To the Graduate Council:

I am submitting herewith a dissertation written by Carole Stubbs entitled "An Investigation of the Effect of Structure of Intellect Training on Academic Achievement with Low Achieving Primary Students." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Education..

Charles L. Thompson
Major Professor

We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

The Graduate School

AN INVESTIGATION OF THE EFFECT OF STRUCTURE OF INTELLECT TRAINING ON ACADEMIC ACHIEVEMENT WITH LOW ACHIEVING PRIMARY STUDENTS

A Dissertation

Presented for the

Doctor of Philosophy

Degree

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Carole Stubbs

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C.A.S.

ABSTRACT

The major purpose of this study was to investigate the effects of Structure of Intellect (SOI) training on learning ability and academic achievement with lower achieving primary grade students. The study was conducted with an elementary school population which had a history of low achievement test scores and high retention rates.

The sample was comprised of 195 students in two elementary schools. In the experimental school one half of the first and second grade students were randomly selected to participate in SOI training, while the remaining students received language experience activities. The first and second grade students in a comparable elementary school served as a control group. Classroom teachers conducted the training three times a week in thirty minute sessions for eighteen weeks. The instruments used to assess the students' performance were the SOI Process and Diagnostic Test and the Metropolitan Achievement Test. The statistical procedures applied to the data included the analysis of variance, the analysis of covariance, and several multiple comparison techniques.

Statistical results from the first and second grade students on the SOI test did not reveal significant differences in learning abilities between students who received SOI training and those who did not receive the

training. The first grade students in the SOI group did achieve significance on one subtest, memory for visual details (MFU). There was no statistical difference in academic achievement among the first grade students. The second grade achievement scores showed that the control group scored significantly higher in math, language, and total basic battery.

The findings from this study do not support the SOI premise that training of intellectual abilities contributes to increased academic performance with this student population. It was concluded that generalized SOI training did not significantly strengthen learning ability nor raise achievement of lower achieving primary grade students.

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CHAPTER I

STATEMENT OF THE PROBLEM

Meeker's Structure of Intellect training has been shown to be effective with a broad range of students. (Bennett, 1979; Abroms & Meeker, 1980; Tuttle & Becker, 1980; Collected Readings, 1982). However, no research has been conducted to determine the effectiveness of SOI training in improving general academic achievement of disadvantaged, low achieving primary students. Therefore, the present study seeks to fill this void by determining if training of intellectual abilities does indeed increase academic performance.

Hypotheses

1. There will be no significant difference in learning abilities between primary grade students who receive Structure of Intellect training and those who do not receive the training.

2. There will be no significant difference in academic achievement between primary grade students who receive Structure of Intellect training and those who do not receive the training.

Rationale

In public education students from low socioeconomic backgrounds have generally scored lower on standardized measures of achievement. Since there can be no control over the environment external to school which might positively effect student performance, the primary concern is to provide learning experiences within school which could contribute to improved academic achievement. The Structure of Intellect (SOI) approach places emphasis on the training of intellectual abilities as a means to facilitate and increase the academic progress of students. Since the traditional approaches to promoting academic achievement have not been considered totally successful, as evidenced by compensatory education programs, alternatives to basal textbooks, supplementary materials and grade retentions, SOI training as a supplement to the standard curriculum appears to be a viable alternative.

The need for evaluating the effectiveness of the Structure of Intellect program and its relation to academic achievement led to the formulation of this study. The major purpose for this study was to investigate the effects of SOI training on learning ability and academic achievement with lower achieving primary grade students.

Limitations

The limitations associated with this study involve: (1) the size of the sample and (2) the length of time the study was conducted.

Design of the Study

One hundred and ninety-five students in two elementary schools comprised the sample for this study. In the experimental school one half of the first and second grade students were randomly assigned to participate in Structure of Intellect training, while the remaining students received language experience activities. First and second grade students in a comparable elementary school served as a control group. Classroom teachers conducted the training in the two treatment groups three times a week for a total of eighteen weeks. The instruments used to assess the students' performance were the SOI Process and Diagnostic Test and the Metropolitan Achievement Test. The statistical procedures applied to the data include the one way analysis of variance, the analysis of covariance, and several multiple comparison techniques.

Organization of the Study

This study contains five chapters. The first chapter includes the statement of the problem, the hypotheses, the

rationale, the limitations, and the design of the study.

Chapter II is a review of related literature with emphasis on the historical development of the Structure of Intellect model and the survey of research. Chapter III presents the procedures and methodology utilized for data collection, including background information, sample, instrumentation, and data analysis.

Chapter IV presents the results and analysis of the data. Chapter V includes the summary, conclusions, and implications for future research.

CHAPTER II

REVIEW OF THE LITERATURE

Historical Development of the SOI Model

The Structure of Intellect is a model of intellectual abilities. It is the product of factor-analytic research conducted by J. P. Guilford and his associates in the Psychological Laboratory at the University of Southern California. Guilford's methods and research are documented in a series of reports under the general title "Reports from the Psychological Laboratory." The Guilford Structure of Intellect model developed into a formal theory in 1959 at USC as part of the aptitudes project, where ninety-six of the one hundred and twenty predicted abilities were extracted from test results.

The Structure of Intellect (SI) model is a three-way classification of intellectual abilities designed to encompass and organize intellectual aptitude factors (Meeker, 1969). It conceptualizes intellectual abilities into a three-dimensional model. Every intellectual ability in the structure is thus characterized in terms of the type of operation which is employed, the content involved, and the sort of product which results (Figure 1). Complete characterization of an intellectual ability is achieved in terms of the possible subclass on each of the three major

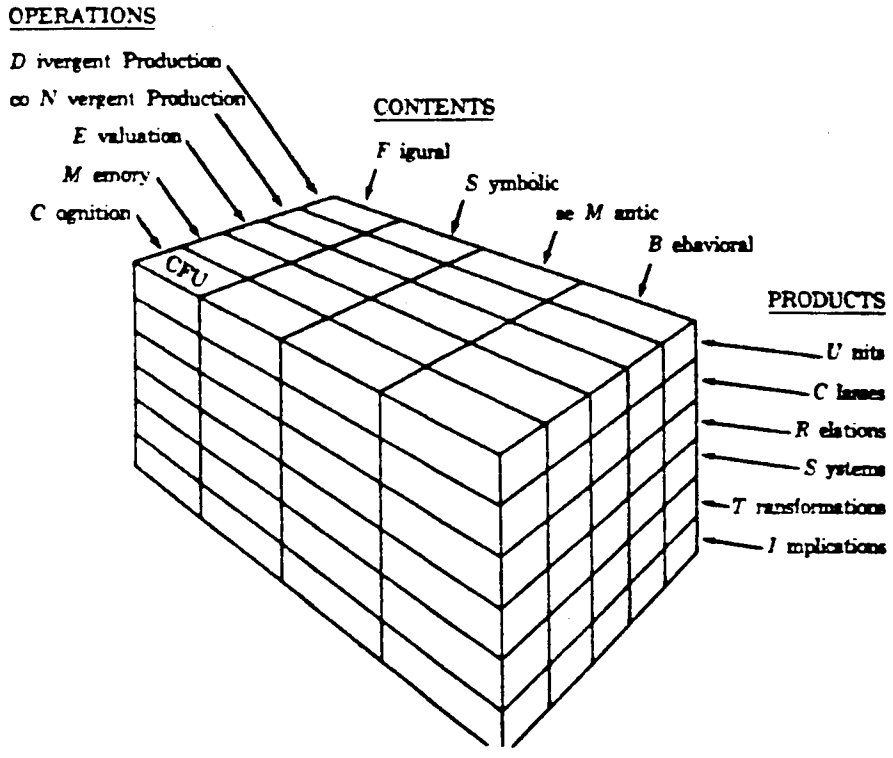


Figure 1. The structure of intellect model.

dimensions. "Operations" is differentiated by six subcategories: Units, Classes, Relations, Systems, Transformations and Implications (Guilford, 1979).

According to Guilford, a three-way interaction of subcomponents represents the possibility of 120 intellectual factors (5 Operations x 4 Contents x 6 Products). Each hypothesized intellectual ability is defined by the intersection of one intellectual operation, one intellectual content, and one intellectual product. Thus, a total of 120 intellectual abilities are defined by the intersections of the three basic dimensions.

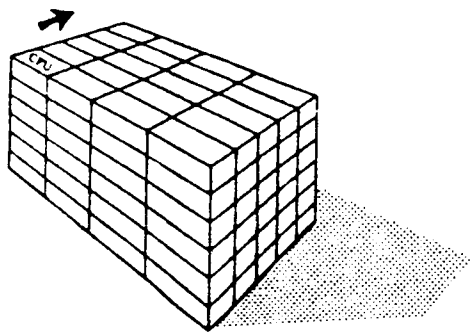
Each cell in the array is tagged with a trigram that readily identifies its three-way subclassification (see Figure 2). The first letter refers to the Operation, the second to the Content, and the third to the Product. "MFU" stands for Memory of Figural Units; "CSC" stands for Cognition of Symbolic Classes; and so on. Each ability is thus designated according to the initial letters of operations--contents--products categorization; there are only two exceptions to this procedure. In order to provide distinction between cognition and convergent production processes, the model uses C for Cognition and N for CoNvergent Production; secondly, in order to distinguish symbolic and semantic contents, the model uses S for Symbolic and M for SeMantic. Otherwise the first letter

OPERATIONS

CONTENTS **PRODUCTS**

C	Cogntion	F	Figural	U	Units
M	Memory	S	Symbolic	C	Classes
E	Evaluation	M	seMantic	R	Relations
N	coNvergent Production	B	Behavioral	S	Systems
				T	Transformations
D	Divergent Production			I	Implications

These letters always come first in the trigram.



Each factor or cell or ability has a three-letter designation. The first letter refers to the Operation, the second to the Content, and the third to the Product.

Figure 2. Reading the SOI trigram.

combinations provide unique shorthand and names for each ability (Meeker, 1969).

The "cube" is simply a visual aid to conceptualizing the three-way classification and is convenient for depicting the intellectual abilities. The Structure of Intellect implies nothing beyond this conceptualization. The order is strictly conventional; that is, no priority--logical, psychological, developmental, or hierarchical--is intended either within or between the categories of classification (Meeker, 1969).

The following will provide definitions of the major dimensions and subcategories of the SOI model.

Operations

Major kinds of intellectual activities or processes; things the organism does with the raw materials of information, information being defined as that which the organism discriminates (Meeker, 1969; Guilford, 1967).

There are five major intellectual operations (Figure 3): Cognition (C), Memory (M), Evaluation (E), coNvergent Production (N), and Divergent Production (D).

Cognition. Immediate discovery, awareness, rediscovery, or recognition of information in various forms; comprehension or understanding (Meeker, 1974).

Cognition is considered the most obvious and the most basic of all the operations. It is certainly an essential

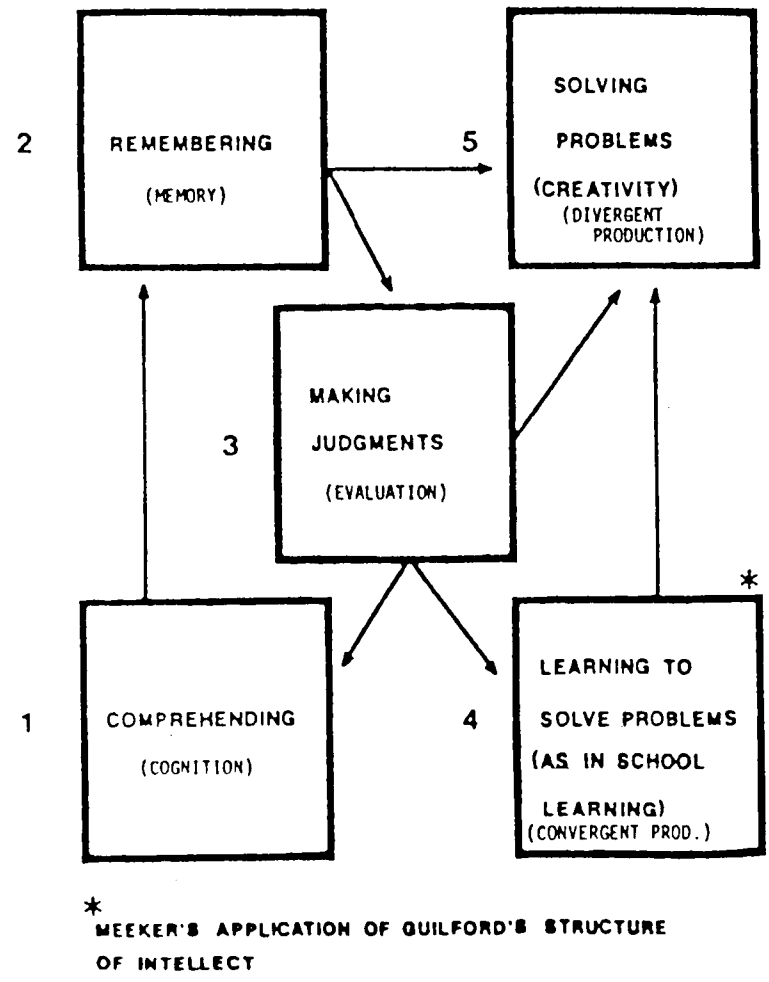


Figure 3. The five intellectual operations of the SOI model.

in the education process even from the earliest stages. In terms of the dynamics of learning it seems to be the primary process since every other activity presupposes perception and awareness of stimuli with the associated ability to discriminate or attend. Without registration there would seem to be no content for further processing (Meeker, 1969).

Obvious as it may be, cognition is worthy of comment as a separate ability since it may actually be slighted in the classroom. The difficulty for education personnel is that they have long become accustomed to the testing of comprehension as contrasted with its exercise. Meeker asks teachers these questions: How often are children taught just to comprehend? How often are experiences provided that have as a simple goal, pure comprehension, without questions, testing, or other demands?

If almost all information taken in has to be comprehended or cognized before it can be manipulated, children would need to experience many opportunities for tasks which require only that they do simple comprehending, that they be stimulated or intrigued. This kind of experience should be as integral a part of the curriculum at the elementary and secondary levels as it is at the kindergarten level, for it stimulates interest and motivation and thus increases visual and auditory attending (Meeker, 1969).

Memory. Retention or storage, with some degree of availability, of information in the same form as it was committed to storage and in response to the same cues in connection with which it was learned (Meeker, 1969; Guilford, 1967).

Memory, like cognition, is a well-known intellectual operation--well known in the sense that it is one of the oldest. Memory is also universally and historically recognized as a primary mental function, but it is something of an enigma in terms of our understanding how it functions in the dynamics of the learning process. Meeker states our understanding is largely restricted to measures of the manifest ability; memory has been assessed in terms of the amounts of information that can be reproduced as qualified by the elapsed time from input to retrieval and the mode of reproduction. Educators have been able to distinguish degrees of long-term (retention) and short-term (immediate) memory in terms of recall and recognition. Though considerably less is known about the underlying processes, some important distinctions about manifest memory abilities have been made (Meeker, 1969).

Evaluation. Reaching decisions or making judgments concerning criterion satisfaction (correctness, suitability, adequacy, desirability, etc.) of information (Meeker, 1969; Guilford, 1967).

Evaluation implies a kind of sensitivity to error or discrepancy on one hand and, on the other, a judgment of relative nearness of a number of items of information for any kind of product to a kind of model item of information on the same continuum--the ability to make judgments in relationship to known or understood standards. Evaluation is the art of decision making (Meeker, 1969).

Evaluation typically has an uneven role in the classroom. In formal education the exercise of "solution" type judgments is obviously favored. Evaluations of the "decision-making" type are perhaps the most slighted. Direct formal teaching of practical evaluation presents difficulties, partly because the process itself is so little understood, but also because of conflict in social value systems. With other abilities where the understanding of the process is not any more complete, the difficulty has been effectively circumvented by measuring in terms of output. Difficult as this situation is there are ways of coping with it. While the milieu of the child can be barren of evaluation experiences and though educators cannot change the greater part of his environs, they can provide formal exercise in those processes which he has no opportunity to assimilate informally (Meeker, 1969).

Convergent Production. Generation of information from given information, where the emphasis is upon achieving

unique or conventionally accepted best outcomes. It is likely the given information (cue) fully determines the response (Meeker, 1969; Guilford, 1967).

Convergent production is "rigorous thinking"--the process of finding the answer where "finding" is something more than mere retrieval and "the answer" suggests that the domain is so systematic, ordered, and determinant that there are rules or principles for converging on the solution. In other words, convergent production is the production of correct answers where "solution" is something more than mere retrieval (Meeker, 1971).

Convergent production is the most familiar SOI ability expected in schools; it is almost synonymous with curriculum assimilation. So much of the curriculum exercises this ability that it is fondly dubbed the "school block." It is, in fact, a higher order intellectual ability which is often taught before the preceding intellectual abilities are secure in children (Meeker, 1969).

Divergent Production. Generation of information from given information, where the emphasis is upon variety and quality of output from the same source; likely to involve what has been called transfer. This operation is most clearly involved in aptitudes of creative potential (Meeker, 1969; Guilford, 1967).

The immediate contrast between convergent and divergent production is the difference between zeroing in and expanding out. Divergent production should show fluency, flexibility, and originality, an ability to break away from the conventional; however, it should also show quality, relevance, and discipline, an ability to stay within "reasonable" bounds (Meeker, 1969; Meeker, 1974).

The second aspect of divergent production is its close association with creativity. Perhaps the desire for adequate measures of creativity has prompted some to equate divergent production with creativity; the association is close, but most investigators would maintain a distinction between the two. The most conservative analysis would consider divergent production as a necessary, though not sufficient, condition for creative ability; so even on this account, encouragement of this ability would represent a promising avenue to the development of creativity (Meeker, 1969).

Contents

Broad classes or types of information discriminable by the organism (Meeker, 1969; Guilford, 1967).

There are four kinds of content out of which intelligence is made. There are Figural (F), Symbolic (S), SeMantic (M), and Behavioral (B).

Figural. Figural content is perceived or is recalled in the form of images, shapes, simple sounds, Gestalts, whole, concrete "things." Figural content has sensory character: visual, auditory, kinesthetic, olfactory. Artists, sculptors, mechanics, and designers are high in Figural intelligence. It is a most primitive kind of input and thus a very basic foundation for beginning learners (Meeker, 1974).

Symbolic. Symbolic content is described by signs and materials such as letters, numbers, musical notations, and other code elements in which the elements have no significance in and of themselves. The alphabet and the number system provide code elements that can be combined in endless ways, such as license plate numbers, telephone numbers, words, prices, and statistics. Mathematicians are high in Symbolic ability (Meeker, 1974).

Semantic. The third kind of stimulus material which the organism must cognize separately from the figural and symbolic is the seMantic, labeled M to distinguish it from Symbolic content. SeMantic content differs from Figural and the Symbolic in that it refers to words and ideas where abstract meanings are associated. These are usually external referents. The word "Tree" relates to one's image of a tree; it has meaning and is thus seMantic. It is abstract in that one's idea of a "tree" may differ from

another and though they could communicate generally, there may also be areas of impreciseness. Teachers, writers, and actors are good with seMantics. Reading is almost totally seMantic (Meeker, 1974).

Behavioral. Behavioral content is defined as the nonverbal information involved in human interactions where awareness of perceptions, thoughts, desires, feelings, moods, emotions, intentions, and actions of other persons and ourselves is understood without verbal clues. It can be thought of as body language and the affective aspect of intellectual contents. Only a few Behavioral abilities have been identified and thus need yet to be clarified (Meeker, 1974).

Products

The organization that information takes in the organism's processing of it (Meeker, 1969; Guilford, 1967).

Products act as organizational categories for figural, symbolic, and semantic contents or stimulus materials. Contents are organized according to the way in which the organism has processed them as products.

U--Units. Units form the first horizontal "slab" of the model. They are regarded as basic in this category and the simplest way in which contents are organized. A Unit is a single item, one of a kind. One figure, one symbol, a

single word or idea, or a bit of behavior is a Unit (Meeker, 1974).

C--Classes. Classes are defined as recognized sets of items or information, grouped by virtue of common properties. A hierarchy of products may be inferred since each product subsumes the preceding product. For example, Classes follow Units and it can be assumed that any classification is made up of Units (Meeker, 1974).

R--Relations. Relations fall below classes as one reads down the SOI model. Relations are regarded as connections between items of information and based on variables or points of contact that apply to them. Relational connections are more meaningful and definable than implications. The individual is asked to process relations between the content involved--relations between figures, or between symbols as in deciphering a code, or relations between words or ideas (semantics) (Meeker, 1969; Meeker, 1974).

S--Systems. Systems may be composed of Figures, Symbols, or SeMantics. A system can be mathematical, where the individual must comprehend the idea of a sequence of operations necessary for a solution. Understanding the System of linguistics in sentence building (for example, diagramming sentences), involves understanding the structure of language and would represent a seMantic System. Systems are regarded as organized or structured aggregates of items

of information; complexes of interrelated or interacting parts (Meeker, 1974).

T--Transformations. Transformations are increasingly more abstract. They involve a modification of given information into other information; that is, transforming the original material into new information. This kind of ability may demand visual, auditory, abstract, or motor flexibility and has been found to characterize people who have been termed creative (Meeker, 1969; Meeker, 1974).

I--Implications. Implications are the final and most abstract in the product category. Teaching for Implications poses a challenge. It is often taken for granted that the student will see the Implications of what he/she has learned and will be able to generalize to unlike situations. The student who does this easily is fortunate, but the one who cannot needs to be shown or taught--needs help in progressing from one step in learning to the next--needs help in seeing cause and effect. Abilities involving Implications may be developed through the use of appropriate assignments (Meeker, 1974).

From the structure of intellect point of view, intelligence is defined as a systematic collection of abilities or functions for processing different kinds of information in various ways. Intelligence is thus concerned both with kinds of information and kinds of operations performed with information (Guilford, 1979).

Guilford (1959) states that the most fundamental implication of the SOI model for education is that it might cause transformations in our conception of the learner and of the process of learning. He states that under the prevailing conception, the learner is a kind of stimulus-response device, on the order of a vending machine. One puts in a coin and something comes out; the machine learns what reaction to put out when a certain coin is put in. However, if one thinks of the learner as an agent for dealing with information it provokes something more analogous to a computer. A computer is fed information; it stores that information; it uses that information for generating new information, either by way of divergent or convergent thinking; and it evaluates its own results (Guilford, 1959). This conception of the learner, according to Guilford (1959), leads to the idea that learning is discovery of information, not merely the formation of association in the form of stimulus-response connections.

The idea that education is a matter of training the intellect has been unpopular, especially when the emphasis has been upon the learning of specific skills (Guilford, 1959). Therefore, Guilford suggests that each intellectual factor of the SOI provides a particular goal at which to aim if education's general objective is to develop the intellects of students. The model provides a taxonomy of

mental functions, which reveals a number of imbalances in both education and the testing of intelligence (Guilford, 1979).

The initial research for the Structure of Intellect was based upon a population of young adults. Follow-up research by other investigators such as Ball, Brown, Carlson, Loeffler, McCartin, Meeker, Meyers, Orpet, Ridler, Sitkei, Stott, Tenopyr, Torrance, Watts, among others, has substantiated the original findings with subject populations ranging in age from two through fifteen years. It is this validation on school-age children which provides the general rationale for using the Structure of Intellect model in the area of primary and secondary education (Meeker, 1969).

In 1962 Mary Meeker analyzed the Stanford-Binet and Wechsler intelligence tests and constructed templates which related the test items to structure of intellect factors. As a school psychologist she sought to provide more detailed information regarding the intellectual resources of school children (Guilford, 1981). Meeker's application and adaptation of Guilford's Structure of Intellect (SOI) model to children and education resulted in the establishment of the SOI Institute for further research and development of materials and programs.

Meeker contends that education needs, but has never been based on, a formal theory of intelligence. If it is

assumed that the core of cognitive functioning is composed of intellectual abilities and that there are certain specific abilities which are a necessary part of a child's learning repertoire if he is to handle academic subject matter, then certain intellectual abilities must be fundamental to academia (Meeker, 1976).

Curriculum has never been organized according to a theory of human intellectual functioning (Meeker, 1969). The learning experience traditionally provided for children often is composed of scaled down adult experiences in curriculum instead of experiences which develop those intellectual abilities that are necessary components for the learning of skills in expected achievement (Meeker, 1976). The SOI theory of intelligence is offered by Meeker as the model upon which learning and curriculum should be established.

It is common to place less severe learning problem children together as "reading problems" and remedial measures are then taken, without diagnosing whether the child has the necessary intellectual skills to learn the subject matter. And the curriculum is not changed to include the teaching of intellectual abilities required for learning (Meeker, 1976).

It has been said that reading is complicated and it is. Reading is a higher level cognitive skill. Meeker (1976)

contends that teachers cannot continue to approach the remediation of reading problems with a simplistic breakdown of reading components. Educators who know SOI may say, "It is simple . . . when children fail reading, they should be taught the abilities required for reading" (Meeker, 1980). SOI assumes that intellectual abilities underlie the learning of academic content and with practice, intellectual abilities can be developed just like subject matter. Learning how to learn is considered the other side of literacy and concepts (Meeker, 1980).

Meeker (1969) states that education must not be content only with identifying those kinds of abilities students need for functioning intellectually; efforts should also focus on giving students experiences which will help them develop those abilities. It would seem that teaching the ability to learn should be considered as equally important a goal as is mastery of prescribed content. The objective then is to teach students how to learn (Meeker, 1969).

Although there have been some changes to strengthen and enrich the curriculum and some modifications to accelerate and streamline teaching techniques, there has been little fundamental effect on the learning process itself according to Meeker (1969). Education has been guided by theories of learning and methods of teaching but it has not been guided by a theory of intelligence. Thus, SOI is seen as important

to education in two respects: first, it provides a new perspective on education and second, it provides a means of making educational diagnoses and prescriptions (Meeker & Meeker, 1980).

Once it is accepted that intelligence is many different abilities and that it can be developed, then education may be viewed in a new light--it is then as much the responsibility of education to develop in intelligence as it is to transmit subject matter (Meeker & Meeker, 1980). It is recognized that education has never been so narrowly defined that it only sought the transmission of subject matter but that the development of general abilities has also always been a goal of formal education. However, Meeker and Guilford propose that with the use of the Structure of Intellect there is now a theory to guide the process, a map to guide education's efforts. SOI charts the intellectual territory but it does not supplant theories of learning or methods of teaching. The Structure of Intellect does not tell you <u>how</u> to teach, it tells you <u>where</u> to teach (Meeker & Meeker, 1980).

In education, reference to the "basics" generally pertains to subject matter--reading, writing, arithmetic. However, there is something more fundamental than these academic "basics" to SOI theorists and that is the intellectual abilities necessary to learn the basics. There

are identifiable Structure of Intellect abilities that are foundational for learning. Researchers have isolated 26 of the 96 SOI abilities which are critical for learning and contribute to successful school performance in reading, arithmetic, math, and creativity (Meeker, 1980).

Meeker (1980) says that children entering school should be given diagnostic tests to see whether they have the foundational abilities for learning and if they do not, these abilities must be developed before placement into failure situations. Curriculum should be used to develop these abilities to help reduce the failure in schools (Meeker, 1980). Utilizing the SOI approach these abilities can be assessed, identified and trained. Intellectual preparedness becomes a more fundamental "basic" than the academic basics (Meeker, 1980).

All children have intelligence; the SOI allows one to ask "what kind" not only "how much" (Meeker, 1974). And if it takes intelligence to do school work then base the curriculum on a theory of intelligence and add basic intellectual training to the core of basics.

According to Meeker (1980) to be prepared for the first grade curriculum it takes:

1. Comprehension abilities to learn . . . nine of them;
2. Memory abilities to learn . . . six of them;
3. Evaluation abilities to learn . . . four of them.

In Appendix A are listed the kinds of intellectual abilities identified in SOI which are necessary to be cognitively ready to learn to read. These six abilities (CFU, CFC, EFU, MSU, MSS) are considered preparatory for reading; they are not reading. The list also includes the thinking skills that are prerequisites for actual reading, arithmetic and math. The relationship between SOI abilities and learning skills, as well as the characteristics of learner behavior is presented in Appendix A.

A goal of cognitive therapy is the realization of a student's learning potential and this requires some measure of his/her abilities. The SOI Learning Abilities test (SOI-LA) was developed by Meeker (1975) to provide a differential measure of abilities. It assesses twenty-six of the abilities in the model which are considered critical for learning. A glossary of these factors is provided in Appendix A.

The SOI profile from an SOI-LA test is not the only way to obtain an individualized pattern of intelligence. Alternately, but considered less comprehensive, an SOI profile can be acquired by analyzing a standard intelligence test protocol such as the Stanford-Binet, Revised Wechsler Intelligence Scale for Children (WISC-R), Wechsler Adult Intelligence Scale (WAIS), Detroit Tests of Learning Aptitude or Slosson Intelligence Test, with SOI templates.

Analysis can then be made of test items and tasks prescribed for individual students utilizing these instruments.

Basically, the process outlined by Meeker involves assessment, which provides a profile of a student's pattern of strengths and weaknesses and from this data an individually prescribed educational program is developed. Each child then has a curriculum based on his/her intellectual pattern. Meeker has also developed Sourcebooks, Workbooks and other materials for training of the SOI learning abilities.

The Sourcebooks are based on the five major intellectual operations and include objectives, suggested activities and materials for training. Each prescribed task fits the definition of a factor in the Structure of Intellect considered necessary for learning. It is recommended that the activities be utilized by the class or individual twenty minutes a day, three times a week to increase abilities for learning and school performance (Meeker, 1979). Appendix A shows a format which utilizes an SOI ability and its relationship with a specified content area. All SOI skills are related to strengthening of learning and subject areas from preschool to adulthood.

Survey of Research

The effectiveness of the SOI approach has been supported in a variety of settings. Meeker (1981) and

Guilford (1981) report that Japan includes SOI training for students ages three through ten; the Japanese refer to it as "intelligence education." The Learned Society for Intelligence in that country has promoted the use of special exercises, each aimed at a particular SOI ability beginning in preschool years. The report is that children enjoy the exercises; they resemble games. One week may be devoted to each ability. Periodic tests are given in order to assess development. Marked gains in the abilities have been reported (Guilford, 1979).

The Governor of Nevada has committed every entering first grader to SOI testing. This is a result of the apparent success of a pilot program which prepared preschoolers so successfully in the SOI abilities for reading that after three months in the first grade the students were excelling beyond grade level (Meeker, 1980).

The SOI model has been shown to have implications for the learning disabled (Abroms & Meeker, 1980). It has also been applied to the development of Individualized Educational Programs (IEP) for handicapped students (Helbing & Rubenser, 1979). Using the Meeker profile and workbook series as a guide, it was noted that the classroom teacher may easily join in the expanding effort of meeting the needs of special students.

The study of Meeker's approach was also recommended to psychologists who frequently administer the WISC-R, even if they do not ascribe to Guilford's theory or Meeker's application of his theory (Kaufman, 1979). It was felt the SOI would be beneficial in providing a more comprehensive interpretation of WISC-R results and insight regarding SOI profiles to specific individualized curricula and educational programming.

Educators of the gifted have been among the first to recognize and apply SOI to their programs. Meeker (1980) attributes this to the idea that they tend to think in terms of positive intelligence, whereas other educators think in terms of categorical students in need of deficit education or in terms of achievement to grade level. Gallagher (1981), when asked in an interview to name "the most significant event in the field of gifted in the last ten or fifteen years," offered this response:

> I think I would focus on the development by J. P. Guilford of the Structure of Intellect model. . . . Mary Meeker used this model as a springboard for devising workbooks and teacher's guides for stimulating productive and creative thinking in gifted children. . . . The model has really formed one of the fundamental bases for the changes in instruction that has taken place in programs for gifted children. . . . Teaching children to be intelligent by teaching many kinds of SOI abilities lays the foundation for learning and for future discoveries. This must take priority.

The California State Department of Education (1977) utilized Guilford's Structure of Intellect model in preparing a Social Sciences Curriculum Guide for gifted children in grades one through three. Tuttle and Becker (1980) recommended the SOI model in their program design for gifted and talented students. They feel it offers a theoretical base from which to examine many aspects of intelligence not often included in most curricula. Karnes (1978) describes the use of an SOI-based classroom for gifted and talented handicapped children, ages three to five years. Bennett (1979) reports on an SOI Demonstration Center for the gifted which is based on Meeker's adaptation of the SOI model. Teachers work with students on an individual, prescriptive basis, with the students engaged in specific tasks identified for them through their student profile. Cunningham et al. (1978) report on the usefulness of the SOI-LA test in providing information for identifying gifted students.

Empirically based studies have attempted to document the effectiveness of SOI training in producing growth in specific learning abilities. Gore (1980; cited in Collected Readings) reported an effort to determine the effect of SOI training in improving learning abilities of junior high school students with both gifted and nongifted groups. The gifted groups received training in Memory and Divergent

Production for forty-five minutes per week for eight we... The nongifted groups received thirty minutes a week of training in all SOI operations. Pre- and posttesting utilized the SOI-LA test and the Ross Test of Higher Cognitive Processes. Although the students made positive gains the results were not statistically significant in showing an increase in intellectual abilities.

Jones' study (1980; cited in Collected Readings) supports the theory that SOI instruction does increase learning abilities. The program was conducted for nine months and included 365 gifted and nongifted students in grades two through six. The gifted experimental students received prescriptive SOI instruction based on their individual profiles while the nongifted experimental group received more generalized, limited SOI training; the control students received no SOI instruction. Although SOI-trained subjects improved significantly more than control students, the question of prescriptive instruction over generalized instruction was not answered.

The Walnut Valley Unified School District in California (1969; cited in Collected Readings) conducted a study with 169 gifted students in grades three through six to prove that creativity can be taught. The experimental group received 120 minutes per week training in Divergent Thinking skills from the SOI Sourcebook. The control group was given

the same amount of time and attention but were taught advanced subject matter. In every instance the experimental groups made significantly higher scores on the posttests.

Manning (1974; cited in Collected Readings) reported a study funded through ESEA Title III and state gifted monies which lasted from 1971-1974. It involved 490 gifted students in grades one through eight. The control group was given SOI training with an emphasis on Convergent Production, while the experimental group received training which emphasized Divergent Production. Pre- and postmeasures of experimental, control, and implementation groups on the Torrance Tests of Creative Thinking was taken at the beginning and end of three consecutive school years. Findings supported the hypothesis that creativity was significantly improved for experimental students in grades two through six; results were positive in grade seven, although not significant. Results were negative in the eighth grade where the control group displayed greater growth in creativity. The study did show that improvement in creativity can be achieved in regular classrooms.

A three year study was conducted by Owen (1982; cited in Collected Readings) as part of an ESEA Title IV-C project with 186 gifted students. Students received remediation training in SOI abilities where they were low and enrichment activities in areas where they were high. Each student's

program was designed to fit his or her own individual pattern of learning abilities. Results with these elementary school students showed that they made improvement in twenty-two of the twenty-six learning abilities of the SOI. This project has been adopted as an exemplary program for gifted by the Texas Department of Education.

Friedburg's study (1979; cited in Collected Readings) included 107 fourth grade students who received SOI training in Cognition and Memory. The students made significant improvement in all Cognition abilities except CMU. In more than half of the tests the gains were significant at the .001 level or better. Significant improvement was also made in all Memory abilities except MFU. Results indicated that SOI training can improve memory and cognition abilities.

The above mentioned studies suggest that it is possible through training to produce significant growth in the intellectual abilities necessary for learning. The following studies attempted to show a relationship between improved learning abilities and academic achievement.

Meeker (1969) reported on the results of a program for educationally handicapped students at the high school level where curriculum was developed for each student based on an individual SOI profile. The findings indicate that growth and improvement in measurable achievement tests did not show up the first year, but by the end of two years significant

gains were made. Students made from three to six years gains; most of them were either at grade level or comparable to the level of their classmates in regular classes.

Hays and Pereira (1972) conducted a two year longitudinal project with four classes of kindergarten students to determine if one cell, MFU-V, of the Structure of Intellect can be trained and if MFU-V has a significant effect on reading achievement. Results showed that both experimental and control groups improved significantly in letter and word memory scores, but only the experimental group showed improvement in reading scores.

Vice and Gonzales (1979; cited in Collected Readings) report a three year study to improve arithmetic achievement with forty educationally handicapped Mexican-American students in the third through fifth grades. The program was based on the SOI model and training focused on those SOI abilities especially related to arithmetic learning. Results demonstrated that arithmetic-related SOI abilities did improve as a result of training and was accompanied by improvement in arithmetic achievement. The experimental group gained twenty-two NCE points on the average in three years; the control group lost 10.62 points on the average during the same time period. The SOI-trained group exceeded the population average at the end of the study and the program was expanded throughout the school district.

A study by Tannir (1976; cited in Collected Readings) investigated the effect of an experimental Structure of Intellect symbolic memory program on the spelling performance of first grade children. The study was carried out for three months and involved eight first grade classes totaling 170 students. The experimental group received eighteen instructional lessons on symbolic memory; the control group had eighteen instructional lessons focusing on other SOI intellectual activities excluding symbolic memory. Statistical results showed that after treatment the experimental students scored significantly higher on the symbolic subsection of the SOI Learning Abilities Test but did not score significantly higher than control students in spelling achievement as measured by the California Achievement Test.

Meeker (1979) reported a study involving the Patterson Road School in Orcuff, California, with kindergarten through sixth grade students. The purpose of the project was to investigate whether average children would learn math better and faster if given SOI training. After the first year, kindergarten students rose from the fiftieth percentile on the arithmetic portion of the Stanford Achievement Test to the eighty-seventh percentile; after the second year, second through sixth graders improved from the fiftieth percentile to eighty-fifth percentile on the SAT.

A study reported by Jones (1982; cited in Collected Readings) sought to determine if training gifted second through sixth graders in specific learning abilities leads to improvement in school achievement in reading and math. The thirty-six students received SOI training from September through March of one school year. Results showed that students who received training in only those abilities which were thought to be necessary for performance in arithmetic improved in arithmetic achievement and those students who received training in SOI-related reading abilities improved in reading achievement on state achievement tests.

Tracy and Baer (1979) did a study correlating intellectual abilities with successful vocational training and placement of licensed practical nurses using the SOI assessment procedure. Based on their findings the researchers infer that the SOI is most useful in screening individuals into training programs and in providing direction to remediate deficiencies and maximize strengths based on their intellectual profile. It was not possible from this limited study to determine the efficiency of the SOI in predicting job performance.

Summary

The SOI is a model of 120 intellectual abilities, developed by Guilford (1959), of which 24 have been

identified by Meeker as critical for learning. Meeker's extension of the SOI is an attempt to interpret a complex psychological model of intelligence for use within the existing framework of school curriculum. A direction is offered for planning curriculum so that individual and group strengths and deficits can be discovered and taught with materials familiar to the teacher. The basic contention is that curriculum should be rooted in a theory of intellectual functioning, the model being Guilford's Structure of Intellect. The SOI approach proposes training the many intellectual abilities students need for the learning of academic subject matter. Meeker believes "teaching the ability to learn" should be considered equally important a goal as is mastery of prescribed content.

The following statements by Meeker (1980) are shared in conclusion:

> Let's pioneer now in education. It has been said that when educators don't know what to do they go backwards--back to basics. Let's build on basics and add human intelligence training as preparation for living. Remember: all "basics" begin with Basic Intellectual Abilities.
>
> By teaching the BASICS to the "Basics"--learning abilities--we can more fully develop the thinking abilities necessary for learning and create successful students prepared for more learning, for literacy or for success in learning a job.

CHAPTER III

METHOD

Background Information

The study was conducted in a city school system in a southeastern Tennessee town of approximately 27,000 people and in a county of approximately 70,300 whose livelihood resides with diversified industry. The approximately 4,400 students attend six elementary schools which house kindergarten through grade six who feed into one junior high, grades seven and eight, who continue to one high school. Approximately 290 certified personnel are employed.

Students in two of the elementary schools comprise the sample. The control school has twenty-four teachers and 380 students in kindergarten through grade six. The experimental school has twenty-one teachers and 308 students.

Both schools have students from low socioeconomic backgrounds. The control school has 66.00% students from low income families, based on data for free and reduced lunches, as determined for eligibility for participating in the Chapter I reading program. The experimental school has 78.57% students from low income families utilizing the same data.

Traditionally, students from both schools are transient and experience retention as a remedy for lack of academic

progress. In the 1982-83 school year, 5.7% of the first grade students and 35.3% of the second grade students in the control school had been retained at least once; 33.3% of first graders and 6.62% of the second graders in the experimental school had been retained.

To demonstrate comparability between the control and experimental schools information regarding test scores is presented in Appendix B. Tables B-1 and B-2 report the results of the Metropolitan Readiness Test (MRT) for 1981 and 1982, which is administered to all first grade students the second week of school.

Students in the second grade take the Metropolitan Achievement Test, form JS, during the Fall norming dates. Results for the school system, control and experimental schools, for 1981 and 1982 are presented in Tables B-3 and B-4 (Appendix B).

Sample

In the experimental school, sixty-six first grade students were assigned to one of two regular first grade classrooms or to a readiness or pre-first-grade classroom at the beginning of the school year. Readiness students were identified through testing as lacking the prerequisite skills to benefit from regular first grade curriculum. Forty-two students were assigned to two second grade

classrooms. One-half of the students in each of the first and second grade classrooms were randomly assigned, utilizing the Table of Random Numbers, to participate in SOI training. The remaining half of the students participated in language experience activities.

There was a total of fifty-four students in the SOI group; this included thirty-three first grade students and twenty-one second grade students. The sample was composed of twenty-four girls and thirty boys. The language experience group contained fifty-three students; there were thirty-three students in the first grade and twenty in the second grade. The sample included twenty-four girls and twenty-nine boys.

First and second grade students in a comparable school served as a control group. This included fifty-seven first graders and fifty-three second graders for a total of 110 students.

Procedures

Students in the SOI group received SOI training three times per week on Tuesday, Wednesday, and Thursday in thirty-minute sessions, for a total of one and one-half hours per week. The students in the language experience group participated in a variety of language related activities during the same time periods. Samples of the SOI

exercises and language activities are presented in Appendix C. No intervention strategies were implemented in the instructional program in the control school.

The training program began on September 29, 1982 and was concluded on February 10, 1983, for a total of eighteen weeks. All training sessions were conducted by regular classroom teachers.

The SOI Process and Diagnostic Test was administered as a pretest to all first and second grade students in the experimental school in May, 1982 and as a posttest the week of February 21, 1983. The Metropolitan Readiness Test (MRT) was used as a pretest to assist in demonstrating comparability between first and second grade students in the control and experimental schools. It was administered the second week of school. The Metropolitan Achievement Test (MAT), form KS, primer level, was administered as a posttest to readiness first grade students in March of 1983. The Metropolitan Achievement Test, form KS, primary I level, was administered to all regular first grade students in the control and experimental schools in March, 1983. The Metropolitan Achievement Test, form JS, primary I level, was administered as a pretest to all second grade students in the control and experimental schools in October, 1983. All second grade students in both schools were administered the Metropolitan Achievement Test, form KS, primary II level, as

a posttest in March, 1983. A schedule of testing is reported in Table 1.

Table 1

Schedule of Testing

	Pretest	Posttest
	Experimental group	
First grade	SOI test MRT	SOI test MAT, form KS
Second grade	SOI test MAT, form JS	SOI test MAT, form KS
	Control group	
First grade	MRT	MAT, form KS
Second grade	MAT, form JS	MAT, form KS

Appropriate in-service training and other assistance to the teachers were provided by the school psychologist (the researcher) and the supervisor of instruction. They maintained ongoing contact with the teachers in the planning of the training activities and to provide the necessary materials.

All materials used with the experimental groups were developed by Mary Meeker at the SOI Institute in California. The readiness first grade SOI group used the following materials: How the Alphabet Doubled textbook, How the Alphabet Doubled student workbook, SOI Read Aloud Baby Book.

The regular first grade experimental group used the SOI Readiness Workbook, four activities from the Basic SOI Cognition Sourcebook, and one exercise from the Basic SOI Memory Sourcebook. The second grade experimental group utilized the SOI Figural-Symbolic-Semantic Memory kit and exercises from the Basic SOI Cognition Sourcebook.

Instrumentation

Students were pretested and posttested with the SOI Process and Diagnostic Test and the Metropolitan Readiness and Achievement Tests. The SOI Process and Diagnostic Test is designed for students in kindergarten through third grade and was utilized to provide a measure of the development of learning abilities. The Metropolitan Readiness Test, form J, was administered to all first grade students to establish comparability of the experimental and control groups. The Metropolitan Achievement Tests were used as a pre- and posttest measure to obtain levels of the students' academic performance in reading, mathematics, language, and basic battery.

Metropolitan Readiness Test

The 1976 edition of the Metropolitan Readiness Test (MRT) was designed to provide information having maximum relevance for early childhood education. It was developed to

provide measures of some important prereading and mathematics skills that are emphasized in kindergarten and grade one instructional programs. The MRT, level II, yields scores in two areas--the prereading composite which includes auditory, visual, and language skills, and the quantitative area (Nurss & McGauvran, 1976). It is widely used with first grade students and generally administered during the first month of school.

Metropolitan Achievement Test

The 1978 edition of the Metropolitan Achievement Test (MAT) has been developed to provide accurate and dependable data concerning the achievement of pupils in important skills and content areas of the school curriculum. The Basic Survey Battery, which was utilized for this study, yields scores in Reading, Mathematics, Language, and Total Basic Battery. Scaled scores are converted from the raw score to provide a grade equivalent, percentile rank, and stanine for the three content areas and total basic battery.

Both forms of the test were empirically normed twice during the school year, in October, 1977 and April, 1978. Most (70%) of the school systems involved in the standardization tested in both fall and spring and included 550,000 pupils in the standardization programs for all components of the series (Prescott et al., 1978).

SOI Process and Diagnostic Test

The SOI Learning Abilities Test (SOI-LA) was developed in 1975. The test design was drawn from J. P. Guilford's The Nature of Human Intelligence and from technical reports issued by Guilford and others at the Psychological Laboratory at the University of Southern California.

The SOI-LA test incorporates twenty-four Structure of Intellect subtests selected from the complete model of ninety identified abilities for their established relationship to school learning, particularly reading, arithmetic, writing, and creativity.

The Process and Diagnostic Test, first produced in 1980, is a variant of the SOI-LA and has been scaled down so that it is appropriate for the youngest students. Some of the subtests have been revised and the format has been enlarged to accommodate young students.

The norming for the Process and Diagnostic Test took place in Florida, Indiana, Oklahoma, Pennsylvania, Texas, and Washington; the test was administered in October and November, 1982. The test was normed kindergarten through grade three and utilized a test/retest procedure. The means, standard deviations, and percentile scores represent the initial test administration (Technical Data Manual, 1982).

The tests which comprise the Processing portion assess six learning acquisition abilities in the Basic SOI Test which indicate whether the student is processing information well enough to be prepared for learning in school. The Processing abilities are:

CFU - Visual closure (reading).

CFC - Visual conceptualization (reading).

CMU - Vocabulary of math and verbal concepts.

MSU - Auditory attending (arithmetic).

NFU - Psycho-motor readiness (writing).

MFU - Visual memory for details (reading).

The five tests included in the Diagnostic section indicate whether learning abilities necessary for, and underlying learning curriculum, are established or even developed to a gifted level. If students process well, but have not developed these prerequisite school learning abilities, they may fail to learn in school for lack of cognitive experiences. The Diagnostic abilities are:

CMR - Comprehension of verbal relations (reading).

CMS - Ability to comprehend extended verbal information (reading).

EFU - Visual discrimination (reading).

NST - Symbol pattern discrimination (reading).

CSS - Comprehension of numerical progressions (arithmetic).

An individual strength-weakness profile can be developed for each student. The profile and procedure for obtaining it, along with the method for producing a level-of-performance, can be found in Appendix C.

Analysis of Data

The first and second grade SOI and language experience groups in the experimental school were formed by random assignment. The first and second graders in a nearby elementary school with a comparable student population served as a control group. The three groups formed for this study are designated as follows: Group I represented the students who received SOI training; Group II was composed of students who were provided with language experience activities; and Group III served as the control, as these students received the regular curriculum with no treatment.

As previously stated, all first and second grade students in the experimental school received pre- and posttesting with the SOI Process and Diagnostic Test. Pre- and posttesting with the Metropolitan Achievement Test was obtained also on all second grade students in the experimental and control schools. The analysis of covariance (ANCOVA) was the statistical procedure applied to the pre- and posttest data obtained from the SOI and MAT. Covariance is a form of the analysis of variance (ANOVA) and is a

statistical, rather than experimental, method that can be used to equate groups on one or more variables. It is based on the assumption that subjects have been randomly assigned to treatment groups. ANCOVA is used in two major ways, as a technique for controlling extraneous variables and as a means of increasing power (Gay, 1981). For purposes of this study, ANCOVA was used to adjust posttest scores for initial differences on the pretest performance of the SOI and MAT, and to compare adjusted scores to determine the effectiveness of the treatment. For any of the means which showed significance at the .05 level, the Pairwise t Test was the multiple comparison procedure utilized with the ANCOVA data. This contrast among the group means served to detect where the difference existed.

There were no pretest achievement scores for the first grade students because the Metropolitan Readiness Test is not equivalent to and does not assess the same variables as the Metropolitan Achievement Test. The MRT is the designated test to be given to beginning first grade students and provides information regarding readiness for acquiring academic skills. The raw score data places students' scores in three categories, Low (L), Average (A), and High (H). Thus, no correlation between the MRT and MAT could be obtained for pre- and posttest data analysis.

The one way analysis of variance was the statistical technique utilized with the three first grade groups on the posttest MAT scores. It is based on the assumption that groups have been randomly formed. ANOVA is used to determine whether there is a significant difference between two or more means at a selected probability level. The concept underlying ANOVA is that the total variance of scores can be attributed to two sources--variance between groups (caused by the treatment) and variance within groups (error variance). At the end of the study and the treatment has been administered, it is determined whether the between groups variance differs from the within groups variance by more than would be expected by chance (Gay, 1981). When the F ratio was significant, two multiple comparison techniques were used to determine which group means were significantly different from the others. The Scheffe' and the Tukey HSD (honestly significant differences) procedures were applied to the ANOVA data. The Scheffe' method is generally considered more rigorous than other multiple comparison procedures with regard to Type I error and may reveal fewer significant results (Ferguson, 1981). Since the Tukey is not as conservative a test as the Scheffe', it was also utilized to test for significant mean differences.

The first grade results were computed to include and exclude the readiness first grade students' scores. As has

been previously mentioned, these students in the readiness class were identified as lacking the prerequisite academic skills necessary for a regular first grade program, by virtue of low test scores. When the scores from the class were included in the data analysis they tended to lower the results in Group I and Group II. Thus, the readiness class has been treated as a subgroup of the first grade population. The data for the SOI and the MAT has been analyzed two ways; first as a total first grade sample of 115 students and secondly, as a sample of regular first graders (without the readiness group) totaling 98 students.

CHAPTER IV

RESULTS

The analysis of data results will be presented with the two hypotheses and will be discussed by grade and testing instrument.

Hypothesis: There will be no significant difference in learning abilities between primary grade students who receive Structure of Intellect training and those who do not receive the training.

The SOI Process and Diagnostic Test was the instrument utilized to assess student learning abilities. The analysis of covariance (ANCOVA) was the statistical technique applied to the SOI scores for both the first and second grades.

The first hypothesis was not rejected because results from the first and second grade students on the SOI test did not reveal significant differences in learning abilities between students who received SOI training and those who did not receive the training. The first grade students who received SOI training did show gain significant at the .05 level in memory for visual details (MFU).

First Grade SOI. The ANCOVA results on the total first grade population ($N = 115$) and without the scores of the readiness first grade subgroup ($N = 98$) are reported in Tables 2 and 3. The MFU (Memory of Figural Units) subtest was significant at the .05 level.

Table 2

Analysis of Covariance for First Grade SOI Process and Diagnostic Test (N = 115)

Subtest	df	Sum of squares	Mean squares	F value
CFU	1	121.29	2105.76	.84
CFC	1	12.11	205.32	.08
CMU	1	6.92	126.71	.09
MSU	1	187.10	215.78	.42
NFU	1	9.17	325.54	.04
MFU	1	2695.04	3652.26	5.35*

*Significant at the .05 level.

Table 3

Analysis of Covariance for First Grade SOI Process and Diagnostic Test (N = 98)

Subtest	df	Sum of squares	Mean squares	F value
CFU	1	11.62	1595.10	.09
CFC	1	82.72	97.47	.62
CMU	1	19.31	191.16	.38
MSU	1	.01	23.08	.00
NFU	1	93.85	123.43	.36
MFU	1	2390.54	2070.14	5.04*

*Significant at the .05 level.

The Pairwise t Test, which compared the means between Group I and Group II, located the significance for the MFU subtest as Group I. This suggests that SOI training (Group I) did increase the students' visual memory for details, which is considered an SOI enabling skill for reading. The least squares means and comparisons are presented in Tables 4 and 5. The sample of fifty eight students represents all first grade students in the experimental school, while the sample of forty one includes all regular first grade students without the readiness subgroup.

Total group means and standard deviations for the SOI test are recorded in Table 6. The pre- and posttest means and standard deviations are presented by group in Tables 7 and 8. Both groups appear to have improved in learning abilities but the standard deviations suggest variability within several of the subtests.

Second Grade SOI. The second grade results are based on a sample of thirty seven students; twenty students in Group I and seventeen students in Group II. The ANCOVA results with the SOI test are reported in Table 9. None of the eleven subtests reached significance at the .05 level. The adjusted or least squares means for the two groups are recorded in Table 10.

The total group means and standard deviations on pre- and posttest scores are presented in Table 11. The lowest

Table 4

Least Squares Means and Group Comparisons for First Grade SOI Process and Diagnostic Test
(N = 58)

Subtest	Group I (SOI)	Group II (Lang.)	Probability LSMEAN 1 = LSMEAN 2
CFU	32.79	29.83	.3629
CFC	48.22	47.30	.7844
CMU	53.76	54.47	.7694
MSU	57.18	53.41	.5188
NFU	34.83	34.02	.8431
MFU	57.92	43.98	.0245*

*Significant at the .05 level.

Table 5

Least Squares Means and Group Comparisons for First Grade SOI Process and Diagnostic Test
(N = 41)

Subtest	Group I (SOI)	Group II (Lang.)	Probability LSMEAN 1 = LSMEAN 2
CFU	34.83	33.74	.7711
CFC	51.44	48.58	.4341
CMU	56.57	55.17	.5394
MSU	59.36	59.33	.9962
NFU	39.62	36.55	.5527
MFU	64.30	48.76	.0306*

*Significant at the .05 level.

Table 6

Means and Standard Deviations of Total Group for First Grade SOI Process and Diagnostic Test

Subtest	(N = 58) Mean	SD	(N = 41) Mean	SD
CFU	31.78	12.00	34.27	11.63
CFC	47.75	12.65	49.97	11.51
CMU	54.12	8.93	55.83	7.09
MSU	55.26	21.06	59.34	19.46
NFU	34.42	15.22	38.05	16.17
MFU	50.82	22.44	56.34	21.77

Table 7

Pre- and Posttest Means and Standard Deviations by Group for First Grade SOI Process and Diagnostic Test (N = 58)

	Group I (SOI)				Group II (Language)			
	Pretest		Posttest		Pretest		Posttest	
Subtest	M	SD	M	SD	M	SD	M	SD
CFU	23.61	11.73	34.25	15.68	20.03	8.56	28.80	13.12
CFC	32.79	15.04	48.39	13.82	31.03	13.02	46.97	11.61
CMU	43.21	7.36	53.39	9.82	46.38	9.99	54.67	8.19
MSU	46.18	17.30	57.61	17.00	38.45	17.91	51.23	25.59
NFU	24.14	17.36	35.36	14.03	19.76	10.06	33.10	16.56
MFU	33.04	23.09	59.21	16.21	24.72	28.05	42.40	28.54

Table 8

Pre- and Posttest Means and Standard Deviations by Group for First Grade SOI Process and Diagnostic Test (N = 41)

	Group I (SOI)				Group II (Language)			
	Pretest		Posttest		Pretest		Posttest	
Subtest	M	SD	M	SD	M	SD	M	SD
CFU	26.40	11.18	36.65	16.40	22.52	7.56	32.00	12.25
CFC	37.55	13.89	51.60	10.30	34.95	11.44	48.43	12.46
CMU	45.00	6.49	56.00	5.98	47.86	9.30	55.71	8.98
MSU	50.50	16.77	59.75	16.74	40.95	17.12	58.95	21.34
NFU	26.60	19.96	39.90	13.84	21.57	9.98	36.29	17.91
MFU	38.60	24.08	65.25	9.39	28.90	29.41	47.86	29.48

Table 9

Analysis of Covariance for Second Grade SOI Process and Diagnostic Test

Subtest	df	Sum of squares	Mean squares	F value
CFU	1	92.89	943.85	.58
CFC	1	288.18	272.98	1.77
CMU	1	4.21	216.91	.07
MSU	1	101.40	268.18	.46
NFU	1	261.67	354.21	.70
MFU	1	68.93	345.82	.20
CMR	1	137.46	293.36	1.55
CMS	1	300.93	1931.92	1.40
CSS	1	330.55	1207.27	.75
NST	1	259.77	1938.04	1.44
EFU	1	126.58	438.65	1.05

Table 10

Least Squares Means for Second Grade SOI Process and Diagnostic Test

Subtest	Group I (SOI)	Group II (Language)
CFU	40.42	43.66
CFC	57.70	51.88
CMU	61.47	60.78
MSU	70.65	67.25
NFU	42.41	48.05
MFU	62.79	59.89
CMR	68.40	64.12
CMS	57.05	62.88
CSS	41.80	35.48
NST	48.37	42.83
EFU	61.13	65.04

Table 11

Pre- and Posttest Means and Standard Deviations of Total Group for Second Grade SOI Process and Diagnostic Test

Subtest	Pretest		Posttest	
	Mean	SD	Mean	SD
CFU	29.31	13.55	41.86	14.34
CFC	48.36	14.23	55.11	13.01
CMU	52.22	6.37	61.17	8.41
MSU	54.36	17.14	69.14	14.88
NFU	33.31	14.19	44.92	19.36
MFU	33.31	14.19	61.50	18.52
CMR	56.69	10.41	66.50	10.02
CMS	36.72	12.16	59.64	17.68
EFU	56.79	11.36	64.00	12.41
NST	20.21	9.42	45.39	16.54

subtest mean on the pretest data was 20.21, while the lowest subtest mean from the posttest scores was 41.86. Table 12 shows the pre- and posttest means and standard deviations by group. The mean scores indicate gains in learning abilities were made but considerable subtest variability is suggested by the standard deviations.

Hypothesis: There will be no significant difference in academic achievement between primary grade students who receive Structure of Intellect training and those who do not receive the training.

The Metropolitan Achievement Test (MAT) was the instrument utilized to assess academic achievement with first and second grade students. The analysis of variance (ANOVA) was the statistical procedure applied to the post-test scores of the first grade students and the analysis of covariance (ANCOVA) was applied to the pre- and posttest scores of the second grade students.

The second hypothesis was not rejected when the scores of regular first grade students were used to obtain achievement results. There was no significance at the .05 level in academic achievement among the three groups. The treatment administered in Group I and Group II did not produce significant differences in achievement.

The second hypothesis was not rejected when scores of second grade students in reading achievement did not obtain

Table 12

Pre- and Posttest Means and Standard Deviations by Group for Second Grade SOI Process and Diagnostic Test

	Group I (SOI)				Group II (Language)			
	Pretest		Posttest		Pretest		Posttest	
Subtest	M	SD	M	SD	M	SD	M	SD
CFU	28.40	11.50	39.95	16.35	30.44	16.08	44.25	11.42
CFC	45.80	15.21	57.10	10.32	51.56	12.64	52.63	15.75
CMU	52.0	5.71	61.35	7.65	52.50	7.30	60.94	9.53
MSU	52.75	16.25	70.35	12.29	56.38	18.51	67.69	17.93
NFU	36.70	16.52	43.45	16.07	29.06	9.50	46.75	23.26
MFU	36.70	16.52	63.70	15.63	29.06	9.50	58.75	21.82
CMR	53.05	8.97	66.85	7.51	61.25	10.54	66.02	12.76
CMS	36.05	11.67	56.50	15.70	37.56	13.07	63.56	19.64
EFU	55.33	8.19	62.65	11.29	58.44	14.22	65.69	13.86
NST	20.22	8.38	47.45	15.95	20.19	10.74	42.81	17.41
CSS	15.28	15.62	41.0	19.31	19.94	15.67	36.81	25.75

significance at the .05 level. Results indicated the three groups were generally equivalent in reading performance.

The second hypothesis was rejected when scores of second grade students in math, language, and total basic battery established significance at the .05 level for Group III. The achievement gains by students in the regular program who received no treatment (Group III) were statistically significant in comparison to those students who received treatment and the regular program. There was no significant difference in achievement between the SOI students (Group I) and language experience students (Group II) in the experimental school.

First Grade MAT. The first grade results were based on a total group sample of 115 students (including the readiness class): Group I had twenty nine students, Group II contained thirty one students, and Group III had fifty five students. The sample without the readiness subgroup was ninety eight students: twenty one students in Group I and twenty two students in Group II.

The ANOVA results of the total first grade population are presented in Table 13. There was significance at the .05 level in the area of reading; this includes the reading grade equivalent, percentile rank, and stanine. Table 14 shows the ANOVA data without the scores of the readiness first grade class. There was no significant difference in

Table 13

Analysis of Variance for First Grade Metropolitan Achievement Test
(N = 115)

Subtest	df	Sum of squares	Mean squares	F value
Reading				
Grade equivalent	2	1.85	.92	4.53*
Percentile	2	5493.50	2746.75	4.64*
Stanine	2	26.07	13.03	5.23*
Math				
Grade equivalent	2	.28	.14	.25
Percentile	2	230.79	115.40	.19
Stanine	2	.68	.34	.13
Language				
Grade equivalent	2	.28	.14	.19
Percentile	2	3944.38	1972.19	2.72
Stanine	2	15.17	7.59	2.38
Total				
Grade equivalent	2	.52	.26	1.07
Percentile	2	2027.65	1013.82	1.49
Stanine	2	12.97	6.49	2.32

*Significant at the .05 level.

Table 14

Analysis of Variance for First Grade Metropolitan Achievement Test (N = 98)

Subtest	df	Sum of squares	Mean squares	F value
Reading				
Grade equivalent	2	.67	.34	1.56
Percentile	2	1838.57	919.29	1.50
Stanine	2	11.45	5.73	2.24
Math				
Grade equivalent	2	1.81	.91	1.61
Percentile	2	1243.76	621.88	1.06
Stanine	2	7.64	3.82	1.48
Language				
Grade equivalent	2	.77	.39	.51
Percentile	2	602.23	301.12	.45
Stanine	2	1.24	.62	.21
Total				
Grade equivalent	2	.01	.00	.01
Percentile	2	103.27	51.64	.08
Stanine	2	.64	.32	.13

*Significant at the .05 level.

reading achievement when scores for students in the regular first grade were used.

When the Scheffe' multiple comparison procedure was applied to the total first grade population, there was a critical difference in the reading stanine score for Group III. The Tukey comparison technique established significance at the .05 level for Group III in reading grade equivalent, percentile rank, and stanine (Table 15). When the Scheffe' and Tukey methods were applied to the scores of the regular first grade students, which did not include the readiness subgroup, no significance was established for any group mean in reading.

The mean and standard deviation for each academic area of the MAT are presented with and without the readiness class in Table 16. The means and standard deviations are displayed by group and population in Tables 17 and 18. These results reflect the difference the readiness class scores made in Group I and Group II.

Second Grade MAT. The second grade results were based on a total sample of eighty students: Group I had twenty students, Group II included seventeen students, and Group III contained forty-three students.

The data obtained from the ANCOVA procedure are presented in Table 19. There was significance at the .01 level in the math grade equivalent, percentile, and stanine

Table 15

Tukey's Multiple Comparison Test for First Grade Metropolitan Achievement Test--Reading ($\underline{N}$ = 98)**

Group	Means	I	II	III
	Grade equivalent			
I (SOI)	1.47	-	-	-
II (Language)	1.47	-	-	-
III (Control)	1.73	*	*	-
	Percentile			
I (SOI)	32.97	-	-	-
II (Language)	33.55	-	-	-
III (Control)	47.00	*	*	-
	Stanine			
I (SOI)	3.83	-	-	-
II (Language)	3.90	-	-	-
III (Control)	4.82	*	*	-

*Significant at the .05 level.

**When $\underline{N}$ = 98 Tukey's showed no significant difference among group means.

Table 16

Means and Standard Deviations for First Grade Metropolitan Achievement Test

Subtest	(N = 115) Mean	SD	(N = 98) Mean	SD
Reading				
Grade equivalent	1.59	.45	1.65	.46
Percentile	39.78	24.34	43.30	24.74
Stanine	4.32	1.58	4.53	1.60
Math				
Grade equivalent	1.45	.76	1.52	.75
Percentile	36.13	24.28	38.76	24.17
Stanine	4.17	1.61	4.32	1.61
Language				
Grade equivalent	1.38	.87	1.42	.87
Percentile	46.51	26.91	42.58	25.74
Stanine	4.74	1.79	4.48	1.72
Total				
Grade equivalent	1.44	.49	1.51	.50
Percentile	44.24	26.07	39.76	24.79
Stanine	4.60	1.67	4.31	1.58

Table 17

Means and Standard Deviations by Group for First Grade Metropolitan Achievement Test
(N = 115)

Subtest	Group I (SOI)		Group II (Language)		Group III (Control)	
	Mean	SD	Mean	SD	Mean	SD
Reading						
Grade equivalent	1.47	.40	1.47	.38	1.73	.51
Percentile	32.97	24.81	33.35	23.71	47.00	24.44
Stanine	3.83	1.63	3.90	1.51	4.82	1.59
Math						
Grade equivalent	1.53	.67	1.46	.66	1.41	.84
Percentile	37.83	21.74	33.90	23.45	35.76	26.23
Stanine	4.28	1.49	4.19	1.49	4.09	1.72
Language						
Grade equivalent	1.46	.55	1.35	1.05	1.35	.89
Percantile	54.00	26.53	50.03	29.00	40.58	25.88
Stanine	5.24	1.68	4.03	1.99	4.38	1.72
Total						
Grade equivalent	1.41	.40	1.35	.47	1.51	.55
Percantile	49.38	27.73	47.06	24.01	39.95	26.27
Stanine	5.00	1.79	4.84	1.46	4.25	1.71

Table 18

Means and Standard Deviations by Group for First Grade Metropolitan Achievement Test
(N = 98)

Subtest	Group I (SOI)		Group II (Language)		Group III (Control)	
	Mean	SD	Mean	SD	Mean	SD
Reading						
Grade equivalent	1.53	.43	1.59	.36	1.73	.51
Percentile	38.86	26.66	40.18	23.59	47.00	24.44
Stanine	4.00	1.73	4.32	1.49	4.82	1.59
Math						
Grade equivalent	1.60	.69	1.73	.53	1.41	.84
Percentile	40.86	21.76	42.41	22.29	35.76	26.23
Stanine	4.43	1.57	4.77	1.31	4.09	1.72
Language						
Grade equivalent	1.46	.58	1.56	1.04	1.35	.89
Percantile	43.57	21.89	46.64	28.63	40.58	25.88
Stanine	4.57	1.33	4.64	2.04	4.38	1.72
Total						
Grade equivalent	1.50	.42	1.52	.42	1.51	.55
Percantile	38.00	22.65	41.05	22.73	39.95	26.27
Stanine	4.29	1.45	4.45	1.34	4.25	1.71

Table 19

Analysis of Covariance for Second Grade Metropolitan Achievement Test (N = 80)

Subtest	df	Sum of squares	Mean squares	F value
Reading				
Grade equivalen	2	.48	20.67	.23
Percentile	2	1675.59	6485.70	2.40
Stanine	2	8.27	27.61	2.21
Math				
Grade equivalent	2	6.04	13.09	7.49*
Percentile	2	3145.69	6470.22	7.04*
Stanine	2	17.85	28.12	11.37*
Language				
Grade equivalent	2	4.05	21.19	3.29**
Percentile	2	2527.56	7097.61	5.44*
Stanine	2	12.46	30.06	5.85*
Total				
Grade equivalent	2	2.22	14.92	3.17**
Percentile	2	2720.72	7163.25	7.16*
Stanine	2	17.94	32.42	9.68*

*Significant at the .01 level.

**Significant at the .05 level.

scores and the language and total battery percentile and stanine scores. The language and total battery grade equivalent findings reached significance at the .05 level.

The Pairwise t Test was utilized to compare the means and determine the location of the significant difference among the group scores. Tables 20, 21, 22, and 23 present the least squares means and the relationship of the three groups when compared to one another. These results indicate that Group III (control) established significance in math achievement at the .01 level when compared to Group II (language experience) on the language and total battery percentile and stanine mean scores. Significance in achievement at the .05 level was obtained over the SOI group in math, language, and total battery results.

The total group achievement means and standard deviations are reported in Table 24 on pre- and posttest scores. This same information is presented by group in Tables 25, 26, and 27. All three groups showed gains in each academic area.

Table 20

Pairwise t-Test of Least Squares Means for Second Grade Metropolitan Achievement Test--Reading

Group	Means	I	II	III
	Grade equivalent			
I (SOI)	3.03	--	.6000	.9380
II (Language)	2.85	.6000	--	.5156
III (Control)	3.05	.9380	.5156	--
	Percentile			
I (SOI)	46.77	--	.1481	.5413
II (Language)	37.71	.1481	--	.0322*
III (Control)	49.99	.5413	.0322*	--
	Stanine			
I (SOI)	4.85	--	.1767	.5234
II (Language)	4.23	.1767	--	.0390*
III (Control)	5.10	.0523	.0390*	--

*Significant at the .05 level.

Table 21

Pairwise t-Test of Least Squares Means for Second Grade Metropolitan Achievement Test--Math

Group	Means	I	II	III
	Grade equivalent			
I (SOI)	2.66	--	.6960	.0012*
II (Language)	2.75	.6960	--	.0074*
III (Control)	3.25	.0012*	.0074*	--
	Percentile			
I (SOI)	44.74	--	.5050	.0104*
II (Language)	41.33	.5050	--	.0015*
III (Control)	55.57	.0104*	.0015*	--
	Stanine			
I (SOI)	4.69	--	.3586	.0016*
II (Language)	4.41	.3586	--	.0001*
III (Control)	5.49	.0016*	.0001*	--

*Significant at the .01 level.

Table 22

Pairwise t-Test of Least Squares Means for Second Grade Metropolitan Achievement Test--Language

Group	Means	I	II	III
	Grade equivalent			
I (SOI)	2.57	--	.9074	.0448**
II (Language)	2.54	.9074	--	.0412**
III (Control)	3.01	.0448**	.0412**	--
	Percentile			
I (SOI)	43.18	--	.3075	.0497**
II (Language)	37.96	.3075	--	.0028*
III (Control)	51.49	.0497**	.0028*	--
	Stanine			
I (SOI)	4.62	--	.4140	.0265**
II (Language)	5.33	.4140	--	.0027*
III (Control)	5.26	.0265**	.0027*	--

*Significant at the .01 level.

**Significant at the .05 level.

Table 23

Pairwise t-Test of Least Squares Means for Second Grade Metropolitan Achievement Test--Total Battery

Group	Means	I	II	III
	Grade equivalent			
I (SOI)	2.67	--	.8287	.0522
II (Language)	2.63	.8287	--	.0385**
III (Control)	2.99	.0522	.0385**	--
	Percentile			
I (SOI)	44.74	--	.1662	.0340**
II (Language)	38.38	.1662	--	.0005*
III (Control)	52.88	.0340**	.0005*	--
	Stanine			
I (SOI)	4.69	--	.1067	.0145**
II (Language)	4.18	.1067	--	.0001*
III (Control)	5.35	.0145**	.0001*	--

*Significant at the .01 level.

**Significant at the .05 level.

Table 24

Pre- and Posttest Means and Standard Deviations of Total Group for Second Grade Metropolitan Achievement Test

Subtest	Pretest		Posttest	
	Mean	SD	Mean	SD
Reading				
Grade equivalent	1.99	1.11	3.01	1.51
Percentile	33.78	28.06	46.58	27.16
Stanine	3.94	2.01	4.85	1.87
Math				
Grade equivalent	1.96	.67	3.00	1.10
Percentile	35.84	23.30	49.84	24.87
Stanine	4.09	1.49	5.06	1.59
Language				
Grade equivalent	1.79	.88	2.80	1.39
Percentile	33.95	23.42	46.54	25.82
Stanine	3.98	1.61	4.90	1.70
Total				
Grade equivalent	1.81	.68	2.83	1.13
Percentile	32.73	24.54	47.76	25.13
Stanine	3.96	1.77	4.94	1.71

Table 25

Pre- and Posttest Means and Standard Deviations for Second Grade Metropolitan Achievement Test--Group I (SOI)

Subtest	Pretest		Posttest	
	Mean	SD	Mean	SD
Reading				
Grade equivalent	1.72	.44	2.74	1.17
Percentile	29.10	19.93	43.00	24.14
Stanine	3.65	1.42	4.60	1.79
Math				
Grade equivalent	2.04	.45	2.81	.41
Percentile	38.20	20.21	47.10	16.28
Stanine	4.15	1.23	4.85	1.04
Language				
Grade equivalent	1.82	.61	2.59	.99
Percentile	34.60	19.55	43.90	23.11
Stanine	4.1	1.33	4.65	1.53
Total				
Grade equivalent	1.74	.37	2.57	.66
Percentile	30.95	17.51	43.50	20.54
Stanine	3.85	1.18	4.60	1.89

Table 26

Pre- and Posttest Means and Standard Deviations for Second Grade Metropolitan Achievement Test--Group II (Language Experience)

Subtest	Pretest		Posttest	
	Mean	SD	Mean	SD
Reading				
Grade equivalent	1.84	.73	2.62	1.44
Percentile	30.59	23.68	34.00	30.73
Stanine	3.88	1.58	4.00	3.24
Math				
Grade equivalent	1.81	.62	2.51	.77
Percentile	31.00	20.48	36.94	25.75
Stanine	3.82	1.47	4.12	1.58
Language				
Grade equivalent	1.8	1.0	2.56	1.58
Percentile	34.24	25.59	38.12	29.82
Stanine	3.94	1.86	4.35	2.15
Total				
Grade equivalent	1.69	.52	2.46	1.08
Percentile	29.35	20.87	35.88	28.54
Stanine	3.76	1.60	4.00	1.97

Table 27

Pre- and Posttest Means and Standard Deviations for Second Grade Metropolitan Achievement Test--Group III (Control)

Subtest	Pretest		Posttest	
	Mean	SD	Mean	SD
Reading				
Grade equivalent	2.17	1.39	3.28	1.65
Percentile	37.21	32.57	53.21	25.48
Stanine	4.09	2.38	5.30	1.64
Math				
Grade equivalent	1.09	.76	3.28	1.33
Percentile	36.65	25.77	56.21	26.05
Stanine	4.16	1.63	5.53	1.64
Language				
Grade equivalent	1.77	.95	2.99	1.46
Percentile	33.53	24.67	51.09	24.91
Stanine	3.93	1.65	5.23	1.54
Total				
Grade equivalent	1.88	.84	3.10	1.26
Percentile	34.88	28.60	54.44	23.98
Stanine	4.09	2.07	5.47	1.64

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Summary

The major purpose of this study was to investigate the effects of Structure of Intellect (SOI) training on learning ability and academic achievement of lower achieving primary grade students. The SOI approach, based on Guilford's model and developed for education by Meeker (1969), proposes training the intellectual abilities students need for the learning of academic subject matter. This study tested the theory on an elementary school population which had a history of low achievement test scores and high retention rates. Students in the first and second grades were randomly assigned to participate in SOI training while the other half of the students received language experience activities. The first and second grade students in another elementary school with a comparable student population served as the control group. The materials utilized in the study were developed by Meeker at the SOI Institute in California. Classroom teachers conducted the training three times a week in thirty-minute sessions, as recommended, for a period of eighteen weeks. The instruments used to assess the students' performance were the SOI Process and Diagnostic Test and the Metropolitan Achievement Test. The

analysis of variance, the analysis of covariance, and several multiple comparison techniques were the statistical procedures applied to the data. The teachers followed the conditions established for the study as verified by the monitoring of lesson plans and frequent contacts by the school principal and researcher.

Conclusions

Hypothesis One: There will be no significant difference in learning abilities between primary grade students who receive Structure of Intellect training and those who do not receive the training.

The SOI Process and Diagnostic Test was utilized to assess learning abilities of students. Based on the data collected and analyzed for this study it was concluded that SOI training did not make a significant difference in students' learning abilities. The results indicate that students in both treatment groups made improvement, but those who received SOI instruction did not make significantly greater gains than those students who received language experience activities.

Hypothesis Two: There will be no significant difference in academic achievement between primary grade students who receive Structure of Intellect training and those who do not receive the training.

The Metropolitan Achievement Test was the instrument used to measure academic achievement. All three groups of first grade students made equivalent gains and no group was superior in achievement to the others. The second grade results were in favor of the control group or the students who received no additional training outside the regular program. The training received in the treatment groups did not generalize or translate directly into significant academic gains for students. It cannot be concluded from these findings that the SOI premise of training of intellectual abilities contributes to increased academic performance.

Implications for Future Research

1. It has already been cited (Chapter II) that there are studies which have demonstrated significant gains in learning abilities and achievement as a result of SOI training. It will be recalled that some of these studies were conducted with a population of students identified as gifted. The focus of this study was on a student population identified as low in achievement scores as determined by local and national norms. Perhaps SOI instruction is more effective with the average and above average student than with the student who is slower to progress. It would seem that more extensive research into the applicability of SOI

training with the slower achieving student should be conducted before it is utilized as a remedial program.

2. The present study utilized a generalized approach of SOI instruction, rather than an individual prescriptive method based on student strengths and weaknesses. It might be beneficial in future research to determine which approach would be most effective with a population of lower achieving students.

3. The primary grade students in a comparable school served as the control for this study. Although it is felt every effort was made to control for this situation, it is recommended that future research be conducted in a school which can accommodate both experimental and control groups of students. This would allow for easier control of extraneous variables and reduce the threat to external validity.

4. Further research with this population of low achieving students should consider a longer period of training, perhaps the entire school year, as well as a longitudinal study. It may be that gains in learning ability and academic performance might not produce immediate results with students who tend to progress at a slower rate. The long term follow-up may provide more measurable benefits and effectiveness.

5. The results of this study, although not necessarily favorable for specialized programs such as SOI, does reflect

positively on the regular instructional program. It could be implied that the regular school curriculum, if implemented efficiently, is effective in and of itself, without being supplemented by programs offering developmental, remedial, or enrichment activities. It might serve school systems well, both in terms of results and finances, to research the effectiveness of such programs before deciding on their purchase and implementation.

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APPENDICES

APPENDIX A

READINESS ABILITIES

READING (Foundational abilities)

___ **CFU**—Visual closure
___ **CFC**—Visual conceptualization
___ **EFU**—Visual discrimination
___ **EFC**—Judging similarities and matching of concepts
___ **MSU (visual)**—Visual attending
___ **MSS (visual)**—Visual concentration for sequencing

READING (Enabling skills)

___ **CMU**—Vocabulary of math and verbal concepts
___ **CMR**—Comprehension of verbal relations
___ **CMS**—Ability to comprehend extended verbal information
___ **MFU**—Visual memory for details
___ **NST**—Speed of word recognition

ARITHMETIC

___ **CFS**—Constancy of objects in space (Piaget) *
___ **CFT**—Spatial conservation (Piaget) *
___ **CSR**—Comprehension of abstract relations *
___ **CSS**—Comprehension of numerical progressions
___ **MSU (auditory)**—Auditory attending
___ **MSS (auditory)**—Auditory sequencing
___ **MSI**—Inferential memory *
___ **ESC**—Judgment of arithmetic similarities
___ **ESS**—Judgment of correctness of numerical facts
___ **NSS**—Application of math facts
___ **NSI**—Form reasoning (logic) *

* Indicates mathematics-related ability

WRITING

___ **NFU**—Psycho-motor readiness

CREATIVITY

___ **DFU**—Creativity with things (figural—spatial)
___ **DSR**—Creativity with math facts (symbolic)
___ **DMU**—Creativity with words and ideas (semantic—verbal)

How to use: Select the present grade level placement for the student, plot the student's scores from the test on the five-level table for that grade (on the reverse side), then, using the following system of symbols:

'+ +' for gifted, '+' for superior, 'o' for average, '– ' for limiting, '– –' for disabling

transfer the appropriate symbols to the form above; this will relate the performance level of the student to reading, arithmetic, writing, and creativity areas of school learning.

SOI Abilities Related to Basic Reading

Six different SOI abilities have been identified as especially related to basic reading. Is worth noting that none of these abilities involve semantics – word meanings – they are all in the figural and symbolic content areas. In that sense they are all precursor abilities to basic reading – abilities that should be developed before reading instruction begins.

STRUCTURE OF INTELLECT ABILITY	LEARNING SKILL DEFINITION	BEHAVIORAL CONSEQUENCES OF ABILITY WEAKNESS
CFU – Cognition of Figural Units	Visual closure	Will not see complete word from first letter to last Misreads "saw" and "was" May incline head when reading Stumbling, tripping, over-reach or knocking things over
CFC – Cognition of Figural Classes	Visual conceptualization	Poor concept formation; low reading comprehension Comprehends single stimulus, but has problems classifying and conceptualizing
EFU – Evaluation of Figural Units	Visual discrimination	Mistakes b and d and p; misreads inside letters Omits small words in sentences Misreads endings or beginnings
EFC – Evaluation of Figural Classes	Judging similarity of concepts	Poor concept formation; low reading comprehension Cannot conceptualize similarities and differences in meanings
MSU – Memory for Symbolic Units (visual)	Visual attending	Problems with spelling, recognition of new words Forgets where things are Has problems with vision span
MSS – Memory for Symbolic Systems (visual)	Visual sequencing	Cannot hold information in mind while "processing" it at the same time Problems in recalling long words or sequences Has difficulty concentrating

SOI Abilities Related to Arithmetic

Seven SOI abilities are identified as especially related to arithmetic, five other SOI abilities are identified as related to arithmetic, but more especially related to mathematics. We will consider, first, those abilities primary for arithmetic.

STRUCTURE OF INTELLECT ABILITY	LEARNING SKILL DEFINITION	BEHAVIORAL CONSEQUENCES OF ABILITY WEAKNESS
CSS – Cognition of Symbolic Systems	Comprehension of numerical progressions	Poor mastery of basic arithmetic facts
ESS – Evaluation of Symbolic Systems	Selecting correct numerical processes	Difficulty in making decisions about numerical processes
NSS – Convergent Production of Symbolic Systems	Application of numerical facts	Difficulty with arithmetic problem solving
MSU – Memory for Symbolic Units (auditory)	Auditory attending and concentration	Forgets verbal instructions Inattentive in lectures
MSS – Memory for Symbolic Systems (auditory)	Auditory sequencing	Cannot hold material presented auditorially, in mind while processing
ESC – Evaluation of Symbolic Classes	Conceptualizing arithmetic processes	Problems with "thought" problems involving different numerical concepts Difficulty understanding and using "set" concepts

GLOSSARY FOR SOI FACTOR DEFINITIONS FOR THE SOI—LA TEST

COGNITION:

CFU -- Ability to identify objects by name, visually and auditorially
CFC -- Classifies perceived objects
CFS -- Perceives spatial patterns and maintains orientation
CFT -- Manipulates or transforms objects into another visual arrangement
CSR -- Discovers relations involving letter patterns
CSS -- Ability to discover complex relationships forms patterns or systems involving symbols
CMU -- Vocabulary
CMR -- Discovers relations in conceptual, abstract meanings
CMS -- Ability to comprehend or structure problems in preparation for solving them

MEMORY:

MFU -- Recalls materials learned by visual and auditory presentation
MSU -- Recalls for immediate production, after one presentation, a series of numerals or letters
MSI -- Memory for well-practiced number operations

EVALUATION:

EFU -- Ability to identify identical forms
EFC -- Ability to classify units--to analyze how they are classified
ESC -- Ability to judge applicability of class properties of symbolic information, i.e. judging the appropriate class in which to place numbers, letters, or signs
ESS -- Ability to estimate appropriateness of aspects of a symbolic system

CONVERGENT PRODUCTION:

NFU -- Ability to comprehend and reproduce an observed bit of behavior
NSS -- States the order of symbolic systems from start to goal correctly
NST -- Ability to produce new symbolic items of information by revising given letters
NSI -- Substitutes or derives symbols as expected

DIVERGENT PRODUCTION:

DFU -- Ability to produce many figures conforming to simple specifications
DSR -- Generates a variety of relations between numbers or letters
DMU -- Ability to call up many ideas in a specified class

☐ COGNITION
☐ MEMORY
☐ EVALUATION
☐ CONVERGENT PRODUCTION
☐ DIVERGENT PRODUCTION

☐ FIGURAL
☐ SYMBOLIC
☐ SEMANTIC

☐ UNITS
☐ CLASSES
☐ RELATIONS
☐ SYSTEMS
☐ TRANSFORMATIONS
☐ IMPLICATIONS

PLANNING FORMAT UTILIZING GUILFORD'S SOI MODEL

SOI CODING: NST GRADE LEVEL: 5,6

CONTENT AREA: Language Arts - Spelling

OBJECTIVE: To develop the ability to produce new symbolic items of information by revising given items.

INSTRUCTIONAL SEQUENCE

1. GENERAL DIRECTIONS: Reproduce and distribute exercise sheet.

2. PROCEDURES: Give the following instructions:

   a. Unscramble the words on the exercise sheet.

   b. When you have unscrambled all of them, go down the line taking three words at a time. Make a sentence using each of the three words in one sentence.

   c. You may use other words, too: verbs, adjectives, adverbs, etc. in your sentence. Underline the three key words.

   d. If you are really imaginative, do the above but make a complete story or write a newspaper article using the key words in order.

   e. Begin with a few easy words.

3. MATERIALS: Pencil, paper, exercise sheet

4. EVALUATION: Provide correct answers. Discuss the techniques each student used to solve the words.

5. EXTENSIONS: Have several similar exercises for students who wish to pursue the skill and then allow students to develop their own lists of scrambled words for spelling lists.

EXERCISE SHEET

NST-4

DIRECTIONS: Unscramble the words below; take 3 words at a time, going down the list in order, and make a sentence using each of the 3 words in the sentence.

trafyc
phorty
rufian
cargil
galupe
elchke
petmste
diafar
rasoii
rowped
lacem
byder
tyigeh
samret
taptetm
geinen
tuifot
kluocn
yanibr
wotuti
elefre
ledyei
tpsiyt
harfet
grudo
lenede
eubtan
butels
yonga
hitba
selnte
vecro
tebatyr
glisne
toyrf
cumis

ANIMALS

EASY WORDS:
gdo
act
rta
soerh
seumo
inol
sfih
eknas
tanelepha
tabirb
surarmk
ifgohsdi
etturi
rrileusa

Vegetables
CRN
OTOATM
SAPE
ATRCOR
EBETS
ELRYCE
OATOPT
RIPUTN

With Clues:
nidina-has feathers but can't fly
nalsid-surrounded by water
bbami-a deer person
sobot-made for walking
zarnat-a real swinger
smyfel-you see this daily
odiri-has little judgment
lepnic-get the point?
morocassl-your surroundings now
tisnara-very frank person
ontesin-makes you nervous
tlable-fancy dance
aichn-place and plate
tewar-never dries up

PLANNING FORMAT UTILIZING GUILFORD'S SOI MODEL

SOI CODING: CFU (Cognition of Figural Units) GRADE LEVEL: 4, 5, 6

CONTENT AREA: Geography

OBJECTIVE: To develop the ability to recognize a figural entity, that is to "close" figural information or perceive a complete visual form.

INSTRUCTIONAL SEQUENCE

1. GENERAL DIRECTIONS: (To the student) Just as you can recognize people by their looks, you can recognize states by their looks. Study the outlines of the states and notice how they differ in shape. Use the U.S.A. map to help you. Write the name of each state on the line below it and complete the outline of each state.

2. PROCEDURES:
   (1) Distribute duplicated outline of five states to students.
   (2) Show them U.S.A. wall map or have them use U.S.A. maps in geography text.
   (3) Illustrate procedure on chalk board.
   (4) Ask the children to complete the outline of the state.

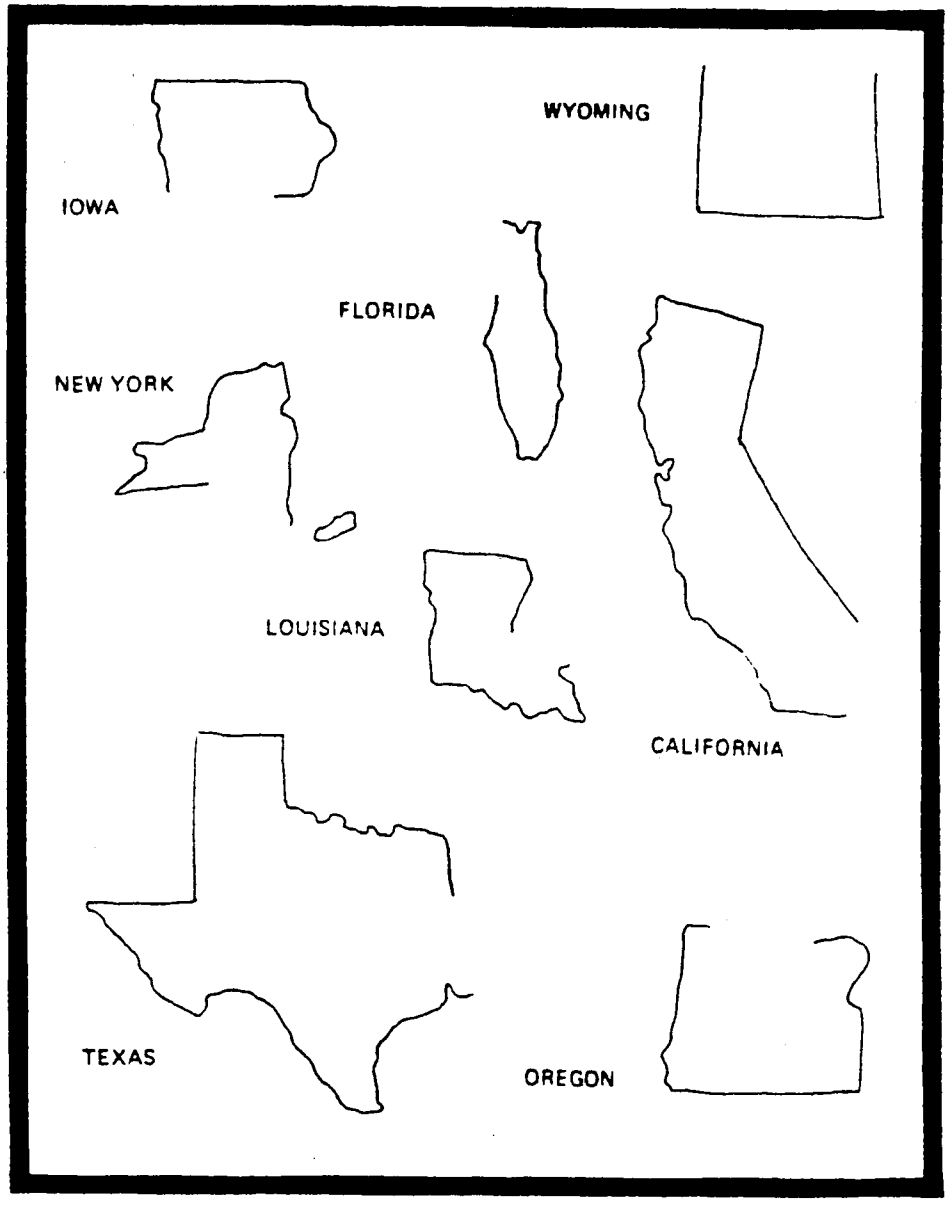
3. MATERIALS: U.S.A. map showing outline of the states
   Pencils
   Copies of exercise sheets

4. EVALUATION: When everyone is through, have them score their own papers as the correct answers are given.

5. EXTENSIONS: Substitute shells, cell animals, etc. for a science lesson using the above procedures.

EXERCISE SHEET

CFU-V-12



APPENDIX B

Table B-1

Median Percentile Scores on Prereading Skills Composite
Metropolitan Readiness Test

Source	1981		1982	
	Number students	Percentile	Number students	Percentile
System-wide	403	48	395	48
Control school	52	26	58	44
Experimental school	63	29	65	34

Table B-2

Median Raw Scores on Quantitative Portion
Metropolitan Readiness Test

Source	1981		1982	
	Number students	Score	Number students	Score
System-wide	403	15	395	15
Control school	52	12	58	11
Experimental school	63	12	65	13

Table B-3

Median National Percentile Scores for Second Grade
Metropolitan Achievement Test--1981

Subtest	System-wide (N = 372)	Control school (N = 54)	Experimental school (N = 55)
Reading	46%	28%	22%
Math	38	38	30
Language	42	26	26
Basic Battery	40	23	20

Table B-4

Median National Percentile Scores for Second Grade
Metropolitan Achievement Test--1982

Subtest	System-wide (N = 356)	Control school (N = 48)	Experimental school (N = 42)
Reading	48%	22%	28%
Math	42	34	30
Language	46	28	32
Basic Battery	48	23	24

APPENDIX C

SAMPLE OF EXERCISES USED WITH FIRST GRADE SOI GROUP*

*From: Meeker, Mary. Reading Readiness Workbook. El Segundo, Ca.: SOI Institute, 1977.

SOI READING READINESS WORKBOOK GUIDE

MFU MFS

GENERAL COMMENTS

MFU - Auditory
MFS - Auditory & Visual

You will need scissors, glue, and tagboard. 8½ x 11 envelopes for storage.

INSTRUCTIONS

UNIT IV - A

[Allow 20 minutes a day until all pictures are cut out. You want each student to have a deck of pictures to work with. You may want to begin this unit on memory by having students glue their pictures to tagboard. (Provide tagboard on which they paste their animal pictures to make a "Deck".) This will make the pictures easier to handle and to store in 8 ½ x 11 manila envelopes. Put each student's name on a storage envelope.]

UNIT IV - B

[To play this game you will need to allow students lots of time to find the animals in their deck. Stand before the class.]

Listen to the two animals names as I call them out. Find the: Pony and Turtle, and hold them up. Now put those face down and find the:

2. Horse and Chimp and put them face down.
3. Rooster and Lamb.
4. Cat and Rat.
5. Buffalo and Cow.
6. Bear and Turkey.
7. Sheep and Lizard.
8. Storkbird and Bumble Bee.
9. Rabbits and Bullfrog.
10. Porpoise and Peacock.
11. Hen and Bat.
12. Owl and Lobster.
13. Snake and Lion.
14. Duck and Monkey.

Put your pictures into your envelope. We will play with them at a later time.

SOI READING READINESS WORKBOOK GUIDE

MFS

GENERAL COMMENTS

This game develops the ability to sequence 3. The animals need not be in order. Any student who cannot keep a series of 3 in mind with the group should be taught separately and given more practice, more games and will require more patience. If necessary, use the SOI Sequencing Machine - MSS.

pony
turtle
horse
chimp
rooster
lamb
cat
rat
buffalo
cow
bear
turkey
sheep
lizard
storkbird
bumble bee
rabbits
bullfrog
porpoise
peacock
hen
bat
owl
lobster
snake
lion
duck
monkey

INSTRUCTIONS

UNIT IV - C

Now we will all find 3 animals. Find the:
_____and_____and_____
(Select any of the animals.) Hold them up if you can or lay them on the board sill.

[Allow 20 minutes, stop, then begin where you left off the day before until all series are called.]

_____and_____and_____
_____and_____and_____
_____and_____and_____
_____and_____and_____
_____and_____and_____
_____and_____and_____
_____and_____and_____
_____and_____and_____

Which animal is left? The next time we play the game we will practice remembering 4 animals.

NOTE: Sequencing problems are often more disabling for reading than simple immaturity or inattention. Give students lots of time to search for their pictures. Students who have difficulty in sequencing 3 or 4 pictures need to take the visual form of the SOI-LA Test. Check them for visual indication. Do not depend on the Snellen Test alone.

UNIT IV - D

Place all your animal pictures face up. Now listen to the ones I want you to find. Listen then look.
Find the:

_____and_____and_____and_____
_____and_____and_____and_____
_____and_____and_____and_____
_____and_____and_____and_____
_____and_____and_____and_____
_____and_____and_____and_____
_____and_____and_____and_____

[Stop the series after 20 minutes. Begin where you left off until all 28 pictures have been sequenced. Observe which students may not be able to hold a sequence of 4 in mind. They will need additional practice.]

[The Memory SOI Sourcebook and modules provide more tasks.]

SOI READING READINESS WORKBOOK GUIDE

CFU EFU MFU MFS

GENERAL COMMENTS

As students work and learn CFU - Auditory & Visual, EFU - Auditory & Visual, MFU & MFS, they lead to Convergent Production.

Provide envelopes, scissors, and crayons.

INSTRUCTIONS

[GENERAL Instructions for all UNITS VI through XV:]

1. Find the word.
2. Say the word.
3. Say the sound.
4. Color the picture.
5. Look at the letter above.
6. Write it under each picture after you have colored it.
7. Provide 10 envelopes for each student. At the end of each unit have students cut their pictures apart to file them in envelopes with the appropriate vowel marked on its front.
8. Be sure each student's name is on the front of each of the vowel envelopes.

NOTE: These are symbolic tasks. Do not concern yourself with blends or dipthongs yet.

[Additional use for vowels in UNITS VI to XV:]

[Each student will have 10 envelopes when they have completed this unit. You can spend repetition periods where you ask students to:]

[Write the names of pictures on the board.]

Take out your long O envelope. Spread the pictures out before you. Pick up the **toes** picture. Show it to me. Put it down. Say the long O sound. Now find the _____.

[Continue until all 18 in each vowel sound are identified. You can also call out 2, 3, 4, or 5 pictures at once to give practice in memory span development.]

SAMPLE OF EXERCISES USED WITH SECOND GRADE SOI GROUP*

*From: Meeker, Mary. Figural-Symbolic-Semantic Memory Exercies. El Segundo, Ca.: SOI Institute, 1980.

INSTRUCTIONS – OUTLINE

This instructor's manual contains ten separate memory training tasks:

FIGURAL MEMORY FOR READING:

1. **Figural Memory – Units level:** pictures of animals are used as stimulus material, presented in sequence of two, three, four and five or more figures. Students recall figures after the entire sequence has been presented. There are sixteen animals available as stimulus materials.
2. **Figural Memory – Systems level:** pictures of animals are used as stimulus material, presented in sequence of two, three, four and five or more figures. Students recall figures, *in reverse order*, after the entire sequence has been presented.

SYMBOLIC MEMORY FOR ARITHMETIC:

3. **Symbolic Memory (Auditory) – Units level:** series of numbers are presented auditorially in sets of three, four, five, six, up to nine. Students recall numbers after entire sequence has been presented vocally.
4. **Symbolic Memory (Visual) – Units level:** series of numbers are presented visually in sets of three, four, five, six, up to nine. Students recall numbers after entire sequence has been presented visually.
5. **Symbolic Memory (Auditory) – Systems level:** series of numbers are presented auditorially in sets of three, four, five, six, up to nine. Students recall numbers *in reverse order* after entire sequence has been presented vocally.
6. **Symbolic Memory (Visual) – Systems level:** series of numbers are presented visually in sets of three, four, five, six, up to nine. Students recall numbers *in reverse order* after entire sequence has been presented visually.

SEMANTIC MEMORY FOR GENERAL ACHIEVEMENT:

7. **Semantic Memory (Auditory) – Units level:** series of words are presented auditorially in sets ranging from three to nine elements; students recall words after entire sequence has been presented vocally.
8. **Semantic Memory (Visual) – Units level:** series of words are presented visually in sets ranging from three to nine elements; students recall words after entire sequence has been presented visually.
9. **Semantic Memory (Auditory) – Systems level:** series of words are presented auditorially in sets ranging from three to nine elements; students recall words *in reverse order* after entire sequence has been presented vocally.
10. **Semantic Memory (Visual) – Systems level:** series of words are presented visually in sets ranging from three to nine elements; students recall words *in reverse order* after entire sequence has been presented visually.

We suggest that the students master the figural exercises (one and two) before starting the symbolic sequence; and that they master the symbolic exercises (three through six) before starting the semantic sequence.

Note: These exercises can be supplemented by those in the *SOI Memory Sourcebook K-12*. For independent study there are two *Memory Handbooks I & II* for self directed study.

For the following four exercises – exercises three through six – the students have two sets of numbers (1 through 9). These numbers should be cut apart so that each student has two sets of nine separate numbers, one set to be put aside for use in replacing any lost numbers. The students use the numbers to match the stimulus presentations.

EXERCISE THREE: SYMBOLIC MEMORY (AUDITORY) – UNITS LEVEL

Verbal instruction: Let's see how well you can remember some numbers that I say. I will say the numbers slowly; wait until I am done, then you find the numbers that I said.

[Say each number with about one second in between; be careful to pronounce the numbers in uniform cadence.]

[You are now ready for the training trials; the instructions to the students are the same as above for all sequences. IMPORTANT: Stop when the students are failing. Repeat training beginning with the first sequence three times a week.]

Suggested training sequences:

First sequence	3 8 6
Second sequence	5 1 3
Third sequence	7 4 9 2
Fourth sequence	6 3 8 5
Fifth sequence	2 9 1 4 7
Sixth sequence	5 3 8 6 2
Seventh sequence	1 7 4 6 3 8
Eighth sequence	2 9 7 4 1 5
Ninth sequence	6 2 1 7 5 8 4 3
Tenth sequence	7 6 4 8 2 5 9 1
Eleventh sequence	3 9 7 1 6 2 8 4
Twelfth sequence	5 4 2 9 6 1 7 3 8

The students respond by selecting numbers that match the ones that you present. NOTE: In this, as in all the exercises, you must be concerned that students do not make their selections until the entire sequence has been presented. This is an exercise of memory; memory will not be trained if the students are allowed to match the presentation sequence without having to remember it.

At this level – units – the order is not considered relevant; in other words, if 3, 6, 8 and 1 are presented and a student selects the same numbers, *in any order*, that would be a correct response. We will not be concerned with order until the systems level exercises (exercises five and six).

Continue daily training at the units level increasing the size of the sets as much as possible.

Store student numbers in envelopes with their names on each.

For the following four exercises – exercises seven through ten – the students have sets of words. These words should be cut apart so that each student has a set of separate words. The students use the words to match the stimulus presentations. Words are to be stored in personally marked envelopes.

EXERCISE SEVEN: SEMANTIC MEMORY (AUDITORY) – UNITS LEVEL

Verbal instruction: Let's see how well you can remember some words that I say. I will say the words slowly; wait until I am done, then you find the words that I said.

[Say each word with about one second in between; be careful to pronounce the words in uniform cadence.]

[You are now ready for the training trials; the instructions to the students are the same as above for all sequences. IMPORTANT: Stop when the students are failing. Repeat training beginning with the first sequence three times a week.]

Suggested training sequences:

First sequence	nose tree dog
Second sequence	fun dad top
Third sequence	cat now end kid
Fourth sequence	eat car low sat
Fifth sequence	fur egg too put ice
Sixth sequence	fat art see toe sky
Seventh sequence	won ear set cup oak pig
Eighth sequence	has buy who tub for bee
Ninth sequence	sun use cow end ate man why
Tenth sequence	hoe say wee out red dig rat
Eleventh sequence	did yes hat run box she tag
Twelfth sequence	can saw did new eel how pie
Thirteenth sequence	boy tin sit had arm met ray
Fourteenth sequence	sir not are get day all old

The students respond by selecting words that match the ones that you present. NOTE: In this, as in all the exercises, you must be concerned that students do not make their selections until the entire sequence has been presented. This is an exercise of memory; memory will not be trained if the students are allowed to match the presentation sequence without having to remember it.

At this level – units – the order is not considered relevant; in other words, if **nose, tree** and **dog** are presented and a student selects the same words, *in any order*, that would be a correct response. We will not be concerned with order until the systems level exercises (exercises nine and ten).

Continue daily training at the units level increasing the size of the sets as much as possible.

LANGUAGE EXPERIENCE ACTIVITIES

Cleveland City Schools

4300 MOUSE CREEK ROAD, N.W.
TELEPHONE 472-9571
CLEVELAND, TENNESSEE 37311

DONALD P. YATES
Superintendent

March 4, 1983

MEMORANDUM TO: Carole Stubbs

FROM: Jackie Wattenbarger jmw

RE: Report on Language Experience in Reading Pilot Project at Blythe Avenue School

Three groups or half of the students in grades one and two were randomly selected to participate in language experiences in reading three times per week for eighteen weeks for a total of fifty-four hours. The three groups were

1) eight readiness first grade students;
2) twenty-five first grade students; and
3) twenty second grade students.

The language experience approach was based on work by Dr. Roach Van Allen and on the general understanding that:

-What they think about, they can say
-What they say, they can write
-What they write, they can read
-What other people have written, they can read
-What they write, others can read

The following language experience activities are representative for the readiness first grade students:

1) Visit to the library
2) Selection of library books
3) Reading orally and acting out stories in the different kinds of library books with emphasis on traditional stories, such as "The Three Pigs," "The Three Bears," and "Little Red Riding Hood."
4) Reading and memorizing nursery rhymes
5) Writing stories about the library and other experiences

The first grade students utilized the Language Experience In Reading (LEIR) kit. The main focus of all the units in the LEIR program is on the language development of children with respect to the three strands of the fabric of communication:

Strand I - Experiencing Communication
Strand II - Studying Communication
Strand III - Relating Communication of Others to Self

The following are representative of the activities for the first grade students for one day:

1) The teacher introduced herself to the children and wrote her name on the chalkboard.

2) The teacher took a pointing tour of the classroom with the children, making labels for each of the centers.

3) The children made nametags for themselves and decorated them.

4) The children who could do so were encouraged to read the name labels on the centers.

5) The teacher helped the children make a "Words We Can Read" chart, using words cut out of magazines by the children.

6) The children play the game "My name is _____." The children sat in a circle and began the game by saying "My name is ___ and your name is _____" to the person on their right. This continues around the circle.

Second grade students participated in the dictation process of LEIR. There are basically five steps in the dictation process:

1) Experience. Before children have expression, there must be impression. Before children can be expected to talk about their feelings and reactions and ideas, many opportunities need to be provided "to fill them up" with direct and vicarious experiences which extend their vocabularies.

2) Verbalize. It is important that children verbalize throughout and after the experience. The teacher has the responsibility of asking questions to help children purposely organize their language and allow time for feelings, ideas, and reactions to be expressed.

3) Represent graphically. Opportunity is given for children to make a picture with paper, and crayons or paint, about their experience.

4) Verbalize. The children tell the teacher about their pictures. Through this conversation, the teacher can begin to develop characterization, setting, and plot through skillful questioning about the child's picture.

5) Dictate. The children tell their stories to the teacher who writes down in large, clear manuscript what the children say.

Follow-up activities are scheduled for further involvement with the stories. Students make them into books, act out the stories, read them, and the like.

The following activities are representative for second grade students:

1) The students talked about and "imagined" what Apple Valley Orchard would be like. The teacher took dictation and read the story to the class.

2) The class visited Apple Valley Orchard.

3) The class dictated story of trip while teacher wrote the story on the board. Then they read the "imagine" sentences and the new story.

4) The class began to make covers for their booklets. When the booklets were completed, each had a title page and the children drew illustrations in them.

5) Individuals dictated to the teacher how they thought apple sauce was made and copied their stories in their own booklets.

6) The class made applesauce. Then the children dictated the "real" recipe for apple sauce and the teacher wrote it on the chalkboard.

7) Another sequence centered around planting eighty jonquil bulbs on the school property.

This has been an exciting project for all of the participants. We look forward to expanding it next year.

If you have further questions, please do not hesitate to contact me.

SOI PROCESS & DIAGNOSTIC TEST PROFILE SHEETS

HOW TO PRODUCE A LEVEL-OF-PERFORMANCE STRENGTHS-WEAKNESS PROFILE

1. Select the grade level band appropriate to the student being tested.
2. Plot the scores obtained from the test within the selected grade-level band.
3. Read the level of performance from the graph:

   Gifted Level is 94%-tile (or better) performance
   Superior Level is 84%-tile – 93%-tile performance
   High Average Level is 66%-tile – 83%-tile performance
   Grade Level is 35%-tile – 65%-tile performance
   Low Average Level is 17%-tile – 34%-tile performance
   Limiting Level is 7%-tile – 16%-tile performance
   Disabling Level is 6%-tile (or below) performance

	PROCESSING ABILITIES						DIAGNOSTIC ABILITIES				
	CFU	CFC	CMU	MSU	NFU	MFU	CMR	CMS	EFU	NST	CSS
Gifted	11	11	17	17	33	18	17	16	17	138	7
Superior	9	10	16	16	26	17	16	15	16	132	6
High Average	8	9	15	15	20	16	15	13	14	120	6
GRADE 3	**7**	**8**	**15**	**15**	**18**	**15**	**14**	**11**	**13**	**111**	**5**
Low Average	6	7	14	14	15	13	13	10	12	101	4
Limiting	4	6	13	12	11	11	12	8	11	82	3
Disabling	3	5	11	10	9	9	11	6	10	54	2
Gifted	8	10	16	18	33	17	16	15	16	122	6
Superior	8	9	15	17	25	16	15	12	15	103	5
High Average	6	6	14	15	19	14	14	10	13	80	4
GRADE 2	**5**	**7**	**13**	**13**	**15**	**13**	**13**	**9**	**12**	**61**	**3**
Low Average	4	6	12	12	12	11	12	7	11	44	2
Limiting	3	5	11	10	11	8	11	6	10	28	1
Disabling	2	4	10	7	8	4	8	4	8	18	0
Gifted	6	9	14	17	30	15	15	12	15	57	4
Superior	7	8	13	15	22	13	14	10	13	35	3
High Average	6	7	12	12	16	11	12	8	12	21	2
GRADE 1	**5**	**6**	**11**	**10**	**11**	**10**	**11**	**7**	**11**	**14**	**1**
Low Average	4	5	10	8	10	7	10	5	10	10	1
Limiting	3	4	9	4	8	4	7	4	8	7	0
Disabling	2	3	8	2	6	0	6	2	6	3	0
Gifted	7	8	13	17	18	13	13	8	12	18	3
Superior	6	7	12	16	14	11	12	7	11	10	2
High Average	4	6	11	12	11	8	10	6	10	8	1
4-5 YEARS	**3**	**5**	**10**	**9**	**9**	**6**	**9**	**4**	**9**	**5**	**1**
Low Average	2	4	10	6	8	5	7	4	8	3	0
Limiting	2	2	9	3	6	1	6	3	6	1	0
Disabling	1	1	7	1	4	0	3	2	4	0	0
	CFU	CFC	CMU	MSU	NFU	MFU	CMR	CMS	EFU	NST	CSS

HOW TO PRODUCE AN INDIVIDUAL STRENGTH-WEAKNESS PROFILE

1. Record obtained score for each test taken.
2. Divide score by maximum possible; record percent correct.
3. Add percent correct across all tests; divide by number of tests taken for overall average.
4. Draw a line on graph—top to bottom—at point of overall average.
5. Plot percentage scores for each of the tests.

PROCESS TESTS

	OBTAINED SCORE	+	MAXIMUM POSSIBLE	=	PERCENT CORRECT
CFU	____	+	15	=	____
CFC	____	+	12	=	____
CMU	____	+	20	=	____
MSU	____	+	18	=	____
NFU	____	+	33	=	____
MFU	____	+	21	=	____

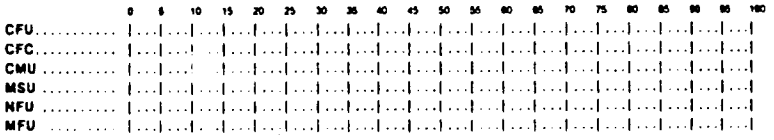
DIAGNOSTIC TESTS

	OBTAINED SCORE	+	MAXIMUM POSSIBLE	=	PERCENT CORRECT
CMR	____	+	19	=	____
CMS	____	+	19	=	____
EFU	____	+	19	=	____
NST	____	+	139	=	____
CSS	____	+	9	=	____

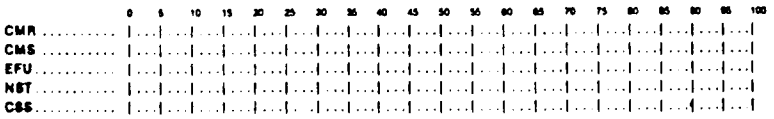
To derive Figural, Symbolic and Semantic scores do the following: Add the percent-correct scores for all the Figural test taken (CFU, CFC, NFU, MFU, EFU); divide the total by the number of tests taken; the result is the student's Figural score. Add the percent-correct scores for all the Symbolic tests taken (MSU, NST, CSS), divide the total by the number of tests taken; record the result as the Symbolic score. Follow the same procedure for the Semantic tests (CMU, CMR, CMS) and record the result as the Semantic score.

	AVERAGE PERCENT CORRECT
Figural	____
Symbolic	____
Semantic	____

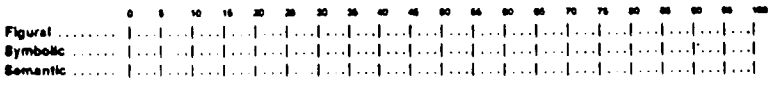
PROCESS TESTS



DIAGNOSTIC TESTS



GENERAL CONTENT ABILITIES



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VITA

Carole Ann Stubbs was born in Fresno, California, but that was to be only the first of several locations her family would reside. She attended public school in the states of Mississippi, California, Idaho, Oregon, as well as Tennessee. Carole received her Bachelor of Science and Master of Arts degrees from Middle Tennessee State University.

Her professional career began near Memphis, Tennessee, where she was employed for two years as a psychological examiner at Arlington State Hospital. Carole then worked on the Psychological Services staff with the Memphis City Schools before accepting her present position as school psychologist with the Cleveland (Tennessee) City School system.

Carole was accepted into the doctoral program in the Department of Educational and Counseling Psychology in the summer of 1981 and completed the Ph.D. degree in August, 1983.