preferences. Over one third (38%) of the gifted children expressed a preference for the needs little category. a little over one-third (34%) of the nongifted children indicated the needs category for structure. It is

interesting to note that 36% of the gifted children and 44% of the nongifted children were undecided for this element.

Table 3
Frequency and Percent of Emotional Stimuli
by Groups

Variable	Gifted (N=76)	Nongifted (N=77)	Total (N=153)
<u>Motivation</u>			
<u>Teacher</u>	12 (15.8%)	16 (20.8%)	28 (18.3%)
<u>Adult</u>	26 (34.2%)	33 (42.9%)	59 (38.6%)
<u>Self</u>	15 (19.7%)	9 (11.7%)	24 (15.7%)
<u>Unmotivated</u>	7 (9.2%)	3 (3.9%)	10 (6.5%)
<u>Mixed</u>	16 (21.1%)	16 (20.8%)	32 (20.9%)
<u>Responsibility and Persistence</u>			
<u>Is Not</u>	3 (3.9%)	5 (6.5%)	8 (5.2%)
<u>Is</u>	48 (63.2%)	57 (74.0%)	105 (68.6%)
<u>Undecided</u>	25 (32.9%)	15 (19.5%)	40 (26.1%)
<u>Structure</u>			
<u>Needs</u>	20 (26.3%)	26 (33.8%)	46 (30.1%)
<u>Needs Little</u>	29 (38.2%)	17 (22.1%)	46 (30.1%)
<u>Undecided</u>	27 (35.5%)	34 (44.2%)	61 (39.9%)

Learning Style as Modality Strength

Research Question 2. Are there differences between gifted and nongifted first grade students in regard to modality strength?

Data obtained from the Swassing-Barbe Modality Index were used in two types of statistical analyses to answer this question: chi-square and independent t-tests. Presented in Table 4 are data relative to frequency and percent regarding perceptual modality strength of the gifted and nongifted groups.

Table 4

Frequency and Percent of Dominant Perceptual Modality
Strength by Groups

<u>Variable</u>			
Strength	Gifted	Nongifted	Total
Visual	28 (36.8%)	32 (41.6%)	60 (39.2%)
Auditory	24 (31.6%)	24 (31.2%)	48 (31.4%)
Kinesthetic	2 (2.6%)	3 (3.9%)	5 (3.3%)
Mixed	22 (28.9%)	18 (23.4%)	40 (26.1%)
N =	(76)	(77)	(153)

χ^2	<u>df</u> = 3,	p < .8350	

Chi-square statistics based on categories determined by percentage scores indicated no significant relationship between giftedness and modality strength. Slightly more than one-third of the first graders had a visual strength (39%) and slightly less than one-third an auditory strength (31%), while one-quarter had mixed strengths. Of interest is the fact that neither group was dominant in the kinesthetic modality. Specifically, only two of the gifted and three of the nongifted children revealed a dominant strength in the kinesthetic modality. Having found no significant differences between the gifted and nongifted groups regarding the categories of modality strength, t-tests were conducted using mean raw scores in each category.

Presented in Table 5 are data relative to t-test comparisons between the gifted and nongifted groups on modality strength.

Table 5

Comparison of Gifted and Nongifted Groups on Modality
Strength Using SBMI Mean Raw Scores
(N = 153)

Variable	Gifted	Nongifted	t-value	prob.
<u>Modality Strength</u>	Mean (S.D.)	Mean (S.D.)		
Visual	24 (1.02)	18.181 (.870)	4.32	.0001*
Auditory	23.21 (.871)	16.81 (.579)	6.06	.0001*
Kinesthetic	17.05 (.873)	12.72 (.647)	3.98	.0001*
Total	64.26 (2.06)	47.72 (1.55)	6.40	.0001*

*p<.05	df = 151			

Significant differences ($p < .05$) were found between the gifted and nongifted groups on independent t-tests of visual, auditory, kinesthetic, and total mean raw score on the Swassing-Barbe Modality Index. Results indicated significantly higher scores for the gifted group on each subtest and subsequently on the total test.

Perceptual Modality Preferences and Strengths

Research Question 3. Is there a relationship between preference for visual, auditory, or kinesthetic mode and

measured modality strength in first grade students?

This research question was initially addressed through the use of three one-way analyses of variance statistical procedures. The dependent variables consisted of mean percentage scores in each of the modality strength areas: visual, auditory, and kinesthetic. The independent variable contained four levels: the categories of visual, auditory, kinesthetic and mixed perceptual modality preferences. Data relative to analyses of variance are presented in Table 6.

Table 6

Analysis of Variance of Perceptual Modality Strength and
Perceptual Modality Preference
(N = 141)

Source of Variation	SS	df	MS	F	Prob.
<u>Visual</u>					
Between (Ss)	109.8	3	36.60	.39	.7633
Within (Ss)	12991	137	94.82		
<u>Auditory</u>					
Between (Ss)	83.8	3	27.94	.30	.8229
Within (Ss)	12614	137	92.07		
<u>Kinesthetic</u>					
Between (Ss)	63.7	3	21.25	.39	.7575
Within (Ss)	7389	137	53.93		

Results in each analysis indicated that there was no evidence that the mean percentage score for visual, auditory, or kinesthetic modality strength differed across levels of modality preference (visual, auditory, kinesthetic, and mixed).

To explore further that nature of modality preference and strength in first grade students, contingency tables for dominant strength and preference were constructed for the total group of gifted and nongifted children and for each of the groups separately. Chi-square statistics were calculated. Data relative to frequency and percent of dominant modality strength and preference are presented in Tables 7-9.

No significant relationships were found in any of the chi-square analyses. However, close examination of the three contingency tables revealed interesting results. Of the 60 students with a dominant visual strength overall, only slightly more than a third (38%) (Table 7) preferred a visual modality. This was true for over half of the gifted group (54%) (Table 8) but only one quarter of the nongifted group (25%) (Table 9) who were fairly evenly spread across their preferences. Of the 40 students with an auditory strength overall, only 10% had a preference for the

Table 7

Frequency and Percent of Dominant Modality Strength and Preference for Gifted and Nongifted
(N = 153)

<u>Variable</u>	<u>Dominant Strength</u>	<u>Visual</u>	<u>Auditory</u>	<u>Kines.</u>	<u>Mixed</u>	<u>Total</u>
<u>Dominant Preference</u>						
<u>Tactual</u>	5 (8.3%)	6 (12.5%)	0	1 (2.5%)	12 (7.8%)	
<u>Auditory</u>	7 (11.7%)	5 (10.4%)	1 (20.0%)	1 (2.5%)	14 (9.2%)	
<u>Visual</u>	23 (38.3%)	17 (35.4%)	1 (20.0%)	20 (50.0%)	61 (39.9%)	
<u>Kinesthetic</u>	11 (18.3%)	9 (18.8%)	3 (60.0%)	8 (20.0%)	31 (20.3%)	
<u>Mixed</u>	14 (23.3%)	11 (22.9%)	0	10 (25.0%)	35 (22.0%)	
<u>Total</u>	60 (100%)	28 (100%)	5 (100%)	40 (100%)	153 (100%)	

Table 8

Frequency and Percent of Dominant Modality Strength
and Preference for Gifted
(N = 76)

<u>Variable</u>	<u>Dom Str.</u>	<u>Visual</u>	<u>Auditory</u>	<u>Kines.</u>	<u>Mixed</u>	<u>Total</u>
<u>Dominant Preference</u>						
<u>Tactual</u>		3 (10.7%)	3 (12.5%)	0	1 (4.5%)	7 (9.2%)
<u>Auditory</u>		2 (7.1%)	2 (8.3%)	1 (50.0%)	0	5 (6.6%)
<u>Visual</u>		15 (53.6%)	11 (45.8%)	1 (50.0%)	12 (54.5%)	39 (51.3%)
<u>Kinesthetic</u>		3 (10.7%)	4 (16.7%)	0	5 (22.7%)	12 (15.8%)
<u>Mixed</u>		5 (17.9%)	4 (16.7%)	0	4 (18.2%)	13 (17.1%)

Table 9
 Frequency and Percent of Dominant Modality Strength and
 Preference for Nongifted
 (N = 77)

<u>Variable</u>	<u>Dom. Str.</u>	<u>Visual</u>	<u>Auditory</u>	<u>Kines.</u>	<u>Mixed</u>	<u>Total</u>
<u>Dominant Preference</u>						
<u>Tactual</u>		2 (6.3%)	3 (12.5%)	0	0	5 (6.5%)
<u>Auditory</u>		5 (15.6%)	3 (12.5%)	0	1 (5.6%)	9 (11.7%)
<u>Visual</u>		8 (25.0%)	6 (25.0%)	0	8 (44.4%)	22 (28.6%)
<u>Kinesthetic</u>		8 (25.0%)	5 (20.8%)	3 (100%)	3 (16.7%)	19 (24.7%)
<u>Mixed</u>		9 (28.1%)	7 (29.2%)	0	6 (33.3%)	22 (28.6%)

auditory mode (Table 7). This was true for 8% of the gifted and 13% of the nongifted samples.

Of the 40 first graders who were dominant in the category of mixed modality strength, 25% also had a preference for the same. About a third of the nongifted sample (33%) who had a mixed modality strength had a preference for mixed modalities. This was true for 18% of

the gifted first graders. Only five of the 153 children tested were dominant in the kinesthetic modality. This was about equally split between the gifted and nongifted groups.

Although the research questions in this study did not deal with gender differences, analyses were conducted and are presented in Appendices E and F. No gender differences were found in first grade students regarding physical and emotional learning style preferences or in perceptual modality strengths. This finding agrees with those of Barbe and Swassing (1979) and Ricca (1984), but it contrasts with that of Keefe (1982). Keefe believes that physiological styles are biologically based and are founded on sex related differences, personal health and nutrition, and reactions to the physical environment.

Summary

This chapter reported the results of the data analysis by describing differences between gifted and nongifted first grade children regarding learning style preferences and modality strengths. In addition, information regarding the possibility of a relationship between perceptual modality preference and measured modality strength in first

grade students was reported.

The results showed that the groups did differ significantly at the .05 level on mobility and perception and at the .10 level on structure. The two groups also differed significantly at the .05 level on short term memory. No evidence was found to indicate that there was a relationship between perceptual modality preference and measured modality strength.

CHAPTER V

Summary, Conclusions, and Recommendations

The purpose of this study was to determine whether first grade students identified as gifted display different learning style preferences and modality strengths from nongifted first grade students. Two instruments, the Learning Style Inventory: Primary and the Swassing-Barbe Modality Index, were administered to two groups of first grade students, gifted and nongifted. Contingency tables were constructed and chi-square statistics were conducted to determine the relationship between giftedness and learning style preferences regarding elements of physical and emotional stimuli.

To examine differences in the gifted and nongifted groups regarding modality strength, two statistical procedures were used. The first consisted of a chi-square analysis conducted on contingency tables. The second consisted of independent t-tests on the two groups regarding subtest and total test mean raw scores.

To determine the relationship between perceptual modality preference and measured modality strength, three one-way analyses of variance were conducted. In order to further explicate the possibility of a relationship, contingency tables were set up and chi-square statistics were calculated.

This chapter presents the summary of findings, conclusions, general recommendations, recommendations for further research, and a discussion.

Summary of Findings

Following is a summary of the major findings of the study:

Research question one:

Do gifted first grade students have learning style preferences regarding physical and emotional stimuli that are different from those of nongifted first grade students?

Relationships were found between giftedness and two of the four physical elements (mobility and perception) and one of the three emotional elements (structure). Although the majority of both gifted and nongifted children did not require mobility, the main difference between the two groups occurred in the requires category. Twelve of the

gifted children required mobility as opposed to one of the nongifted.

Regarding perception, half of the gifted children preferred the visual modality, while preferences of the nongifted were fairly evenly spread over the visual, kinesthetic, and mixed modalities. For structure, gifted and nongifted children expressed opposite preferences. About a third of the nongifted children expressed a preference for structure. About a third of the gifted group did not require structure in the learning environment.

Research question two:

Are there differences between gifted and nongifted first grade students in regard to modality strength?

Chi-square statistics yielded no significant relationship between giftedness and dominant modality strength. Both groups had a dominant visual strength. Independent t-tests revealed significant differences at the .05 level between the two groups on visual, auditory, kinesthetic, and total mean raw scores. Results indicated higher scores for the gifted group on each subtest and on the total test.

Research question three:

Is there a relationship between preference for the visual, auditory, or kinesthetic mode and measured modality strength in first grade students?

Results of analyses of variance indicated that there was no evidence that the mean percentage scores for visual, auditory, or kinesthetic modality strength differed across levels of modality preference. To further explore the relationship between modality preference and strength, chi-square statistics were calculated. No significant relationship was found using this procedure.

Conclusions

Based on the findings of this study it is concluded that gifted and nongifted first grade children tend to be more similar than different in regard to physical and emotional learning style preferences and dominant modality strengths. Considering this information it would be inappropriate to develop a differentiated curriculum for first grade children based solely on the results of the study.

It is, however, important to note that very similar preferences regarding the elements of mobility, perception,

and structure have been found in studies of older gifted children. Although the differences found in this study were weak, when combined with the findings of similar studies of older gifted children, they help to form a body of learning style preferences which distinguishes the gifted as a group from nongifted children.

In reviewing learning style research of gifted and nongifted students in general, one finds both similarity and disparity. The finding of no significant differences between the two groups regarding dominant modality strength in this study reflects some of the disparity. It was therefore concluded that learning style preferences and dominant modality strengths of gifted children are highly individualistic and should be considered on a case by case basis.

No relationship was found between perceptual preference and strength. The Swassing-Barbe Modality Index seems to measure the sense of touch and small muscle activity. The Learning Style Inventory: Primary asks questions about activities involving working tactually with puzzles, paint, clay, drawing materials, and blocks. Kinesthetic questions are those regarding playing a game, acting out a story, acting in a play, or building a project

with blocks. It was concluded that the instruments may be assessing different aspects of the kinesthetic modality.

General Recommendations

In order to gain the maximum instructional benefit from the use of learning style information, it is recommended that teachers of both gifted and nongifted children assess styles individually. When using the Learning Style Inventory: Primary, it is necessary to administer the entire instrument to develop a profile which includes the four stimuli related to learning style preferences: physical, emotional, environmental, and sociological. Children at the primary grade levels, kindergarten through second, have not had adequate time to explore the various learning style stimuli. It is recommended that they be given opportunities to experience and develop their own styles.

Regarding the use of the Swassing Barbe Modality Index for assessing modality strengths, it is also recommended that this assessing be done on an individual basis. The information is best used in initial teaching strategies and/or whenever a student or group of students is having difficulty grasping the content of a lesson. Barbe and

Swassing (1979) refer to this as the "point of intervention" and recommend that the teacher present the information through dominant modalities.

The findings of the present study suggest that gifted first graders are more similar than different from the nongifted on physical and emotional learning style preferences and dominant modality strengths. However, these findings, when considered with those of similar studies on older children, show some group tendencies and patterns. It would not be appropriate to develop a differentiated educational program for gifted first graders based on the findings of this study. It is recommended instead that the findings be viewed as a small contribution to differentiation for these children.

In studies of children in grades three through twelve, it has been found that the achievement can be raised when children are given instruction commensurate with their style preferences (Dunn and Dunn, 1987). To determine the relative value of the findings of this study in working with gifted first grade students, it is recommended that the information be used in a subsequent study involving testing on their achievement after having been taught

through the learning style preferences and dominant modality strengths.

Recommendations for Further Research

The following are recommendations for further research:

(1) A similar study of gifted primary grade children should be conducted in another school system to determine if the results of this study could be replicated.

(2) A comparative study of young gifted and nongifted children in which the entire Learning Style Inventory: Primary is administered should be conducted to obtain additional information about the possibility of further learning style differences between the two groups.

(3) A study which investigates learning style differences between gifted and nongifted primary grade children regarding instructional strategies should be completed.

(4) An investigation involving pre and post achievement testing of children after incorporating instruction using learning style information would be valuable.

(5) The refinement of present research instruments for determining learning styles of primary grade children and the development of additional instruments for use with young children are much needed and recommended. Further refinement of the Learning Style Inventory: Primary may reduce its limitations regarding obtaining actual preferences of young children.

Discussion

The following information is presented to illustrate where the results of this study reaffirm findings in similar studies and differ from others. In this study the majority of first grade students in both groups indicated they did not require mobility. Of those who did require mobility in the learning environment, more were from the gifted group. Dunn and Dunn (1978) found that the gifted have a need for mobility in the learning environment.

The gifted group preferred the visual modality whereas the nongifted group indicated equal preferences for the visual, kinesthetic, and mixed modalities. By comparison, Griggs and Price (1980) found older gifted students to have strong visual, tactual, and kinesthetic preferences. Findings of two other studies conducted with older students

(Dunn and Price, 1980; Price, Dunn, Dunn and Griggs, 1981) indicated that gifted students preferred the tactual and kinesthetic modalities.

Results of the present study revealed that gifted first grade students preferred a less structured learning environment than nongifted. This finding concurs with those of similar studies of older gifted children (Dunn and Price, 1980; Stewart, 1981; Cody, 1983; Ricca, 1984).

The first grade gifted students were found to have perceptual modality strengths which were very similar to those of the nongifted children. By contrast, in their summary of research on modality strengths of gifted children, Barbe and Swassing (1982) found that gifted children of all ages as compared to nongifted children tended to have dominant visual and mixed modality strengths and to a lesser degree, kinesthetic. Also, according to their findings, gifted children neither prefer the auditory modality nor is it their strength. In comparisons of the two groups in the present study on mean raw scores for each of the three modality strength subtests and the total test, the gifted group scored consistently higher in each which indicated superior short term memory for this group. This finding reaffirms that of Kirchoff (1981).

The findings of the present study indicating no relationship between preference for the visual, auditory, or kinesthetic mode and measured modality strength in first grade students reaffirm results of similar studies conducted on older students (Barbe and Swassing, 1979; Barbe and Milone, 1981; Davidman, 1981; Ramirez, 1982).

It is important to remember that young children have not had the time to explore fully the varied learning style stimuli available as compared to older children and therefore have not fully developed their preferences. This may be a contributing factor to explain the differences between the results of this study and those conducted on older children. It is also important to remember that the perceptual modalities develop gradually and are subject to change. Children must have the opportunity to develop all of the modalities. According to Barbe and Swassing (1982), gifted children who rely on a single modality do not reach their maximum potential.

Few instruments are available for assessing learning styles of primary grade children. Those available tend to have low reliability when compared to instruments appropriate for older children. Young children are anxious to please the adults in their lives and tend to follow the

routine established by such significant adults as parents and teachers. This was evidenced in the administration of the Learning Style Inventory: Primary and was also seen in the results of the motivation element on the inventory. In certain cases it was difficult to elicit from the child his/her actual preference for a learning situation. Instead he/she might answer in accordance with the teacher's established routine. This was evident in such questions taken from the inventory as:

(1). When you finish a paper in school what do you want to do with it?

- 1 show it to the teacher
- 2 put it away

(2). If you could get up and move around the room when you wanted, would it be hard for you?

- 1 hard to do your schoolwork?
- 2 easy for you to do your schoolwork?

Some children might answer this question by stating that they were supposed to put their work in the teacher's basket, or for question two, that they were not allowed to get up from their seats. All children were encouraged to give their own preferences, however, and it was observed by those administering the inventory that in general gifted

children were more willing than nongifted children to take the risk of answering with their actual preferences. One possible reason for this might be found in those results of the study which indicated that slightly more of the gifted than nongifted were self-motivated.

Regarding perceptual preference, the area least preferred by the gifted group was that of the auditory modality followed by the tactual and kinesthetic. The fact that gifted children as young as first grade age do not prefer the auditory modality is significant when one considers that this has been found to be true in studies of older gifted children. Regarding measured modality strength, the weakest area for both groups of first graders was the kinesthetic modality. It is the belief of this researcher that young children need to be offered more opportunities to explore and strengthen the kinesthetic modality in the classroom and in the home.

The finding of no relationship between modality preferences and measured modality strength in children at the first grade age level is an important one for educators. It means that one could not assume that the two dimensions are the same. It would be necessary to administer both the Learning Style Inventory: Primary and

the Swassing-Barbe Index to obtain a total profile of a child's or a groups' most comfortable way of receiving information and his/her strength in receiving and processing information.

In conclusion, a profile of the gifted first grade students in this study regarding physical and emotional learning style preferences and modality strengths would contain the following information. Gifted first grade students do not require intake of food while learning. They prefer to learn in the afternoon and to have the opportunity for some mobility while learning. They prefer learning through the visual rather than the auditory modality but show visual and auditory strengths. Less structure is required in learning activities for gifted first graders. Gifted first grade students are responsible and persistent and are motivated. They are adept at short term memory.

The field of learning styles, although not new, has once again come to the forefront in education. It is to be considered one of many valuable concepts available to teachers. The careful and thoughtful use of this concept can assist in maximizing the learning opportunity for all children.

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APPENDICES

APPENDIX A

LEARNING STYLE INVENTORY: PRIMARY PROFILE

APPENDIX B
RELIABILITY AND VALIDITY FOR LEARNING STYLE INVENTORY:
PRIMARY

Reliability and Validity

Initial reliability and validity studies have revealed the following data. Thirty-four kindergarten, 1st, and 2nd grade youngsters were tested with the 12 subscales of the *Learning Style Inventory: Primary Version* in September 1981. Five weeks later they were retested. The results were:

	Percentage of youngsters who did not change their preference from initial test to retest*	Reliability Coefficients employing the equal length Spearman Brown
Sound	83%	r = .50
Light	65%	r = .74
Temperature	86%	r = .81
Design	83%	r = .88
Motivation	68%	r = .85
Responsibility	90%	r = .73
Structure	89%	r = .80
Sociological	68%	r = .79
Perception	65%	r = .61
Intake	86%	r = .67
Mobility	89%	r = .82
Time	71%	r = .80

Note: Motivation, Sociological, Perception and Time subscales are not dichotomous scales.

The *Learning Style Inventory* (Dunn, Dunn & Price, 1980) has established "impressive reliability and validity" set down in an article by P. Kirby (Kirby, P., 1980; *Cognitive Style, Learning Style and Transfer Skill Acquisition; Information Series No. 195, The National Center for Research in Vocational Education; The Ohio State University, Columbus, Ohio.*)

Researchers from the Deer Park School District, Cincinnati, Ohio, correlated responses of 3rd grade youngsters to the *Learning Style Inventory: Primary* and the *Learning Style Inventory*. The following chart illustrates those results:

Learning Style Elements

Percents of Agreement Between Responses on LSI and LSI:P (n = 9)

STIMULI	ENVIRONMENTAL	Oulet 100%		Bright 100%		Cool 100%		Formal 100%				
		SOUND		LIGHT		TEMPERATURE		DESIGN				
		Noise 100%		Low Light 100%		Warm 100%		Informal 100%				
		Self 100%		Adult 100%		Persistent 89%		Responsible 78%		Needs Structure 44%		
EMOTIONAL	MOTIVATION		PERSISTENCE		RESPONSIBILITY		STRUCTURE					
	Teacher 89%		Unmotivated 100%		Nonpersistent 89%		Not Responsible 78%		No Structure 44%			
SOCIOLOGICAL	PEERS 100%		SELF 100%		PAIRS*		TEAM*		ADULT 89%		VARIED*	
	Auditory 100%		Visual 89%		Non Intake 100%		A.M. 100%		Late A.M. 100%		Needs Mobility 56%	
PHYSICAL	PERCEPTUAL		INTAKE		TIME		MOBILITY					
	Tactile 78%		Kinesthetic 67%		Intake 100%		A.M. 100%		Evening 100%		No Mobility 56%	

* Learning Style Elements of the LSI:P are not dichotomous scales. The LSI:P but not the LSI:P: P is a true dichotomous scale.

APPENDIX C

RECORD SHEET FOR SWASSING-BARBE MODALITY INDEX

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**SWASSING—BARBE MODALITY INDEX
RECORD SHEET**

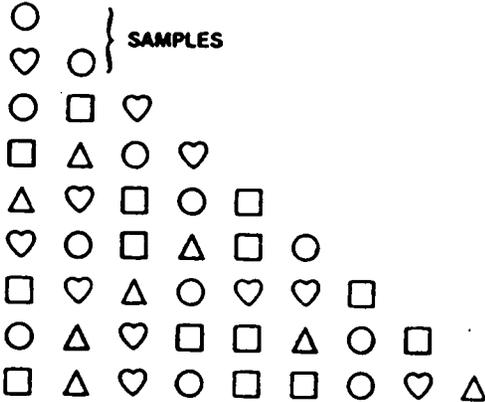
_____ Date: _____

Name: _____

Examiner: _____

Birthdate: _____ Sex: F _____ M _____

Grade: _____ Dominant Hand: L _____ R _____



VISUAL TEST:

Show set of shapes; follow timing guidelines as outlined in directions. Remove card at end of time limit or when child indicates she/he is finished if before allotted time. Child assembles sequence just seen. Mark answer sheet. Stop test when child has made errors on two consecutive sets.

TOTAL VISUAL CORRECT: _____

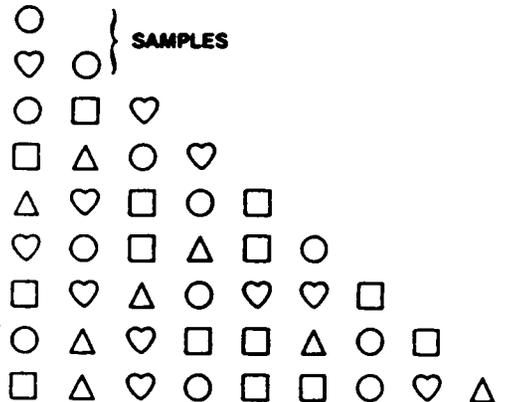
Before proceeding, ask child how she/he arrived at answer _____

AUDITORY TEST:

Read aloud the names of shapes in sequence at rate of one per second. Child assembles sequence of shapes just heard. Mark answer sheet. Stop test when child has made errors on two consecutive sets.

TOTAL AUDITORY CORRECT: _____

Before proceeding, ask child how she/he arrived at answer _____



KINESTHETIC TEST:

Holding shield so child cannot see shapes, put set in front of child; place child's dominant hand on first shape on left; child may use both hands. Do not speak during test. If child accidentally skips a shape, place her/his hand on missed shape. Follow timing guidelines as outlined in directions; remove set and shield. Child assembles sequence. Mark answer sheet. Stop when child has made errors on two consecutive sets.

TOTAL KINESTHETIC CORRECT: _____

Ask child how she/he arrived at answer _____

VISUAL CORRECT: _____

PERCENTAGE VISUAL: _____%

AUDITORY CORRECT: _____

PERCENTAGE AUDITORY: _____%

KINESTHETIC CORRECT: _____

TOTAL CORRECT _____

PERCENTAGE KINESTHETIC: _____%

APPENDIX D
CORRESPONDENCE

**Prince William County
Public Schools**

March 28, 1988

Ms. Susan Coleman

Dear Ms. Coleman:

I have reviewed your request to conduct a research project pertaining to learning style preferences of first grade students. Due to the potentially useful information the project may yield, and the endorsement of the Supervisor of Gifted Education, I am approving the request although I will leave participation by schools as voluntary and as determined by principals and affected teachers. I am requesting that you provide this office with a summary of your findings.

Sincerely,

William N. Cox
Associate Superintendent
for Instruction

WNC:lar

cc: Ms. Carol Brunner
Ms. Gail Hubbard
Mr. Mike Salkco

April 1988

Parents of: _____

During the present school year, I am conducting a research project in the elementary schools of Prince William County. The purpose of this project is to explore learning style preferences and perceptual modality strengths of first grade students. I would like your child to participate in this research project.

He or she will be given two learning style inventories taking approximately 20 minutes each. The gifted education resource teacher will administer the inventories during the regular school day. This project has been approved by the administration. No individual student names will be used in the report of research findings. You may have a copy of the results.

If you approve of your child's participation, please sign this form and return it to your child's teacher. If you have questions, please call me at 791-7455 or 491-6712. Thank you for your cooperation and assistance with this research.

Yours very truly,

Susan Coleman

SC:cb

I give permission for my child _____
to participate in the research project conducted by Ms. Susan
Coleman. This will involve taking two inventories to determine
learning styles.

Parent's signature

Date

APPENDIX E
CHI-SQUARE RESULTS:
LEARNING STYLE INVENTORY: PRIMARY
BY SEX

Chi-Square Results of
Relationship Between Sexes By
Physical and Emotional Stimuli

Variable	χ^2	df	p-value
<u>Physical Stimuli</u>			
<u>Intake</u>	2.513	2	.2845
<u>Time</u>	2.064	3	.5591
<u>Mobility</u>	2.805	2	.2459
<u>Perception</u>	1.805	4	.7716
<u>Emotional Stimuli</u>			
<u>Motivation</u>	4.555	4	.3360
<u>Responsibility and persistence</u>	.1030	2	.9498
<u>Structure</u>	2.183	2	.3356

APPENDIX F
CHI-SQUARE RESULTS:
SWASSING-BARBE MODALITY INDEX
BY SEX

Frequency and Percent of Modality Strength
By Gender

Variable	Male	Female	Total
<u>Strength</u>			
Visual	31 (40.8%)	29 (37.7%)	60 (39.2%)
Auditory	28 (36.8%)	20 (26.0%)	48 (31.4%)
Kinesthetic	3 (3.9%)	2 (2.6%)	5 (3.3%)
Mixed	14 (18.4%)	26 (33.8%)	40 (26.1%)
N =	(76)	(77)	
----- 2			
X = 5.193	<u>df</u> = 3,	p < .1582	

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