Coston, Caroline Ann

THE DEVELOPMENT AND VALIDATION OF A PREASSESSMENT INSTRUMENT FOR THE CRITERION REFERENCED CURRICULUM

The Ohio State University PH.D. 1983

THE DEVELOPMENT AND VALIDATION OF A PREASSESSMENT INSTRUMENT FOR THE CRITERION REFERENCED CURRICULUM

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

Caroline Ann Coston, B.S., M.S.

* * * * *

The Ohio State University

1983

Reading Committee:

Dr. T. M. Stephens

Dr. J. O. Cooper

Dr. D. S. Hill

Approved By

T. M. Stephens

Adviser
College of Education

I thank God for keeping me emotionally strong
throughout the course of my study.
I dedicate this work to my parents, Miles and Ella,
for their prayers and encouragement; and to
Hali, for his presence and support.

ACKNOWLEDGMENTS

I have been most fortunate to have a supportive and helpful dissertation committee. I would like to express my deepest appreciation to Dr. Thomas M. Stephens for his guidance, moral support, and understanding throughout this program. I would also like to thank Dr. John Cooper for his supportive suggestions and consideration during my coursework and study. My appreciation also goes to Dr. David Hill for his constructive criticism, moral support, and patience in assisting me with statistical procedures.

There are numerous individuals who were very helpful during the course of preparing this study. My sincere thanks goes to Dr. Hutchinson and his staff at Charles E. Merrill Publishing Company for their assistance; to Dr. Caron, Columbus Public Schools; and most sincerely to Mrs. Barbara Little, a wonderful typist whose patience and guidance supported me throughout the final stages.

VITA

May 3, 1953	Born - New York, New York
1975.	B.S., North Carolina A & T State University, Greensboro, North Carolina
1976-1978	Classroom Teacher, Learning Disabilities Resource, Seneca, Wisconsin
1976.	M.S., University of Wisconsin, LaCrosse, Wisconsin
1978-1980	Instructor/Student Teaching Supervisor, Bennett College, Greensboro, North Carolina

FIELD OF STUDY

Major Field: Exceptional Children

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Need for the Study

Evaluation of student performance has proven to be an essential component of the educational process. However, activities which led to a substantial increase in the interest in educational evaluation did not become apparent in the United States until the 1950s. This increased interest was stimulated by several factors. First critics of public schools expressed their concern with the apparent ineffectiveness of instruction, and the launch of Sputnik influenced a change in the curriculum focus in American schools. A second factor stems from federal legislation providing financial support to public education. Receiving federal funds automatically required evaluation of sponsored programs. Similarly, the more recent reduction in both federal and state funding for public education has produced a greater demand for accountability of educational programs (Popham, 1975). These, along with other factors, have contributed to the emphasis on educational evaluation and its subsequent contributions to educational decisions, and to the instructional process.

Educational evaluation plays a significant role in the decision-making process and influences all facets of education. R. L. Thorndike (1969) defines evaluation as:

> The complete process of identifying the objectives of an aspect of education and appraising the extent to which those objectives have been achieved. Evaluation is likely to use tests as tools but also to include other informational types of evidence, and undertakes to integrate these into a value judgment of the effectiveness of an educational enterprise. (p. 647)

In an effort to make educational evaluation a systematic process, many educators have developed models for that purpose. These models provide a conceptual framework around which educators can organize their data to make appropriate recommendations, judgments, and decisions regarding the effectiveness of their programs. Although most evaluation models have overlapping characteristics, generally they can be categorized into groups of similar orientation. Popham (1975) identified four categories of evaluation models.

1. The goal attainment approach, as advocated by Tyler (1942), emphasized the development of educational goals based on three sources: the student, society, and subject matter; and specifying measurable objectives based on these goals. When an instructional program is completed, the individuals are measured to determine the extent to which the predetermined goals were achieved.

2. The judgment model emphasizing intrinsic criteria is a model which places major emphasis on professional judgment based on process criteria. The evaluator's judgment influences the outcome of the evaluation (Popham, 1975).

3. The judgment model emphasizing extrinsic criteria is quite similar to the second model described here, except that the professional's judgment is based on product criteria. This approach is reflected in Scriven's (1976) explanation of formative and summative evaluations.

4. The decision facilitation model has characteristics found in each of the three models previously described, yet its major focus is to provide information so that appropriate decisions regarding education can be made. Stufflebeam's (1971) Context, Input, Process, Product (CIPP) model is a prime example.

These four models constitute a part of the framework upon which the concept of educational evaluation is based. While their differences imply that educational evaluation has varying purposes, each purpose dictates the type of evaluation conducted, the type of information obtained, the way the information is interpreted, and the type of decision to be made.

Evaluation in special education centers around the identification of individuals who possess special learning needs. Evaluation in special education requires collecting information that can be used in decisions regarding screening, placement, instructional programming, pupil evaluation, and program evaluation (Salvia & Ysseldyke, 1981). Data collection is typically organized around the Diagnostic Model (Quay, 1968; Iscoe, 1972; Caterall, 1970; Hickey & Hoffman, 1973; Dunn, 1968). These models identify specific information that is relevant to making decisions, particularly those regarding instruction. Several instructional models also offer a framework which reflects the need for collecting appropriate evaluative data to make instructional decisions (Reese, 1976; Peter, 1965; Cartwright, Cartwright, & Ysseldyke, 1976; Stephens, 1976). However, within the evaluation framework an area of significance is the assessment role of individual performance in instructional decision making.

The implementation of Public Law 94-142, the Education for the Handicapped Act, has facilitated evaluation in educational decision making and the role of assessment in making instructional decisions. P.L. 94-142 requires the development of an Individualized Educational Program (IEP) for all students requiring special educational services (NASDSE). Within the IEP, teachers must identify individual strengths and weaknesses, and specify educational goals and objectives to be accomplished by the educational program. Specific assessment results enable teachers to complete these tasks (Stephens, 1976).

In most instances, assessment of individual performance has been conducted by administering standardized norm referenced tests. However, the technical adequacy of these instruments for making instructional decisions has been questioned (Ysseldyke, 1978; Wallace & Larsen, 1978; Bennett, 1981). Research provides evidence that other assessment data such as observation, informal tests, and criterion referenced tests are more appropriate for making instructional decisions (Thurlow & Ysseldyke, 1979). Survey level assessments, as advocated by Stephens (1976) and Zigmond, Valecrosa, & Silverman (1983), will also yield information that is specific and relevant to planning instruction. These allow teachers to pinpoint specific skills within categories or within a skill hierarchy, thus providing the teacher with a point of departure for further assessment or instruction.

Statement of the Problem

Teachers are responsible for making educational decisions regarding instructional programming, based upon students' levels of performance in

each academic area. Teachers must identify students' performance levels in order to decide where instruction should begin. This instructional decision should be based upon an accurate measure of the student's performance. Measurement of performance requires instruments that identify those skills and behaviors which students must demonstrate in order to perform an instructional task.

Generally, achievement tests are used for instructional decisions. Frequently, however, they are time-consuming and yield information that has little value for instruction because they provide grade level scores or percentile scores, which do not indicate the specific skill deficits that are reflective of those scores. Consequently, the teacher is still faced with the problem of identifying where the student performs within a skill hierarchy and where to begin in-depth assessment and instruction.

Teachers need ways to assess that make efficient use of time and yield information of an instructional nature. Assessments meeting this description should identify strengths and weaknesses that can be used as a basis for further assessment and instruction, and should be valid instruments that will provide a reliable measure of individual performance.

Purpose of the Study

The purpose of this study is to develop a preassessment (entry level) instrument for the Criterion Referenced Curriculum in reading and math (Stephens, 1982). The study will report the level of test reliability and identify the extent to which the test will assess the academic needs of mildly handicapped and normally functioning students.

The instrument will be used to probe clusters of academic skills, identify individual skill deficits within those clusters, and indicate areas that require more in-depth assessment. This study describes the instrument's content validity.

Research Questions

The following research questions will be investigated in this study:

1. Can a reliable entry level assessment instrument be developed for the Criterion Referenced Curriculum?
2. Does the instrument reliability identify skill deficit areas in reading and math?
3. Does the instrument identify the functional skill deficits of mildly handicapped and normally functioning students in reading and math?
4. Does the instrument measure difference between group functioning?
5. Does the instrument have content validity?

Definition of Terms

Mildly handicapped. The population of handicapped individuals typically categorized as learning and behaviorally disordered and developmentally handicapped (EMR) whose learning and/or behavior deficit are not severe enough to warrant special school placement. These individuals are usually served in self-contained and resource classrooms, some of which are mainstreamed into the regular education program.

Specific learning disability. A disorder in one or more of the basic psychological processes involved in understanding or in using language spoken or written, and which may manifest itself in an imperfect ability to listen, speak, think, read, write, spell, or to do mathematical calculations. The term includes such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. The term does not include children who have learning problems that result from visual, hearing, or motor handicaps. The term also does not include children who have learning problems that result from mental retardation, emotional disturbance, or environmental, cultural, or economic disadvantage.

Developmentally handicapped. Significantly sub-average general intellectual functioning existing concurrently with deficits in adaptive behavior manifested during the developmental period which adversely affects a child's educational performance.

Criterion Referenced Curriculum. An instructional system designed to help teachers provide individualized instruction in reading and math. The system is based upon the Directive Teaching Model, involving four steps: (1) assessment, (2) planning, (3) implementation, and (4) evaluation. The system can be used to prescribe skills in reading and arithmetic on an individual basis in sequenced units of instruction. The curriculum covers two major academic areas, reading and math. The reading component is composed of seven subcategories. These are: (1) auditory discrimination, (2) visual discrimination, (3) comprehension, (4) phonetic analysis, (5) structural analysis, (6) sight words, and (7) oral reading. The math component has five subcategories,

which are: (1) measurement, (2) numbers, numeration and number systems, (3) operations and their properties, (4) sets, and (5) metrics. The curriculum also contains criterion referenced assessment tasks for each of the skills, an assessment manual for each content area, and a teaching strategies manual.

Summary

Chapter I introduced the need for educational evaluation, its contribution to educational decisions, and to the instructional process. The investigator described four categories of evaluation models, and identified evaluation in the field of special education. The statement of the problem was discussed, as well as the investigator's objective to develop a preassessment (entry level) instrument for the Criterion Referenced Curriculum in reading and math. Finally, Chapter I concluded with the five research questions hypothesized in this study and a definition of terms used.

CHAPTER II

Review of Literature

The process of education has undergone numerous changes throughout educational history. Most, if not all, educators would agree, however, that one single factor which has influenced a change and improvement in education is the systematic use of evaluation in education. R. L. Thorndike (1969) defines evaluation as:

> The complete process of identifying the objectives of an aspect of education and appraising the extent to which those objectives have been achieved. Evaluation is likely to use tests as tools, but also to include other informal types of evidence, and undertakes to integrate these into a value judgment of the effectiveness of an educational enterprise. (p. 647)

This definition is broad and inclusive because it acknowledges the interrelationship between objectives appraisal (measurement), test tools, and informal evidence and value judgments. These elements are basic to any evaluation process.

Evaluation in education is an ongoing process and is conducted for numerous reasons. Evaluations are frequently used to make "a determination of value" (Popham, 1975, p. 1). This broad definition may be applied to the value of a curriculum and educational programs, instructional effectiveness, characteristics of individual competence, or specific competencies for making selections among individuals and groups. Whatever the case may be, once this determination has been made, evaluation data are generally used as a basis for some type of decision.

The use of measurement and evaluation dates back to as early as 2200 B.C. when the Chinese used essay examinations. However, systematic use of evaluation is a result of more recent developments.

Lindvall (1964) summarized two eras in which major developments were made in educational evaluation. The "Testing Movement," which began during the early 1900s, was initiated when Binet constructed the intelligence test. The work of Binet and Ria, who promoted the development of standardized achievement tests, paved the way for the development of numerous measurement instruments of intelligence, aptitude, and achievement. In addition to this, the testing movement significantly influenced teaching practices because measurement instruments provided a "scientific means for identifying student capacity, diagnosing learning difficulties, and fitting instruction to the student's capacity" (Lindvall, 1964, p. 6).

The "Evaluation Movement," which began around the 1930s, was a counteracting influence to the testing movement. Educators acknowledged that great interest in and a high level of enthusiasm for testing led to their misuse and misinterpretation. In some situations tests were being used with little regard for their intended purposes, while in other situations testing was viewed as the sole means of evaluation. But, research during this period focused on the need for specifying instructional objectives. Testing was emphasized as a function of measuring these objectives, and therefore seen as an integral part of the instructional process and comprehensive evaluation. Both movements greatly increased the interest of researchers in the process of educational evaluation and contributed significantly to producing a large body of knowledge in this area.

One primary purpose of evaluation in education is "to collect information and gain an understanding of a person in order to provide assistance" (Shertzer & Linden, 1976, p. 6). This definition reflects an aspect of evaluation that is more relative to the instructional process, in that evaluation provides information regarding individual strengths and weaknesses such that provisions may be made for changing specific behaviors. The definition also reflects the interrelationship between teaching, learning, and evaluation. Evaluation plays a vital role in the instructional process by providing information which teachers need to define learning outcomes, instructional objectives, and monitor student progress. In Figure 1, Gronlund (1976, p. 9) uses a simplified instructional model to portray this process.

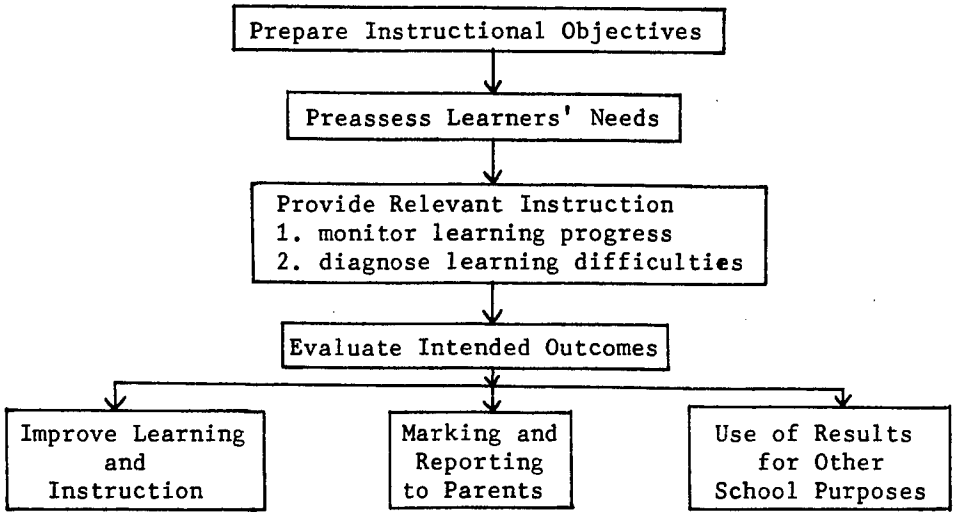


Figure 1. Simplified Instructional Model

Instructional objectives are based upon the desired learning outcome behaviors that are a result of appropriate instruction. Objectives

provide direction for teachers in selecting appropriate methods and materials, and specifying what behaviors should be evaluated after instruction. However, before any instruction occurs, teachers should make a preassessment (evaluation) of the learner's needs. This type of evaluation will indicate strengths and weaknesses so that direct instruction and remediation may be applied. However, implementation of instruction is not an isolated process. Formative evaluation, in the form of informal assessment of skill mastery, is integrated with instruction. Timed math tests and weekly spelling tests are two examples of how this type of evaluation provides continuous feedback to the teacher in regard to the appropriateness of instruction, and both feedback and reinforcement to the student.

The final step, evaluation of intended outcomes, provides summative evaluation information. It is a means by which attainment of instructional objectives and desired outcome behaviors are measured. As indicated in Figure 1, results serve as a basis for improving instruction and learning, informing parents of student progress, and other school purposes. This model emphasizes how evaluation is an integral part of the total instructional process and reinforces the definition of evaluation as described by R. L. Thorndike (1969).

These definitions of evaluation presented here provide only a partial representation of the numerous definitions available, and portray the broad scope of the evaluation process in education. A better idea of the vast application of evaluation in the educational process may be perceived by observing some of the models which have been developed.

Evaluation Models in Education

There are numerous models which have been developed by philosophers and psychometricians. They were developed to provide a structured conceptual framework and systematic application procedures for educators to follow when confronted with an evaluation task. Although there are a variety of models available, some are more applicable to certain educational problems than others. Within this discussion, several of the more prominent models will be reviewed. Since many evaluation models have similar characteristics, one way of looking at them is by grouping together those which have similar orientations. Popham (1975) has suggested four categories which reflect a general orientation for educational evaluation models and several models which fit these categories.

Goal-Attainment Models

Goal-attainment models conceive of evaluation as the determination of the degree to which an instructional program's goals were achieved. This model is closely associated with the work done by Tyler and his efforts in the Eight Year Study of the 1930s. Tyler (1942) emphasized the development of educational goals based upon three sources (the student, society and subject matter, and specifying measurable objectives based upon these goals). When an instructional program is completed, the individuals are measured to determine the extent to which predetermined goals were achieved.

Worthen (1973), using a matrix of various characteristics, presented a comparison of several evaluation models. In describing Tyler's evaluation model, Worthen identified the role of the evaluator as a

curriculum specialist who evaluates as part of curriculum and development assessment. Decision making, in regard to strengths and weaknesses of a curriculum, is based upon pupil performance data. The types of evaluation used are pre and posttest measures, and the criteria used for judging evaluations are based upon clearly stated behavioral objectives with reference to both course content and applied mental processes. Worthen identified the major contribution of this model as being an easy means of assessing whether objectives are achieved and a means of checking the degree of congruence between performance and objectives. The limitations of this model include its tendency to oversimplify the program focus on terminal information, rather than ongoing and preprogram information. This narrow focus places little attention upon the worth of objectives being assessed.

Another model characterized as goal-attainment was proposed by Hammond (1969). In this model, Hammond suggested that innovations are influenced by the interaction of three dimensions of the program. These are the instructional, institutional, and behavioral dimensions and the specific variables from these dimensions. This model is applied by using several steps. In order to carry out a sound evaluation of current programs, an adequate collection of baseline data must be collected before any decision regarding change in innovation and programs can be made.

Step one: First look at the prediction sources; specifically define what should be evaluated.

Step two: Define the descriptive variables within the instructional and institutional dimensions.

Step three: State objectives in behavioral terms and include specification of the behavior to be

achieved by the learner; the conditions under which the behavior will occur; and the acceptable criteria of performance.

Step four: Assess the stated behavioral objective. At this point, adequate measurement tools are identified and put to use.

Step five: Analyze the results of relationships between factors and within factors based upon actual behaviors. The feedback process from outcome behaviors to terminal behaviors allows the evaluator to determine how effectively the program has met the outcomes. The evaluator can then recommend the necessary changes for improvement. (p. 13)

In Hammond's model the evaluator serves as a consultant who provides expertise in data collection and a trainer for local evaluators. Decisions regarding instructional, institutional, and behavior dimensions are based upon evaluation data of actual student performance. The criteria for judging the evaluations is based upon the identified behavioral objectives as an ongoing process and provides feedback on the achievement of stated goals.

Worthen (1973) suggested that the major contributions of this model include that while using local personnel to carry out the evaluation process it incorporates several dimensions and variables to be used in the analysis, and that specification and assessment of behavioral objectives within the evaluation process allows feedback for program development and revision. The limitations of this model relate to the possible difficulty in quantifying data related to some of its dimensions and variables. For instance, the behavioral dimension includes such factors as cognitive behavior, affective behavior, and psychomotor and perceptual behavior. There has been some contradiction in research literature

regarding the actual reliability and validity of instruments used to measure perceptual behaviors (Carroll, 1972; Sabatino, 1973; Larson & Hammill, 1975). Other limitations of this model include its neglect for judgmental dimensions and its complexity.

A major focus of the two models described under the goal-attainment category is placed upon the development of specific behavioral objectives and their relationship to determining the attainment of program goals and desired outcome behaviors. Given this focus, it is important to address oneself to the two limitations that will significantly affect the type of decisions and revisions that are made in a program. Behavior objectives must be relevant to the goals of the program and the needs of the student involved. This will increase the probability of having a successful program and producing competent individuals. Equally important to this process is the selection and use of appropriate measurement tools. Data gathered by assessment instruments provide the core information upon which decisions will be made. Unless measurement instruments are reliable and valid, appropriateness of decisions regarding programmatic changes will be questionable.

Judgment Models

Judgment models place major emphasis upon professional judgment based upon certain criteria. The two types of judgment models generally focus upon are intrinsic or extrinsic criteria. Criteria intrinsic to the object being evaluated are usually referred to as process criteria. This type of model is most often associated with accreditation procedures such as those used by the North Central Association, and have limited

application to this discussion. Judgment models emphasizing extrinsic criteria or product criteria focus upon the effects of the object under evaluation. The two prominent models that fit this category were developed by Stake (1967) and Scriven (1976).

The "Countenance Model," as described by Stake (1967), stressed the use of descriptions and judgments in the evaluation process. Data collected in these two areas must be relative to three important phases of the educational program, those being the antecedents, transactions, and outcomes of the educational program. This information, in conjunction with the program rationale, Stake contended, will provide the essential information required for the formal evaluation of an educational program. The components of this model are portrayed by two matrices containing 12 cells which provide various types of information from different resources, all of which impact upon the educational decisions to be made (see Figure 2).

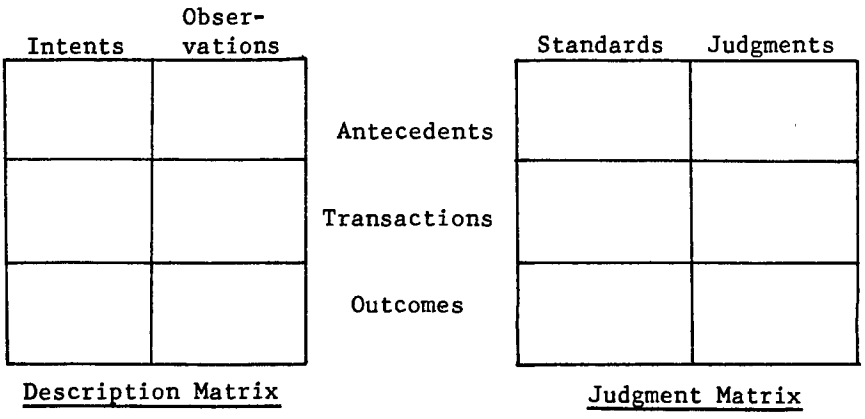


Figure 2. Data and Statements Needed For Educational Evaluation.

The description matrix requires the evaluator to define the goals and intentions of the program in regard to the antecedents, transactions, and outcomes, or specifically intended environmental conditions, planned environmental conditions (planned instruction), and planned outcome behaviors. Once this has been specified, observations of antecedents, transactions, and outcomes are made. In processing these data the evaluator should find logical contingencies within intentions and empirical contingencies within observations. Congruence will exist when observations show that planned intentions have been obtained.

The judgment matrix requires the evaluator to use the descriptive data to make absolute and relative comparisons. Standards of excellence are identified for absolute comparison, and other descriptive program characteristics are presented for relative comparison. Using these comparisons, the evaluator can make judgments and recommendations regarding the merits of the program.

With Stake's model the evaluator's role is to collect, process, and interpret descriptive and judgmental criteria. Descriptive and judgment data and recommendations are summarized in reports and used as a basis for decision making. Worthen (1974) identified three major contributions of Stake's model as being a systematic means of organizing data to show intra and interrelationships, its use of absolute and relative judgments, and the generalizability of its use.

Scriven's recommendations do not constitute a structured framework which flows from one level to the next; rather, he suggests that there are specific concepts and types of evaluation that serve as a frame of reference for educational evaluators. These concepts are identified

as follows:

1. Formative/Summative Distinction. There are two distinct roles of educational evaluation. Formative evaluation focuses upon intrinsic characteristics of an educational program. Here the ongoing instructional program with regard to specific student needs is assessed. These data provides information essential to making decisions regarding a student's strengths and weaknesses, and ways to improve them. Summative evaluation focuses upon extrinsic characteristics, or the effects of a completed instructional sequence. It provides information for educators and administrators to use to decide what changes should be made or when a program should be replaced by a more effective one. This distinction implies a need for different procedures in data collection and data analysis techniques.

2. Quality of Goals. In relation to the formative and summative roles of evaluation, it is imperative for evaluators to determine whether the goals of an educational program are valid and useful. The intent here is that an evaluation has little essence if the goals have remote value to those which the program serves.

3. Payoff Evaluation. This approach is concerned primarily with the effect of the program. Although it has a broad focus, it requires the evaluator to place some attention upon the internal components in order to identify the effects of the program as a whole.

4. Goal-free Evaluation. The goal-free approach is suggested as an alternative to goal-based evaluation. This option, in addition to assessing the quality and attainment of program goals, allows the evaluator to identify unanticipated outcomes and their effect.

5. Comparison Evaluation. The concept of comparative evaluation of educational programs is stressed by Scriven because when a decision is made to replace an educational program, educators must select from competitive alternative programs. Therefore, comparative evaluations provide information regarding the merits of these programs--information that is essential for making appropriate choices.

6. Modus Operandi Method. This approach is suggested by Scriven as an alternative when other experimental approaches cannot be used. It focuses on identifying a causal chain which may link certain events related to an intervention or instruction to the observed effect, and to determine whether these events or other causal links are related to the effect.

The two models described here as judgment models demonstrate the relevance of gathering appropriate information and emphasize how identifying the purpose of evaluation will influence the type of judgment to be made.

Decision Facilitation Models

Decision facilitation models have characteristics that overlap with previously described models. They differ in that the major role of the evaluator is to provide information to the decision maker--someone other than the evaluator. These models are also characterized by their applicability to system-wide or program-wide evaluation, yet all have a component that relates specifically to instruction.

Examples of decision facilitation models include Stufflebeam's (1971) CIPP Model, where four types of evaluation are identified:

(1) context, (2) input, (3) process, and (4) product evaluation. The process and product components are relative to instructional strategies used to attain objectives, and product evaluation involves measurement of the extent to which attained objectives have met desired outcomes or goals.

The goal attainment model described by Hammond (1969) is most reflective of evaluation that is relative to the instructional process because it focuses upon the instructional and behavioral dimensions. The model stresses stating objectives in behavioral terms and assessing the behavior described in the objectives. When assessments are conducted in this manner, decisions are based upon actual behaviors. This is clearly a more definitive procedure for planning and/or revising instruction and educational programming.

The role of systematic evaluation in educational decision making cannot be overstressed. These models, though differing in orientation, represent a conceptualization of the need for: (1) specifying the purpose of dimensions of the evaluation, (2) defining appropriate criteria (goals), (3) utilizing adequate resources, (4) analyzing data and identifying interacting variables, and (5) using information as a basis for suggestions, recommendations, judgments, and decisions.

Evaluation of the Mildly Handicapped

The previous section on evaluation and evaluation models established the fact that systematic collection of evaluation data plays a major role in educational decision making as it relates to the total program, as well as instruction. Evaluation of the handicapped learner

also requires a systematic process whereby academic and nonacademic characteristics of the learner are ascertained. The process is often referred to as diagnosis, and provides a variety of information that is used as a basis for instruction.

In order to provide a systematic framework for conducting diagnostic procedures, several educators have developed models which teachers and diagnosticians may use to organize their findings (Quay, 1968; Iscoe, 1972; Caterall, 1970; Hickey & Hoffman, 1973). Dunn (1968) described a model which contains four simple steps.

Dunn's Model

Dunn (1968) suggested a step-by-step process that allows for continuous use of diagnostic data.

> Step one: Study the child to find what behaviors have been acquired.
>
> Step two: Prepare samples of a sequential program to move the student forward; use different reinforcers under different conditions.
>
> Step three: Determine the best method for teaching the material.
>
> Step four: After a successful prescription is devised it should be communicated to the home school. Failure should be attributed to the program or instruction, but not the student. (p. 12)

Although this model does not point out specific assessment instruments to be used, step one, "study the child," implies the use of assessment instruments or other data collection measures, such as direct observation, in order to collect relevant information regarding the individual's performance.

Quay's Model

Quay (1968) described an information processing model in which various modalities are evaluated in relation to input, response, and reinforcement parameters. Input refers to the information received (visually, auditorally); response refers to the individual's interpretation and reaction to incoming information; reinforcement refers to directing the individual toward the stimulus and the capacity of the reinforcer to reinforce the response. Information processing models of this nature have limited application to skill instruction.

Caterall's Model

Caterall (1970) described a model that is considered to be a service delivery model. The diagnostician focused upon four areas:

1. Environmental interventions--things that can be done around the student.
2. Installed interventions--things done to the student.
3. Assigned interventions--things accomplished by the student.
4. Transactional interventions--things done with the student.

Assessment which focuses on these areas examines not only the student variables, but also environmental and interactional factors that will influence learning.

The diagnostic models suggest an organizational framework and provide guidance for teachers and diagnosticians in their evaluation procedures. However, these models fail to direct the teacher or diagnostician toward specific assessment procedures that relate directly to instructional planning.

An instructional model applicable here, described by Sabatino & Miller (1970) as a diagnostic prescriptive model, was developed by Cartwright, Cartwright, & Ysseldyke (1973). The authors refer to this model as a "decision model." The steps of this model are shown in Figure 3.

The six major steps of this decision model indicate the procedures to be followed by the teacher. The other steps are decision points which allow the teacher to make judgments about the students and give direction for recycling the process. Here, again, specific reference is not made to assessment instruments; however, step one, "identify relevant characteristics of the child," is the point at which teachers can assess the individual's performance. In step two, specific goals are developed from information collected during step one (or assessment). When teaching goals and objectives have been specified, the teacher can identify appropriate teaching strategies and management procedures. Step four allows the teacher to select among the available options those teaching materials which will accomplish identified goals. In step five, the teacher tries the materials and strategies with the student. Actual instruction is provided. In step six, the teacher evaluates the child's performance in relation to the specified goal. Based upon the information collected here, and the objectives made in the previous step, teachers can determine whether instruction was effective. At this point, several questions are raised regarding the appropriateness of goals and instructional strategies. When goals are not met the teacher recycles the steps in the process.

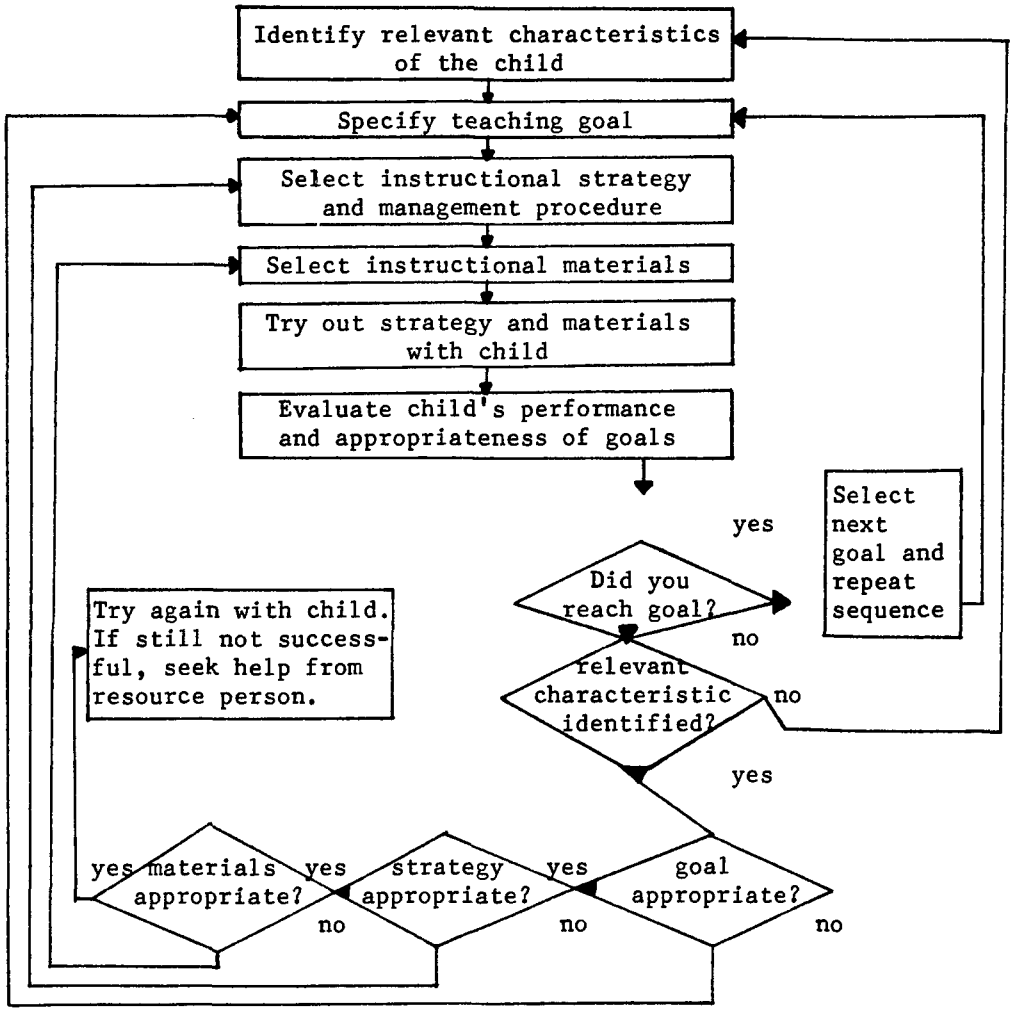


Figure 3. Decision Model For Diagnostic Teaching.

One other teaching model, which is similar to that described by Cartwright et al. (1973), described four simple steps which teachers may use to collect relevant information about individual performance to use for instructional planning. Stephens (1970, 1976) described what is called the Directive Teaching approach.

Directive Teaching Model

Directive Teaching is a skill training approach based upon "a system of instruction that aids those who teach children with learning and behavior difficulties to be effective in academic and social skill instruction while simultaneously responding to the classroom management concerns" (Stephens, 1976, p. 57). The steps in the Directive Teaching model are shown in Figure 4.

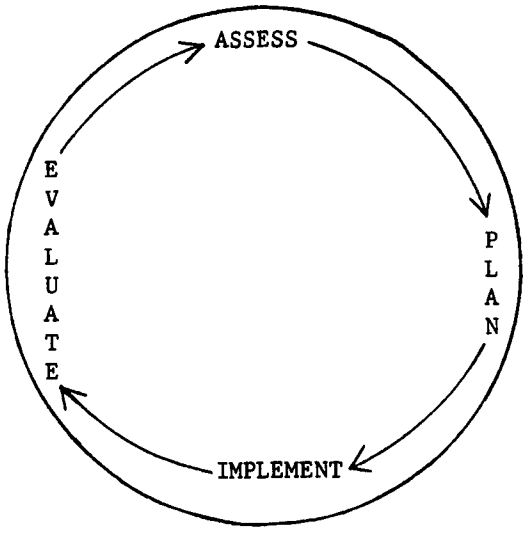


Figure 4. The Directive Teaching Wheel

Stephens recognized that the first step in gathering information about individual performance is to assess. In describing assessment,

Stephens (1976) made the following observations:

> Assessment . . . is a careful observation or testing of responses in academic and social behavior. Its purpose is instructional since it reveals students' specific understandings and skills. (p. 79)

Stephens contended that gathering descriptions of instructionally relevant behavior concerning academic functioning, social behavior, and reinforcement preferences of students is essential. This information should be task specific and written in precise, descriptive terms. Step two requires planning instruction; upon identifying the specific skills and behaviors through assessment, teachers can specify the conditions for completing the task, the level of performance expected, materials and equipment to teach the skill, and incentives that will increase learning of specified skills and behaviors (Stephens, 1982). Step three involves actual teaching; the plan developed in the previous step is carried out. Step four requires an evaluation of the effects of instruction; observation is made of the degree to which the individual's actual performance meets previously determined criteria.

Various diagnostic and instructional models provide a systematic framework which teachers can use to organize information essential to making decisions regarding the instructional process. Few models specifically identify the role of assessment and the importance of selecting appropriate assessment techniques in making instructional decisions.

Using Assessment to Plan Instruction

In its broadest sense, one of the major purposes of providing instructional experiences is to bring about change in the learner's

behavior. Cawley (1977) stated that, "Instruction, the process of teaching, must be designed specifically to meet the unique needs of individuals." In a description of the components of a Psychology of Instruction, Glaser (1976) stated the following:

> Instructional design has an immediate approach which takes seriously the fact that effective instruction requires careful assessment of strengths and weaknesses, styles and background, interests and talents of individual learners. . . . This requires the adaptation of an attitude that looks upon the information obtained as information for improving instruction. (p. 1)

Consequently, assessment of academic and social skill needs of individuals will provide data essential to making decisions regarding appropriate instruction.

A major reason for the great emphasis upon assessment of handicapped learners is that P.L. 94-142 (the Education for the Handicapped Act) requires the preparation of an individualized educational program (IEP) for all individuals requiring special educational services. The basic requirements of the IEP are as follows:

1. A statement of the individual's present educational performance.
2. Annual goal statements.
3. A written description of short-term instructional objectives.
4. The services provided to meet stated objectives.
5. Conditions under which services are provided.
6. Initiation and termination of stated services.
7. Evaluation criteria for measuring the stated objectives.

This requirement for a specified plan of instruction practically guarantees that an evaluation of student needs will be conducted.

Assessment involves making an evaluative, interpretive appraisal of performance (Ysseldyke & Salvia, 1981). More specifically, Stephens (1977) defined assessment as, "A survey of student functioning to determine those responses and skills that are adequate and those yet to be learned or mastered" (p. 145). By identifying specific skills and behaviors, teachers obtain precise information regarding what to teach, and can plan instructional materials and methods around this information. This notion is further supported by Ysseldyke & Salvia (1978), who contend that assessment which allows the unique learning needs of the individual to surface must be linked to instruction.

Data gathered during assessment can serve several decision-making purposes. Assessment data are used for screening decisions, placement decisions, instructional planning, pupil evaluation, and program evaluation (Ysseldyke & Salvia, 1981; Adleman & Taylor, 1983). Algozzine (1979) described assessment by stating:

> The most important purpose of assessment should be programming. Teachers and other professionals who develop systematic instructional programs must do so upon appropriate and relevant assessment information. (p. 1)

The role of assessment in instructional decision making is quite fundamental. Assessment data assists the teacher in planning objectives and procedures for changing the individual's behavior or environment. Consequently, this information serves as a point of departure for academic skill instruction, which is implemented immediately and over a period of time.

Neisworth (1982) described assessment as the key to appropriate instruction because good, informal classroom assessment activities are

virtually synonymous with good classroom instruction. This is further supported by Zigmond, Vallecorsa, & Silverman (1983), who described assessment as:

> A process of collecting information about students and interpreting the likely meaning of that information for educational decision making. Assessment for instructional planning can help the teacher decide what and how to teach . . . and can help to make the teacher more targeted, more precise, more efficient, and more likely to succeed. (p. 1)

Educators appear to agree that assessment is essential to making appropriate educational decisions. One can assume, therefore, that assessment is the primary means through which information to be used for instructional planning should be obtained. One cannot assume, however, that any assessment instrument will provide information that will be appropriate for making instructional decisions. When teachers and diagnosticians are conducting initial assessments they seek information regarding where in-depth assessment and instruction should begin; therefore, careful consideration must be given to the type of instrument used.

Selecting An Assessment Instrument

Traditionally, assessment of student performance is made by administering various tests. In relation to academic skill placement, students are given standardized achievement tests to identify their level of performance. Several studies have shown that a large number of tests are frequently used to make decisions regarding screening, placement, instructional programming, pupil evaluation, and program evaluation (Ysseldyke, Regan, & Schwartz, 1981; Ysseldyke, Mirkin, Thurlow, Polland, & Allen, 1981; Salvia & Ysseldyke, 1981). However, educators in the

field of special education have raised questions regarding the technical adequacy of standardized norm reference tests for making educational decisions for exceptional learners (Ysseldyke & Thurlow, 1979; Salvia & Ysseldyke, 1978; Wallace & Larsen, 1978; Bennett, 1981). This relates to the nature of norming procedures, and assumes that the background experiences and opportunities of individuals being tested are similar to those individuals used to standardize the instrument (Newland, 1980). In support of this, Salvia & Ysseldyke (1981) conducted a study to evaluate evidence of reliability and validity of a number of tests which are frequently used with educationally handicapped individuals. Over 25 tests were considered to have inadequately reported norm, reliability, and/or validity information. This implies that many of the tests used in assessing educationally handicapped individuals may yield information which is an inappropriate assessment of the individual's functioning and is inappropriate for making instructional decisions.

Research findings suggest that some assessment instruments may be more appropriate for making decisions regarding instruction than others. Salvia & Ysseldyke (1978) recommended that assessment devices should be differentiated by the type of decision to be made. Thurlow & Ysseldyke (1979) conducted a study involving 44 Child Service Demonstration Centers to determine the kinds of assessments used, the data collected, and the purpose of their use. Results showed that data most frequently used for instructional programming were: observational data, 74.3 percent; informal devices, 88.6 percent; and criterion-references tests, 89.2 percent.

The notion of differentiating between assessment devices is further supported by Stephens (1973). Stephens identified distinct differences between the uses of standardized tests and criterion referenced tests, as shown in Figure 5.

	Criterion-Referenced Tests	Standardized Tests
Comparison	compares the individual's performance to a criterion	compares the individual's performance to that of other students
Instruction	useful for instructing individuals and groups	useful for curriculum development
Counseling	useful for counseling for immediate activities	useful for counseling students on future planning
Evaluation	useful for evaluating student (performance)	useful for evaluating groups of students
Information	provides specific information to individual students, parents, and teachers	provides information to the public in general concerning schools

Figure 5. Uses of Criterion-Referenced and Standardized Tests.

Assessment data that will be most useful to decisions regarding instructional programming must be specific. However, there are many occasions when teachers only know broad categories within a subject matter area where individuals appear to be experiencing difficulty. At this point, teachers should be able to conduct assessments that make efficient use of time and yield data regarding the student's performance over a broad range of skills. This can be accomplished by administering survey level assessments. Zigmond, Valecorsa, & Silverman (1983) suggested using survey level tests as a means of obtaining a "broad sample of behavior." They identified several advantages of using survey assessments:

1. A behavioral sample may be obtained from a test or other assignment.
2. It provides an overview of the skills the student has mastered and those lacking.
3. The teacher begins to see where the problems lay.
4. By focusing on incorrect responses, teachers can follow-up the survey with a probe and pinpoint deficiencies.

Stephens (1976) has also suggested using surveying, stating that, "Surveying may be used when screening students to determine which ones should be carefully assessed and also at which levels to begin assessing" (p. 89). Surveying can be considered as an "entry level" assessment measure. The information gathered from entry level assessment can be used to identify a point to enter a student in a skill sequence. Once this determination has been made teachers can administer more in-depth assessments, such as criterion-referenced tests developed from the curriculum. This more in-depth assessment can be used to indicate the level of mastery for all skills identified during entry level assessment.

Entry level assessments, as described by Zigmond et al. (1983) and Stephens (1976), can be developed from any body of curriculum. One example is the Criterion Referenced Curriculum (CRC) (Stephens, 1982). The CRC, an instructional system designated to help teachers provide instruction in reading and arithmetic, is based upon the Directive Teaching model (see Figure 4). CRC is an updated revision of the original Directive Teaching Instructional Management System (DTIMS). Magliocca and Stephens (1977) summarized the development of DTIMS components:

Skill statements in reading, arithmetic, and social behavior. Skill statements in reading and arithmetic were identified through a survey of commonly used basal textbooks and grouped within categories by levels of difficulty. Social skills were identified through content analysis of 12 published behavioral checklists, particularly those designed for elementary and special education.

Assessment tasks. Each skill is incorporated into a "criterion referenced" assessment task to assess students' performances prior to teaching the skill. Results of these assessments allow teachers to identify mastered skills, skills being learned, the student's instructional range, and skills which are too difficult.

Instructional strategies. In systematic instruction, teaching is directly related to assessment. Two instructional strategies, all of which were field tested, are provided for each skill. Each contains a skill statement, required student responses, a list of materials, and keyed references to commercial materials for additional instruction and practice.

Evaluation and tracking. After instruction, assessment tasks are used to evaluate teaching effectiveness. Students' performances are recorded showing their level of acquisition at the time of assessment and following instruction. Tracking may be conducted manually with student progress records or through a computerized program. Results of evaluative data indicate skills which need further instruction. The pace of instruction is synchronized with the student's progress. (p. 17)

Several research studies have been conducted supporting the curriculum's content consistency with other programs (Lucus, 1973) and instructional effectiveness with developmentally handicapped and learning disabled students (Quinn, 1980; Romeo, 1974; Merriman, 1974). Stephens, Cooper, & Hartman (1973) describe a study investigating the effect of the directive teaching system on reading performance with two experimental groups and control groups. Pretests and posttest results from the California Achievement Test indicated a significant gain in reading achievement for the experimental group. In a later study, Quinn (1980) examined the effectiveness of DTIMS on the acquisition of basic math

skills with secondary L&BD students. Students were assessed to identify specific skill deficiencies in math. Teachers who had received orientation training in using DTIMS employed the DTIMS teaching strategies, commercial references and games booklet as intervention materials. After mastery of criterion was achieved, post assessments were administered to the students. Results indicated gains from pretest to posttest measures for all classes.

Summary

Chapter II discussed the need for collecting appropriate assessment data prior to making instructional decisions, which has been well established in research literature. Yet, only a limited number of references have been made regarding gathering preassessment information in planning in-depth assessment and instruction. Consideration must be given to the type of assessment instrument to be used in the initial stages of planning. Teachers need an efficient way to identify a variety of skill deficits before in-depth assessment regarding level of mastery can be conducted and before planning instructional methods. It is suggested that surveying entry level skills and behaviors will provide the information necessary for planning in-depth assessment and instruction.

Chapter III describes the two groups of subjects, the setting, and the materials used in this investigation. Procedures used to train testers and to administer the tests to the mildly handicapped and normal groups are described.

CHAPTER III

Methodology

Subjects

The first group of subjects who participated in this study were 100 mildly handicapped students placed in self-contained classes for the Developmentally Handicapped or Specific Learning Disabilities. All subjects were functioning below third-grade level in reading and/or math, and their academic grade placement ranged from kindergarten through sixth grade.

The second group of subjects were 70 normally functioning students served in regular education programs and whose academic grade placement ranged between kindergarten and third grade. The students were selected from summer day care programs for school-aged children. Permission for participation, as well as information regarding the student's age and academic grade placement, was obtained from the parent of each student who participated.

Setting

All mildly handicapped subjects were tested in their individual school setting. In each school an isolated area, i.e., an empty classroom or a school psychologist's office, was used as the test area. These areas provided a quiet setting where subjects could work undistracted.

The normally functioning students were identified through various day care programs for school-aged children. Each center provided an empty classroom or other isolated area where students could work undistracted.

Materials Used

The CRC probe was developed directly from the items and objectives in the "Criterion Referenced Curriculum" (Stephens, 1982). The "Criterion Referenced Curriculum" is a revision of the original "Directive Teaching Instructional Management System" (DTIMS). The CRC is a set of materials that covers basic fundamental skills in reading and math from kindergarten through third grade. CRC is based upon a skill training approach which employs assessment procedures for precise identification of academic skill deficits. The curriculum is structured around four steps: assessment, planning, instruction, and evaluation (Stephens, 1970). The basic objectives of the curriculum are:

1. To develop instructional strategies which will insure systematic instruction.
2. To provide strategies to establish a positive classroom environment.
3. To provide teachers with a systematic way to select, deliver, and record instructional strategies.
4. To monitor and evaluate the effects of instruction on each student.

CRC contains performance objectives and performance criteria, and criterion referenced assessments tasks for 364 skills in math and 267 skills in reading. Each content area has an assessment manual and assessment sheets, instructional strategies manual and worksheets, and progress record forms which allow teachers to monitor pupil progress. The assessment manual and assessment sheets are the components used to construct the CRC reading and math probes. The construction of the probes is described by the following four steps.

Step One - Content and Item Preparation

Six of the seven subcategories in reading and four subcategories in math were combined to form three content areas for the reading and math probes, respectively. These content areas are shown in Figure 6 and Figure 7. The "reading and math skill trees," which are components of the original DTIMS materials, provided a hierarchical listing of the clusters of skills for each subcategory area by grade level. From this list, a pool of items which represent each content area of the reading and math probes was identified. All items were listed in matrices with cells containing from four to 11 items.

Initially, over 130 skills were identified as items for the reading and math probes. As a preassessment instrument, inclusion of 130 items would make the probes too long and time-consuming. The skills were reviewed by the writer and by consultants from the test construction division of Charles E. Merrill Publishing Company. Several factors were taken into consideration during the selection of skills. The test should be short and easy to administer. Those skills which showed consistency

CRC Reading Probe Content

READING READINESS	READING RECOGNITION	COMPREHENSION
1. auditory discrimination	1. phonetic analysis	1. classifying
2. visual discrimination	2. structural analysis	2. labeling
	3. sight words	3. word meaning
		4. main idea

Figure 6. Reading Skills By Subcategory Area.

CRC Math Probe Content

CONTENT	OPERATIONS	APPLICATIONS
1. numbers	1. addition	1. measurement
2. numeration and number systems	2. subtraction	
3. geometric figures	3. multiplication	
4. sets	4. division	

Figure 7. Math Skills By Subcategory Area.

from grade level to grade level within a category area should be selected. Items were narrowed down to 54 items in reading and 46 items in math. These skills are listed in the matrices in Appendix A and Appendix B, and are coded in the skill trees (Appendix D) to show their relative position within the hierarchy of skills. The objectives list for content in the reading and math probes can be found in Appendix C.

In developing the items, consideration was also given to item generation rules (Popham, 1975). These rules suggest generating item specifications which include the following:

1. General descriptions: a brief description of the behavior being assessed.
2. Sample items: this reflects the attributes of the test items.
3. Stimulus attributes: provides limitations of the class of stimulus materials which the examinee may encounter.
4. Response attributes: in this case, provides a class of response options from which the examinee may select an appropriate response.
5. Specification supplement: to provide in certain instances, more detailed information about the test item.

The purpose in writing item specifications is to identify the guidelines to be used in constructing test items that measure the identified behavior. When clear specifications statements have been developed, they may be used by several item writers to construct similar items that

should all measure the same behavior. This information had been previously determined when the CRC assessment tasks were constructed and could easily be identified.

1. General descriptions: the behavioral objective that accompanies each assessment task.
2. Sample item: each assessment task contained several samples, among which one was selected for the CRC probe item.
3. Stimulus attribute: these may be determined by the characteristics of the stimulus selected for each item and the characteristic of other stimuli on the assessment task.
4. Response attributes: acceptable responses were identified in the CRC assessment manual. Student selected response options were developed from those identified as acceptable responses in the assessment manual.

Stimulus materials for each test item were taken directly from the skill assessment in the Criterion Referenced Curriculum. All skills in the curriculum are coded by a number which identifies their position in the skill hierarchy and corresponds with the specific teaching strategies to be used for instruction. The skill assessments in the curriculum are criterion referenced and require several responses per item. Since the probe items would require only one response, only a portion of the CRC skill assessment task was used to generate the stimulus for each item on the probes.

Each CRC assessment task was retrieved and copied to provide a stimulus set for each item in the test matrices. One portion of the assessment task was selected as the stimulus for each test item. An example of how this process was conducted is illustrated in Figure 8.

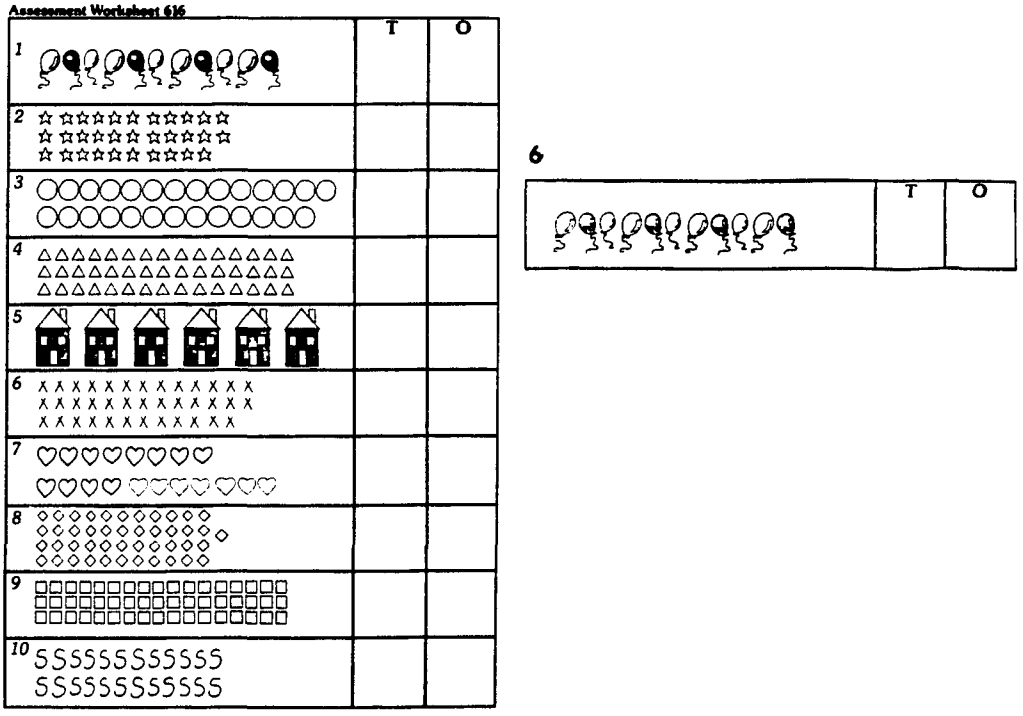


Figure 8. CRC Assessment Task and the Stimulus Selection Process.

Once the stimulus items for each test item were identified, each was copied and formatted by content area and by grade level, as illustrated in the matrices. The first item in each content area begins with kindergarten-level skills, followed by first-, second-, and third-grade level items. All items were numbered consecutively throughout the entire test.

The directions for each item were generated from the appropriate behavioral objective listed in the curriculum and the directions for assessing the skill in the assessment manual. Special effort was given to producing directions that were explicit and would focus the student's attention upon the assessment item. All directions are followed by the correct response to facilitate scoring the items immediately following the student's response.

A response form was constructed to accompany the probe. This form is used by the examiner to score the student's response to each item. The response form has three purposes: (1) it allows the tester to score each item as the test is being administered, (2) the tester can immediately identify the individual's frustration level and discontinue testing or proceed to another section, and (3) it provides a condensed record of the individual's performance and immediate feedback regarding the area and level of performance at which further assessment should be made.

Step Two - Setting the Test Standard

The major purpose of the CRC probe is to serve as a screening device for further assessment in the CRC or other reading programs. The focus is not to establish a level of mastery, but to identify deficit areas within subcategory areas in reading and math. Given this purpose, the use of standard setting procedures suggested by Nedelsky (1954), the "Borderline-Group Method" or "Contrasting-Group Method," are inappropriate. These methods are most applicable to Criterion Referenced tests whereby mastery of performance is being assessed.

After reviewing several screening instruments, such as the Peabody Individual Achievement Test, Wide Range Achievement Test, Key Math, and several others, the investigator found that most of these instruments set their ceiling levels at three to four consecutive incorrect responses. At this point, the researcher prepared a sample form of the test to determine solely if a similar pattern could be obtained. After administering the test to two students (one kindergarten and one second-grade student) it was observed that this rule would be appropriate. After consulting with other assessment experts, the investigator decided to establish a "discontinue rule" whereby four consecutive incorrect responses should be the level at which testing should be discontinued for each content area in reading and math. Furthermore, since the skills on the probe are hierarchically arranged and represent clusters of skills, four consecutive errors would represent a wide range of skills along the skill continuum that would require more direct assessment.

Step Three - Constructing the Test Manual

The test manual was constructed to provide information regarding the characteristics of the test, the purpose, time allowance, preliminary instructions for administering the test, scoring, and interpreting test results. A copy of the test manual, the CRC reading and math probes and their directions, are found in Appendices E - I.

Step Four - Procedure
For Training Examiners

Two individuals were selected to assist in administering the test to the normally functioning students. The individuals were a Master's degree student in Child Development and a Doctoral candidate in Early and Middle Childhood Education. These individuals were both former teachers with 3 and 6 years' teaching experience, respectively.

Examiners met with the investigator for 1½ hours. They were presented with a copy of the manual, a set of directions, and copies of the reading and math probes. The investigator reviewed the manual with the examiners, discussed the items and directions, and described how the testing environment should be arranged. The investigator also demonstrated several items where the examiner may have been required to provide a brief explanation of the item to the student. Examiners were requested to review the materials and to contact the investigator if any questions arose.

Procedures For Testing the
Mildly Handicapped Group

The investigator met with the Director of Special Education Programs for Columbus Public Schools in order to identify programs which served students in kindergarten through third grade, and to discuss the requirements for the study. The director provided a list of eight schools, and made initial contact with the principals and teachers. The investigator later contacted the principals and scheduled a time to discuss the project with those who expressed willingness to participate. Teachers were given a description of the characteristics of the students

needed to determine how many students in their classes would qualify. Teachers also described their class schedules and identified times when testing would be most convenient. In most instances, all of the students in each class fit the description of students needed for the study. In those instances, all students in the class were tested. Table 1 indicates each school, grade range, and the type of students involved in this study.

Table 1

Identification of School, Grade Range, and Type of Students

School	Grade Range	Program	No.
Broadleigh Elementary	K - 3	Developmentally Handicapped	23
Parkmoor Elementary	K - 3	Developmentally Handicapped	12
Devonshire Elementary	K - 3	Learning Disabilities	13
Como Elementary	K - 3	Learning Disabilities	11
Hubbard Elementary	K - 3	Learning Disabilities	16
Gladstone Elementary	4 - 6	Developmentally Handicapped	7
	4 - 6	Learning Disabilities	3
Weinland Park Elem.	4 - 6	Developmentally Handicapped	11
	4 - 6	Learning Disabilities	4
TOTAL			100

Upon arriving at each school, the investigator checked the assigned testing area and set up the seating arrangements and materials. The classroom teacher introduced the investigator to the students,

explained that we would be working in reading and math, and selected a student to be tested.

As the investigator took each individual to the test area, a short conversation was initiated to establish rapport and to make the student feel comfortable. The investigator introduced the session by informing the subject to listen carefully to the directions and to mark the correct response in the booklet. The subject was told to inform the investigator when a problem was encountered that s/he could not perform, and they would proceed to the next item. The purpose of this instruction was to discourage the student from guessing. The subject was told that s/he may or may not be required to complete the entire booklet.

The investigator read the directions for each item to the subject. After the subject marked the answer, the investigator recorded the response on the response form. If the subject appeared confused, the investigator repeated the directions or asked the subject if s/he knew how to answer the question. If the response was "no," the investigator scored the item as incorrect and proceeded. The subject was allowed at least 2 minutes to respond to an item. Testing continued until it was observed that four consecutive incorrect responses were made. At this point, the investigator turned the test booklet to the next section and resumed testing. When the subject concluded each test, the investigator praised the subject for working very hard, returned the subject to class, and selected another subject. The same procedure was followed for each subject. The investigator made notation of the amount of time each subject required to complete each test. A daily log was also kept to allow the investigator to identify any problems that arose, to identify items

that were unclear and needed further explanation, and to record other relevant observations. The procedure was repeated at each school with all subjects.

Procedures For Testing the Normally Functioning Students

The investigator met with directors of several day care centers which provided programs for "school-aged" children to discuss the project and determine their willingness to participate. As an incentive, Merrill Publishing generously agreed to provide $5 of materials to each center for each subject to participate in the study. Parent permission forms were disseminated to parents by the day care directors. The forms gave a brief description of the study, requested information regarding the child's age, date of birth, and grade placement. When forms were returned, the investigator met with the directors and scheduled a time for testing. Once the testing schedules were determined, the investigator contacted the examiners to specify when and where they would be testing.

The procedure as previously described for testing the mildly handicapped group was used in testing the normally functioning group.

The investigator accompanied each examiner to their initial testing site. This was done so that the investigator would be available to assist the examiner if any problems arose, and to increase the number of students that could be tested within a given testing session. The seven centers which participated provided 70 individuals who were individually tested by the investigator and the two examiners during a 2 week period.

Summary

Chapter III described the methodology and procedures used to conduct this study. A description of test construction procedures and training provided for examiners were given. The procedures used for selection of subjects, testing environment, and administration of the test were described.

Chapter IV describes the results ascertained from this study. This chapter presents an examination of item analysis data and statistical analysis of test scores and group performances in order to address each research question.

CHAPTER IV

DATA ANALYSIS

Results

Test results for the CRC Reading and Math Probes are presented in three parts: part one describes the characteristics of the sample, part two describes the analysis of the test items, and part three describes the performance of the groups.

The number of male and female subjects in each of the three groups is presented in Table 2. The grade levels represented within each category are presented in Table 3. A summary of Tables 2 and 3 indicates that the majority of the subjects were males and the mean grade level for the total group was 2.1.

Table 2

Description of the Number of Male and Female Subjects by Label

	Male	Female	% Total
DH	29	24	31.2
LD	35	12	27.6
Norm	30	40	41.2
TOTAL	94	76	100.0

Table 3

Description of Grade Levels and Grade Mean by Label

	K	1st	2nd	3rd	4th	5th	6th	$\bar{x}$	SD
DH	1	8	10	16	6	11	1	3.0	1.45
LD	0	2	14	22	5	3	1	2.9	1.01
Norm	26	23	13	8	--	--	--	1.0	1.01
TOTAL	27	33	37	46	11	14	2	2.18	1.50

Table 4 and Table 5 report the range of scores in reading and math, and the percent of the total group attaining that score. A summary of Tables 4 and 5 indicates that the range of scores in reading was much greater than the range of scores in math. This suggests greater variability in the total group performance on the reading probe.

Table 4

Total Score Percentages for the Reading Total Test

Total Score	%	Total Score	%	Total Score	%	Mean Score Total	SD	Median
11	.6	25	2.9	39	5.9	34.00	10.40	36.9
12	2.4	26	1.8	40	4.1			
13	.6	27	1.8	41	5.3			
14	1.2	28	2.4	42	3.5			
15	.6	29	.6	43	4.1			
16	1.2	30	1.2	44	3.5			
17	1.2	31	.6	45	5.3			
18	1.8	32	.6	46	2.9			
19	2.4	33	3.5	47	4.1			
20	2.4	34	3.5	48	2.4			
21	2.4	35	4.1	50	.6			
22	4.1	36	2.4	52	1.2			
23	.6	37	2.9					
24	2.4	38	5.3					

Table 5

Total Score Percentages for the Math Total Test

Total Score	%	Total Score	%	Total Score	%	Mean Score Total	SD	Median
7	1.2	19	3.5	31	4.1	22.01	7.9	22.07
8	.6	20	2.4	32	1.8			
9	.6	21	4.7	33	1.8			
10	1.8	22	4.1	34	1.2			
11	5.3	23	4.1	35	1.2			
12	2.9	24	5.3	36	2.4			
13	4.7	25	4.7	37	.6			
14	4.7	26	5.9	40	1.2			
15	4.7	27	2.9	42	.6			
16	1.8	28	4.1	44	.6			
17	5.9	29	1.8					
18	2.9	30	4.1					

In order to test research question 1, procedures to analyze test items were computed. The results of an analysis of the items are presented in the following tables. Table 6 reports the number and percent of items scored as correct, incorrect, or no response for the total reading test, and Table 7 reports the number and percent of items scored as correct, incorrect, and no response for the total math test. A summary of Tables 6 and 7 indicates that there are a number of items in reading and math which were not responded to by a substantial number of subjects.

Analysis of item response data shown in Table 8 reports the specific items which were missed by at least 50 percent of the students responding to them. Table 9 shows the specific items which received no response from at least 40 percent of the subjects responding to them. Although the percentage of incorrect responses fluctuates within a subcategory, note that the percent of no response observations increases with each subsequent item. This suggests that as items become

Table 6

Number and Percent of Correct, Incorrect, and No Response Observations for Each Item in Reading

	Item No.	Correct Responses	%	Incorrect Responses	%	No Response	%
Readi-	1	157	92.4	13	7.6	--	--
ness	2	147	86.5	23	13.5	--	--
	3	164	96.5	6	3.5	--	--
	4	154	90.6	16	9.4	--	--
	5	119	70.0	50	29.4	1	.6
	6	120	70.6	49	28.8	1	.6
	7	164	96.5	5	2.9	1	.6
	8	162	95.3	7	4.1	1	.06
Word	9	151	88.8	19	11.2	--	--
Recog-	10	123	72.4	47	27.6	--	--
nition	11	163	95.9	6	3.5	1	.6
	12	156	91.8	13	7.6	1	.6
	13	137	80.6	31	18.2	2	1.2
	14	143	84.1	25	14.7	2	1.2
	15	125	73.5	43	25.3	2	1.2
	16	150	88.2	17	10.0	3	1.8
	17	57	33.5	108	63.5	5	2.9
	18	95	55.9	68	40.0	7	4.1
	19	146	85.9	12	7.1	12	7.1
	20	49	28.8	108	63.5	13	7.6
	21	53	31.2	99	58.2	18	10.6
	22	77	45.3	73	42.9	20	11.8
	23	11	6.5	138	81.2	21	12.4
	24	82	48.2	13	7.6	75	44.1
	25	47	27.6	45	26.5	78	45.9
	26	10	5.9	79	46.5	81	47.6
	27	4	2.4	82	48.2	84	49.4
	28	68	40.0	17	10.0	85	50.0
	29	9	5.3	70	41.2	91	53.5
	30	20	11.8	55	32.4	95	55.9
Compre-	31	168	98.8	2	1.2	--	--
hension	32	168	98.8	2	1.2	--	--
	33	150	88.2	20	11.8	--	--
	34	167	98.2	3	1.8	--	--
	35	167	98.2	3	1.8	--	--
	36	163	95.9	7	4.1	--	--
	37	147	86.5	23	13.5	--	--

Table 6 (continued)

	Item No.	Correct Responses	%	Incorrect Responses	%	No Response	%
Compre-	38	153	90.0	16	9.4	1	.6
hension	39	102	60.0	67	39.4	1	.6
	40	114	67.1	53	31.2	3	1.8
	41	69	40.6	89	52.4	12	7.1
	42	96	56.5	59	34.7	15	8.8
	43	90	52.9	52	30.6	28	16.5
	44	89	52.4	49	28.8	32	18.8
	45	108	63.5	26	15.3	36	21.2
	46	100	58.8	32	18.8	38	22.4
	47	101	59.4	28	16.5	41	24.1
	48	86	50.6	40	23.5	44	25.9
	49	76	44.7	50	29.4	44	25.9
	50	81	47.6	42	24.7	47	27.6
	51	73	42.9	47	27.6	50	29.4
	52	103	60.6	12	7.1	55	32.4
	53	102	60.0	10	5.9	58	34.1
	54	80	47.1	31	18.2	59	34.7

Table 7

Number and Percent of Correct, Incorrect, and No Response Observations for Each Item in Math

	Item No.	Correct Responses	%	Incorrect Responses	%	No Response	%
Content	1	170	100.0	--	--	--	--
	2	169	99.4	1	0.6	--	--
	3	140	82.4	30	17.6	--	--
	4	137	80.6	33	19.4	--	--
	5	142	83.5	28	16.5	--	--
	6	46	27.1	124	72.9	--	--
	7	133	78.2	33	19.4	4	2.4
	8	64	37.6	98	57.6	8	4.7
	9	115	67.6	44	25.9	11	6.5
	10	63	37.1	91	53.5	16	9.4
	11	87	51.2	67	39.4	16	9.4
	12	70	41.2	75	44.1	25	14.7
	13	32	18.8	109	64.1	29	17.1
	14	87	51.2	40	23.5	43	25.3
	15	22	12.9	99	58.2	49	28.8
	16	7	4.1	106	62.4	57	33.5
Opera-	17	110	64.7	59	34.7	1	.6
tions	18	161	94.7	9	5.3	--	--
	19	98	57.6	72	42.4	--	--
	20	43	25.3	127	74.7	--	--
	21	74	43.5	91	53.5	5	2.9
	22	87	51.2	77	45.3	6	3.5
	23	76	44.7	43	25.3	51	30.0
	24	49	28.8	65	38.2	56	32.9
	25	51	30.0	61	35.9	58	34.1
	26	32	18.8	76	44.7	62	36.5
	27	51	30.0	42	24.7	77	45.3
	28	6	3.5	70	41.2	94	55.3
	29	14	8.2	58	34.1	98	57.6
	30	24	14.1	37	21.8	109	64.1

Table 7 (continued)

	Item No.	Correct Responses	%	Incorrect Responses	%	No Responses	%
Applica-	31	168	98.8	2	1.2	--	--
tions	32	141	82.9	29	17.1	--	--
	33	139	81.8	31	18.2	--	--
	34	59	34.7	111	65.3	--	--
	35	165	97.1	5	2.9	--	--
	36	111	65.3	59	34.7	--	--
	37	166	97.6	4	2.4	--	--
	38	145	85.3	25	14.7	--	--
	39	25	14.7	145	85.3	--	--
	40	47	27.6	121	71.2	2	1.2
	41	101	59.4	66	38.8	3	1.8
	42	21	12.4	136	80.0	13	7.6
	43	17	10.0	104	61.2	49	28.8
	44	19	11.2	98	57.6	53	31.2
	45	17	10.0	90	52.9	63	37.1
	46	45	26.5	4	2.4	121	71.2

Table 8

Items With Most Frequent Incorrect Observations in Reading and Math

	Item No.	Incorrect Responses	%	No Responses	%
Reading	17	108	63.5	5	2.9
Word	20	108	63.5	13	7.6
Recog-	21	99	58.2	18	10.6
nition	23	138	81.2	21	12.4
	41	89	52.4	12	7.1
Compre-	6	124	72.9	--	--
hension	8	98	57.6	8	4.7
Math	10	91	53.5	16	9.4
Content	13	109	64.1	29	17.1
	15	99	58.2	49	28.8
	16	106	62.4	57	33.5
Math	20	127	74.7	--	--
Operations	21	91	53.5	--	--
Applica-	34	111	65.3	--	--
tions	39	145	85.3	--	--
	40	121	71.2	2	1.2
	42	136	80.0	13	7.6
	43	104	61.2	49	28.8
	44	98	57.6	53	31.2
	45	90	52.9	63	37.1

Table 9

Items With Most Frequent No Response Observations in Reading and Math

	Item No.	No Response	%
Reading	24	75	44.1
Word	25	78	45.9
Recognition	26	81	47.6
	27	84	49.4
	28	85	50.0
	29	91	53.5
	30	95	55.9
Math	27	77	45.3
Operations	28	94	55.3
	29	98	57.6
	30	109	64.1
Applications	46	121	71.2

more difficult, more students reach the ceiling criteria before gaining the opportunity to respond to more difficult items. Consequently, fewer students responded to the entire tests.

Pearson's correlation coefficient was computed to compare each reading item to the total test score. Results of this procedure are reported in Table 10. The correlation for reading subtest items to each reading subtest score is reported in Table 11. Table 12 reports the correlation between math items and the total math score. Table 13 reports the correlation between the math items and each total subtest. A summary of Tables 10 - 13 indicates that most items on the reading and math probes have adequate correlation coefficients.

A coefficient of .40 or higher indicates items with acceptable reliability. Coefficient alpha reliability for the total test in reading was computed (Cronbach, 1951). Six items on the test had zero variance, in that over 90 percent of all students scored the items correctly. Based upon the remaining 48 items, the reading total test reliability was .63. Reliability for the readiness subtest was .39; reliability for the word recognition subtest was .51; reliability for the comprehension subtest was .57. Reliability was computed for the total math test and each math subtest. The total math reliability was .71; reliability for the content subtest was .47; reliability for the operations subtest was .42; and reliability for the applications subtest was .41. Although the reliability for the readiness subtest might be considered low in relation to the total test score, overall the reliability coefficients indicate the reading and math tests are reliable measures of reading and math skills.

Table 10

Pearson Correlation Between Reading Items and Total Test Score

Item No.	Correlation	Item No.	Correlation
1	0.37	28	0.20
2	0.18	29	0.17
3	0.18	30	0.12
4	0.27	31	0.02
5	0.20	32	0.12
6	0.17	33	0.07
7	0.20	34	0.12
8	0.37	35	0.18
9	0.37	36	0.25
10	0.38	37	0.56
11	0.30	38	0.51
12	0.40	39	0.43
13	0.53	40	0.67
14	0.33	41	0.37
15	0.28	42	0.52
16	0.49	43	0.54
17	0.38	44	0.39
18	0.73	45	0.49
19	0.30	46	0.38
20	0.48	47	0.53
21	0.46	48	0.44
22	0.71	49	0.53
23	0.20	50	0.25
24	0.50	51	0.29
25	0.38	52	0.17
26	0.30	53	0.26
27	0.33	54	0.26

Table 11

Pearson Correlation Between Reading Subtest Items and Total Subtest Scores

	Item No.	Correlation	Item No.	Correlation
Readiness	1	0.37	5	0.34
	2	0.29	6	0.32
	3	0.21	7	0.26
	4	0.30	8	0.28
Word Recognition	9	0.44	20	0.61
	10	0.43	21	0.56
	11	0.33	22	0.77
	12	0.37	23	0.27
	13	0.51	24	0.47
	14	0.41	25	0.54
	15	0.36	26	0.27
	16	0.47	27	0.39
	17	0.44	28	0.16
	18	0.73	29	0.21
	19	0.24	30	0.39
Comprehension	31	0.34	43	0.61
	32	0.15	44	0.48
	33	0.08	45	0.61
	34	0.13	46	0.42
	35	0.15	47	0.55
	36	0.28	48	0.53
	37	0.59	49	0.65
	38	0.54	50	0.46
	39	0.44	51	0.49
	40	0.72	52	0.27
	41	0.43	53	0.42
	42	0.50	54	0.38

Table 12

Pearson Correlation Between Math Items and Total Test Score

Item No.	Correlation	Item No.	Correlation
1	.99	24	0.47
2	--	25	0.51
3	0.14	26	0.54
4	0.46	27	0.44
5	0.52	28	0.39
6	0.48	29	0.53
7	0.30	30	0.41
8	0.45	31	0.03
9	0.37	32	0.36
10	0.41	33	0.05
11	0.41	34	0.40
12	0.07	35	0.09
13	0.52	36	0.46
14	0.45	37	0.12
15	0.31	38	0.21
16	0.20	39	0.50
17	0.15	40	0.39
18	0.28	41	0.50
19	0.54	42	0.41
20	0.38	43	0.47
21	0.60	44	0.45
22	0.59	45	0.36
23	0.37	46	0.16

Table 13

Pearson Correlation Between Math Subtests and Total Math Score

	Item No.	Correlation	Item No.	Correlation
Content	1	.99	9	0.27
	2	-0.02	10	0.31
	3	0.20	11	0.43
	4	0.41	12	0.17
	5	0.43	13	0.35
	6	0.45	14	0.23
	7	0.31	15	0.21
	8	0.49	16	0.25
Operations	17	0.21	24	0.54
	18	0.26	25	0.58
	19	0.62	26	0.65
	20	0.43	27	0.53
	21	0.66	28	0.41
	22	0.66	29	0.59
	23	0.40	30	0.50
Application	31	0.09	39	0.58
	32	0.40	40	0.55
	33	0.12	41	0.48
	34	0.53	42	0.48
	35	0.08	43	0.46
	36	0.50	44	0.53
	37	0.19	45	0.46
	38	0.28	46	0.20

The analysis of the performance of the three groups is reported in the following tables. The means and standard deviations for the reading total test and reading subtests for each group are reported in Table 14. The math total test and math subtest score means and standard deviations for each group are reported in Table 15. In order to test research questions 3 and 4, an analysis of covariance was computed for the total test score and subcategory scores in reading and math to determine whether mean scores, adjusted for grade differences for each group, were significantly different.

The Tukey post hoc procedure was used to compare differences between groups. Tables 16 through 31 report the ANCOVA, adjusted mean scores, and post hoc comparisons between groups. ANCOVA results indicated significant differences among groups on the reading scale ($F = 37.31$; $df = 2,166$; $p < .01$) (see Table 16). Post hoc comparisons indicated a significant difference between the LD and DH groups, between the normal and DH groups, and between the normal and LD groups (see Table 17). ANCOVA results indicated significant differences between groups on the readiness scale ($F = 6.04$; $df = 2,166$; $p < .03$) (see Table 18). Post hoc comparisons indicated a significant difference between the LD and DH groups and between the DH and normal groups, but no significant difference between the LD and normal groups (see Table 19). ANCOVA results indicated significant differences among groups on the word recognition scale ($F = 33.51$; $df = 2,166$; $p < .001$) (see Table 20). Post hoc comparisons indicated a significant difference between the LD and DH groups, between the normal and DH groups, and between the normal and LD groups (see Table 21). ANCOVA results indicated significant

Table 14

Means and Standard Deviations for Reading
Total Test and Subtest by Group

	Reading		Readiness		Word Recognition		Comprehension	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
DH	30.26	10.71	6.58	1.10	9.37	4.50	14.13	6.09
LD	38.36	8.03	7.85	3.10	11.78	3.95	19.19	4.46
Norm	33.90	10.57	6.98	1.30	11.74	4.25	15.74	6.27
TOTAL GROUP	34.00	10.40	7.10	2.00	11.01	4.39	16.19	6.06

Table 15

Means and Standard Deviations for Math
Total Test and Subtest by Group

	Math		Content		Operations		Applications	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
DH	19.17	6.77	7.28	2.34	4.37	3.11	7.52	2.63
LD	28.89	7.13	11.19	4.96	7.44	3.13	8.91	2.50
Norm	20.88	7.78	8.37	3.20	4.25	3.18	8.11	2.56
TOTAL GROUP	22.01	7.90	8.81	3.88	5.17	3.43	8.15	2.60

Table 16

Analysis of Covariance for Reading for the Label Main Effect

Source	ss	df	ms	F	F
Label	4445.05	2	2222.52	37.31	.001
Residual	9888.90	166	59.57	--	--

Table 17

Adjusted Means and Post Hoc Comparisons for Reading Total Test Scores

	DH	LD	Normal
	Adjusted Means = 25.60	Adjusted Means = 34.34	Asjusted Means = 40.11
DH	--	8.76**	14.50**
LD	--	--	5.74**
Norm	--	--	--

*p < .05
**p < .01

Table 18

Analysis of Covariance for Readiness
for Label Main Effect

Source	ss	df	ms	F	F
Label	45.24	2	22.62	6.04	.003
Residual	621.39	166	3.74	--	--

Table 19

Adjusted Means and Post Hoc Comparisons for
Readiness Subtest Scores

	DH	LD	Normal
	Adjusted Means = 6.33	Adjusted Means = 7.63	Adjusted Means = 7.33
DH	--	1.30*	1.00*
LD	--	--	.30
Normal	--	--	--

*p <.05
**p <.001

Table 20

Analysis of Covariance for Word Recognition for Label Main Effect

Source	ss	df	ms	F	F
Label	837.26	2	418.63	33.51	.001
Residual	2073.53	166	12.49	--	--

Table 21

Adjusted Means and Post Hoc Comparisons for Word Recognition Subtest Scores

	DH	LD	Normal
	Adjusted Means = 7.60	Adjusted Means = 10.27	Adjusted Means = 14.11
DH	--	2.67**	6.11**
LD	--	--	3.84**
Normal	--	--	--

*p < .05
**p < .01

differences among groups on the comprehension scale ($F = 34.83$; $df = 2,166$; $p < .001$) (see Table 22). Post hoc comparisons indicated a significant difference between the LD and DH groups, the normal and DH groups, and a significant difference between the LD and normal groups (see Table 23). ANCOVA results on the math scale indicated a significant difference between groups ($F = 45.18$; $df = 2,166$; $p < .001$) (see Table 24). Post hoc comparisons indicated a significant difference between the LD and DH groups, between the normal and DH groups, but no significant difference between the LD and normal groups (see Table 25).

ANCOVA results indicated a significant difference between groups on the content scale ($F = 24.96$; $df = 2,166$; $p < .01$) (see Table 26). Post hoc comparisons indicated a significant difference between the LD and DH groups, between the normal and DH groups, but no significant difference between the normal and LD groups (see Table 27). ANCOVA results indicated a significant difference between groups on the operations scale ($F = 33.15$; $df = 2,166$; $p < .01$) (see Table 28). Post hoc comparisons indicated a significant difference between the LD and DH groups, the normal and DH groups, but no significant difference between the normal and LD groups (see Table 29). ANCOVA results on the applications scale indicated a significant difference among groups ($F = 22.92$; $df = 2,166$; $p < .01$) (see Table 30). Post hoc comparisons indicated a significant difference between the LD and DH groups, between the LD and normal groups, and between the normal and DH groups (see Table 31).

Table 22

Analysis of Covariance for Comprehension for Label Main Effect

Source	ss	df	ms	F	F
Label	1392.99	2	696.49	34.83	.001
Residual	3318.93	166	19.99	--	--

Table 23

Adjusted Means and Post Hoc Comparisons for Comprehension Subtest Scores

	DH	LD	Normal
	Adjusted Means = 11.45	Adjusted Means = 16.89	Adjusted Means = 19.31
DH	--	5.44**	7.86**
LD	--	--	2.42*
Normal	--	--	--

*$p < .05$
**$p < .01$

Table 24

Analysis of Covariance for Math for the Label Main Effect

Source	ss	df	ms	F	F
Label	2606.09	2	1303.04	45.18	.001
Residual	4787.41	166	28.84	--	--

Table 25

Adjusted Means and Post Hoc Comparisons for Math Total Test Scores

	DH	LD	Normal
	Adjusted Means = 15.53	Adjusted Means = 23.78	Adjusted Means = 25.73
DH	--	8.25*	10.20*
LD	--	--	1.95
Normal	--	--	--

*p < .05
**p < .01

Table 26

Analysis of Covariance for Content for Label Main Effect

Source	ss	df	ms	F	F
Label	505.38	2	252.69	24.96	.001
Residual	1680.06	166	10.21	--	--

Table 27

Adjusted Means and Post Hoc Comparisons for Content Subtest Scores

	DH	LD	Normal
	Adjusted Means = 6.06	Adjusted Means = 10.14	Adjusted Means = 10.00
DH	--	4.08**	3.94**
LD	--	--	.14
Normal	--	--	--

*p <.05
**p <.01

Table 28

Analysis of Covariance for Operations for Label Main Effect

Source	ss	df	ms	F	F
Label	357.60	2	178.80	33.15	.001
Residual	895.33	166	5.39	--	--

Table 29

Adjusted Means and Post Hoc Comparisons for Operations Subtest Scores

	DH	LD	Normal
	Adjusted Means = 2.82	Adjusted Means = 6.11	Adjusted Means = 6.34
DH	--	3.29**	3.52**
LD	--	--	.23
Normal	--	--	--

*p < .05
**p < .01

Table 30

Analysis of Covariance for Applications for Label Main Effect

Source	ss	df	ms	F	F
Label	199.67	2	99.83	22.92	.001
Residual	722.92	166	4.35	--	--

Table 31

Adjusted Means and Post Hoc Comparisons for Applications Subtest Scores

	DH	LD	Normal
	Adjusted Means = 6.42	Adjusted Means = 7.97	Adjusted Means = 9.58
DH	--	1.55**	3.18**
LD	--	--	1.61**
Normal	--	--	--

*p < .05
**p < .01

Summary

The data analysis presented in Chapter IV described the 170 subjects used in this study. The normal group represented the largest (41.2) percent, and the majority of all students (44.2 percent) was in kindergarten through third grade. Statistical procedures conducted to analyze the test items and test reliability indicated that reliability coefficients for the reading and math tests were moderately adequate. However, revising items with very low values will increase the test's reliability coefficient. Analysis of group performance confirmed that the reading and math tests identify differences among DH, LD, and normal group performance, and identify individual academic deficits within each group.

Chapter V presents the test results and implications for future research.

CHAPTER V

SUMMARY, RESULTS, AND RECOMMENDATIONS

Summary

The purpose of this investigation was to develop a preassessment (entry level) instrument in reading and math for the Criterion Referenced Curriculum which would identify skill deficit areas, thus providing information for in-depth assessment and instructional planning, and to answer the following research questions:

1. Can a reliable entry level assessment instrument be developed for the Criterion Referenced Curriculum?
2. Does the instrument reliability identify skill deficit areas in reading and math?
3. Does the instrument identify the functional skill deficits of mildly handicapped and normally functioning students in reading and math?
4. Does the instrument measure difference between group functioning?
5. Does the instrument have content validity?

The investigator constructed the reading and math probes from the materials in the CRC. Steps were taken to identify programs serving mildly handicapped students ranging from kindergarten through grade six, and normally functioning students in kindergarten through grade

three. The investigator administered the test to 100 mildly handicapped subjects over a 3 week period. Two testers were trained to help administer the tests to the normally functioning group. The investigator and the testers administered the tests to 70 normally functioning students over a 2 week period. Statistical procedures were used to analyze student performances to determine test reliability.

Results

Research questions 1 and 2 relate to the instrument's reliability. A moderately acceptable level of reliability was established for both reading and math instruments. Although reliability coefficients were low, several factors should be taken into consideration.

The reading and math instruments were administered to 170 subjects of differing grade and ability levels. Only 73 students responded to an adequate number of reading items to allow calculation of the reliability statistic. Only 26 subjects responded to an adequate number of math items to allow calculation of the math reliability statistic. Therefore, it is reasonable to assume that both tests would obtain low reliability coefficients based upon these restricted samples. Observations from the frequency data indicated that only 27 LD subjects and 14 normal subjects completed the tests with less than 4 no response items recorded. Observations from item frequency data reported in Table 8 indicated that there were 5 reading items and 15 math items where 50 percent of the subjects answered incorrectly or gave no response. These items may be inappropriate for the subjects taking the test. There were 7 items in reading, 6 were third-grade level

word recognition items, where at least 40 percent of the subjects gave no response, and 5 items in math, 4 were third-grade level operations items, where 40 percent of the subjects gave no response (see Table 9). This demonstrates the increasing difficulty of items. There were 21 of 54 reading items, and 17 of 46 math items, where at least 10 percent of the subjects gave no response. The implication here is that a large number of subjects met the four consecutive error ceiling prior to attempting these items. This shortened the length of the test for a number of students.

The investigator believes the factors previously described had a significant impact upon the reliability coefficients obtained. Test reliability and item correlation calculations are based upon correlation between the total test score and item values. There were a number of instances where item mean values were low because a fewer number of students responded to these items on the total test. Also, the length of the test varied for subjects dependent upon the number of items each subject completed. An important factor in determining test reliability relates to test length. The longer the test, the more adequate sample of behavior being measured (Gronlund, 1976). Overall results indicate that a reliable entry level assessment which identifies skill deficit areas in reading and math can be developed for the Criterion Referenced Curriculum.

Research questions 3 and 4 are concerned with whether the instruments identify skill deficits in mildly handicapped and normally functioning students and if the test differentiates group performances.

Analysis of group data indicated differences in performance among groups. It was expected that the DH group would perform lower than the LD and normal groups. Although there was variance in the group's scores, 24 of 53 DH subjects scored above the normal group total test mean and 5 scored above the LD group total test mean in reading; and 18 of 53 subjects scored above the normal group total test and 4 scored above the LD group total test mean in math.

An unexpected finding was that the LD group scored higher on the reading and math probes than the normal group. Analysis computed to control for grade differences indicate that on most subtests in reading and math, significant differences existed between the LD and normal groups. The normal group scored significantly higher than the LD group in reading total test word recognition, comprehension, and application. On the reading readiness, math total test, content, and operations subtest, there was no significant difference between the LD and normal groups' performances. These results suggest that the LD group experienced greater difficulty than the normal group in reading, and supports the fact that 85-95 percent of LD students have reading problems (Kaluger and Kolson, 1978).

Another factor unaccounted for, which may have contributed to these differences, is age. Over 90 percent of the subjects categorized as LD were 1 to 2 years older than regular education students in their same grade placement. These students have more school experience than their normally functioning peers. In relation to group performance, 35 of 43 LD subjects scored above the normal group mean total test mean in reading, and 38 of 43 scored above the normal group total test mean in

math. Thus, over 50 percent of the LD group scored above the normal group mean on both tests.

Item and test reliability statistics indicate acceptable correlation coefficients. With respect to this, consideration must be given to the purpose and use of the tests. These tests contain a survey of skills that are hierarchically arranged by content, difficulty, and by grade level. When the student misses two, three, or four items in any subcategory area, a specific skill cluster is identified where in-depth assessment of higher and lower level skills can begin. Individual students are not required to respond to every item in order to identify a point for further assessment and entry into the curriculum. This demonstrates the edumetric characteristics of the tests, since discrepancies within the individual may be identified without comparing the test performance to that of other individuals.

As previously mentioned, for a significant number of students the items were sufficiently difficult that students reached the ceiling before completing all items. The results suggest that the instruments can identify functional skill deficits in reading and math for all groups, and that the instruments are sufficiently sensitive to differentiate among groups.

Finally, research question 5 concerns the content validity of the reading and math instruments. Content validity addresses how well the test measures the subject matter, content, and behaviors under consideration. The test construction stage of this study, as described in Chapter III, identifies several measures taken which relate directly to assuring that the instruments have content validity.

The specific purpose of the tests was identified as an entry level assessment to survey a range of skills in reading and math. Based upon this purpose, the content of the CRC was grouped into six relevant subcategories. The specific skills within several skill clusters of each subcategory were selected, listed in matrices, and reviewed. Behavioral objectives and other components of the CRC used for item specifications were identified. The items selected for the tests were based upon specific behavioral objectives in the curriculum and taken directly from the assessment tasks which accompany the instructional system. The skills in each probe are consistent with the hierarchical and grade level arrangement of skills within the curriculum, and therefore measure many of the same behaviors.

The acceptable reliability estimates obtained in this study are evidence of the instrument's ability to consistently assess the specified behaviors. Talmadge (1976) suggests that content validity is concerned with the representativeness of items in an instrument to elicit "specific behaviors in a defined content for a given population" (p. 112). Further evidence of the content validity of these instruments may be established through revisions and follow-up assessments as suggested later in this chapter.

Recommendations

The results of this study provide the foundation for continued development and improvement of the reading and math entry level assessments for the Criterion Referenced Curriculum. The investigator suggests that further research efforts should focus upon increasing the

reliability estimates on item correlation coefficients for both instruments. In order to improve the test and increase reliability estimates, all items which have very low correlation coefficients should be revised or replaced with other items. Since an item pool had been established previously, additional items may be selected from this pool or from the curriculum. The tests should be readministered to establish higher reliability estimates.

Special attention should be given to selecting subjects. The sample should include different age, grade, and ability levels. The sample should also contain an appropriate number of subjects across categories who complete an adequate number of items in reading and math to allow for an accurate calculation of the reliability statistic. This may suggest extending the grade levels to second through sixth grade for normal students and third through eighth grade for mildly handicapped students.

When higher levels of reliability have been obtained, the test should be administered to mildly handicapped and normally functioning students to identify their academic skill deficits. This should be followed-up by administering the criterion referenced assessment tasks from the CRC related to the content areas and skill clusters identified. This procedure will verify the accuracy in the reading and math probes of identifying skill deficit areas, and support the extent of content validity of the assessments.

An additional aspect should be addressed by future research. Since the CRC probes are potentially adequate measures of student performance, research should determine the extent to which scores on the reading and

math probes compare with scores on other achievement tests which are widely used with handicapped students. This issue is significant since few instruments which provide instructionally relevant information have been calibrated with subjects from populations for which they are used.

Further development of this instrument will provide a significant contribution to assessment of mildly handicapped students. Teachers will have a reliable instrument that will identify skill deficits, allow efficient use of time, provide a reliable measure of student performance, be cost efficient, and provide instructionally relevant information.

APPENDIX A

ITEM MATRIX FOR CONTENT IN THE READING PROBE

	READING READINESS Auditory Discrimination Visual Discrimination	WORD RECOGNITION SKILLS Phonetic & Structural Analysis; Sight Word Recognition	COMPREHENSION SKILLS
Kindergarten Level Skills	(8) 004 - matching sounds 006 - matching sounds 007 - repeats sounds 009 - repeats sounds 254 - identifies likenesses & differences 255 - matches symbols 257 - recognizes letters 259 - recognizes letters	(4) 219 - upper & lower case letters 220 - upper & lower case letters 221 - upper & lower case letters 222 - upper & lower case letters	(6) 12 - classifying 32 - labeling 53 - points to left or right 55 - points to back 57 - points to top 61 - points to bottom
First-Grade Level Skills		(6) 79 - blends 130 - digraphs 185 - vowels 209 - singular/plural 231 - word building 233 - sight words in context	(6) 16 - classifying concepts 21 - drawing conclusions 41 - main idea 43 - matching symbols 47 - sequencing 64 - word meaning

	READING READINESS Auditory Discrimination Visual Discrimination	WORD RECOGNITION SKILLS Phonetic & Structural Analysis; Sight Word Recognition	COMPREHENSION SKILLS
Second-Grade Level Skills		(6) 86 - blends 144 - dipthings 171 - phonetic words 192 - contractions 196 - punctuation 245 - sight words in context	(6) 18 - alphabetizing 26 - drawing inferences 42 - identifies main idea 44 - identifies opposite 68 - word meaning 69 - word meaning
Third-Grade Level Skills		(6) 128 - consonant variate 200 - prefixes 210 - singular/plural 215 - syllables 216 - syllables 249 - sight words in context	(6) 19 - classifies concepts 27 - draws inferences 38 - uses location skills 40 - uses location skills 46 - recall 72 - word meaning
TOTAL	(8)	(22)	(24)

APPENDIX B

ITEM MATRIX FOR CONTENT IN THE MATH PROBE

	CONTENT Numbers, Numeration and Number Systems; Geometric Figures	OPERATIONS AND THEIR PROPERTIES	APPLICATIONS Measurement
Kindergarten Level Skills	500 - geometric figures 574 - cardinal numbers 580 - numerals 610 - ordinal numbers	657 - addition 658 - addition	502 - length 517 - money 518 - money 519 - money
First-Grade Level Skills	589 - numerals 616 - place value 631 - rational numbers 809 - ordering sets	671 - addition 705 - inverse operations 726 - multiplication 774 - subtraction	505 - length 525 - money 548 - measure 555 - time
Second-Grade Level Skills	612 - ordinal numbers 622 - place value 643 - rational numbers 816 - ordering sets	677 - addition 712 - inverse operations 733 - multiplication 778 - subtraction	508 - length 537 - money 551 - temperature 563 - time
Third-Grade Level Skills	599 - numerals 613 - ordinal numbers 627 - place value 650 - rational numbers	686 - addition 692 - division 755 - multiplication 780 - subtraction	515 - length and distance 542 - money 552 - temperature 567 - dates

APPENDIX C

OBJECTIVES LIST FOR CONTENT IN THE READING AND MATH PROBES

CRC READING PROBE SKILLS LIST

Readiness Skills

Item No.	Skill No.	Objective
1	S006	Listen to words in a set and say if they end alike.
2	S007	Listen to and repeat the sounds of letters.
3	S009	Listen to and repeat sentence from 3 to 8 words.
4	S253	Point to a different letter in a row of letters.
5	S254	Match like letters.
6	S255	Put words into groups that begin alike.
7	S257	Student will name letters m, n, r, u, h from letter cards.
8	S258	Student will name letters k, l, f, b, d, t from letter cards.

Reading Recognition Skills

Level	Item No.	Skill No.	Objective
Kinder-	9	S219	Matches upper and lower case f.
garten	10	S220	Matches upper and lower case d.
	11	S221	Matches upper and lower case m.
	12	S222	Matches upper and lower case g.
First	13	S079	Say sound for "tr" when shown letters.
grade	14	S130	Say sounds for words beginning with "ch, th, wh, sh".
	15	S185	Say words with short "a" sound.
	16	S209	Say singular and plural form of object.
	17	S231	Point to root words in words ending with "s, ed, ing".
	18	S233	Reads first level sight words in context.
Second grade	19	S086	Read "gl, thr, spl, spr" when presented on a card.
	20	S144	Say "oi" as in "oil" from word cards.
	21	S171	Say "ar" as in "bark" from word cards.
	22	S192	
	23	S196	Read "isn't, I've, he's, you're, its, we've".
	24	S245	Reads second level.
	25	S128	Read words beginning with "kn, wr, gn" and names silent letter.
Third	26	S200	Reads prefixes "un, es, dis" from words.
grade	27	S210	Change final f to v when adding "es".

Level	Item No.	Skill No.	Objective
	28	S215	Divide words with double consonants into syllables.
	29	S216	Divide words into 3 syllables using hyphens.
	30	S249	Read third level sight words in context.
			Comprehension Skills
Kinder-garten	31	S012	Separate food, furniture, vehicles.
	32	S032	Tells action of a familiar object.
	33	S053	Points to left or right side of picture.
	34	S055	Points to back of object.
	35	S057	Points to top of object.
	36	S061	Points to bottom of object.
First grade	37	S016	Separate number words, color, words, names.
	38	S021	Tell object described in paragraph.
	39	S041	Identify a story's topic.
	40	S043	Points to a sentence that matches a picture.
	41	S047	Read to sentences and indicate sequence.
	42	S064	Select a synonym from two words.
Second grade	43	S018	Place words in alphabetical order.
	44	S026	Explain an inference after hearing a short story.
	45	S042	Tell main idea of a story.
	46	S044	Say opposite of up, high, big, come.
	47	S068	Chooses correct homophone.
	48	S069	State an alternative meaning.
Third grade	49	S019	Alphabetizes words using first two letters.
	50	S027	Tell a conclusion for a story after hearing a paragraph.
	51	S038	Says what source to use (glossary, encyclopedia).
	52	S040	Read map to answer questions.
	53	S046	Say facts about a story.
	54	S072	Tell meaning of root word with prefix.

CRC MATH PROBE SKILLS LIST

Content Skills

Level	Item No.	Skill No.	Objective
Kinder-garten	1	S500	Name circle and square.
	2	S574	Point to numerals to match sets of objects (1-10).
	3	S580	Circle numerals (1-10) in rows of letters/numerals.
	4	S610	Mark objects according to ordinal positions (first-fifth).
First grade	5	S589	Write numerals in ascending order.
	6	S616	Write number of tens and ones in sets of objects.
	7	S631	Mark shapes with one-half shaded.
	8	S809	Write symbols for "less than/greater than" between numerals 0-9.
Second grade	9	S612	Match ordinal number symbols to objects (1st-10th).
	10	S622	Write numerals in 1, 10, 100's place from 3-digit numerals.
	11	S643	Shade 1/4, 2/4, 3/4 of shape according to fraction given.
	12	S816	Write symbols "less than/greater than".
Third grade	13	S599	Write numeral one hundred more than numeral given.
	14	S613	Write ordinal word name for position of objects.
	15	S627	Write numeral in 1, 10, 100, 1000's place.
	16	S650	Write 1/2, 1/3, 1/4, of whole numbers.

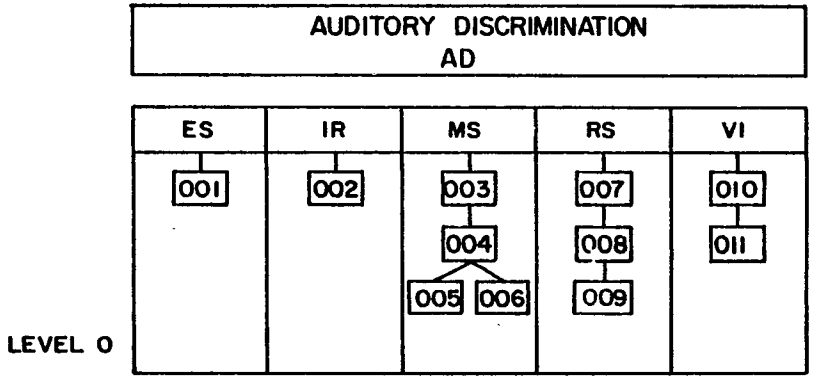
Operation Skills

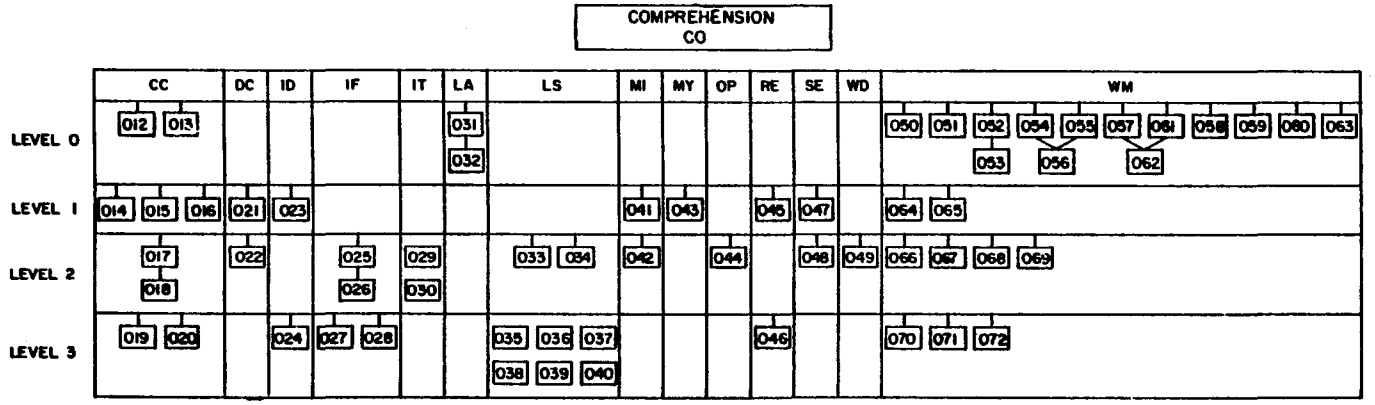
Kinder-garten	17	S657	Mark numeral for sum of sets (0-5).
	18	S658	Mark numeral for sum of sets (0-10).
First grade	19	S671	Write sums to 50 (ones to tens, without renaming).
	20	S705	Write addition and subtraction problems (sums to 10) showing inverse operations.
	21	S726	Write multiples of three from 3-100.
	22	S744	Write differences (2-digits from 2-digits, without renaming).
Second grade	23	S677	Write sums (3 or more addends, 1 digit).
	24	S712	Solve addition and subtraction story problems (2-digit, with renaming).

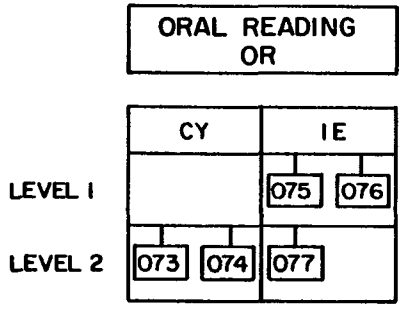
Level	Item No.	Skill No.	Objective
	25	S733	Complete missing number patterns (2's, 3's, 4's, 5's).
	26	S778	Write differences (2 digit from 2 digits, with renaming).
Third grade	27	S686	Write sums (2 addens, 3 digits, with renaming).
	28	S692	Write quotients (factors 2 and 3).
	29	S755	Write products (2 digit multiplication by 1 digit with renaming).
	30	S780	Write differences (3 digits from 3 digits with renaming).
			Applications Skills
Kinder-garten	31	S502	Mark longer or shorter object.
	32	S517	Name penny, nickel, dime.
	33	S518	Name amounts of pennies from 1-5 cents.
	34	S519	Mark picture of coins equal to 5 cents.
First grade	35	S505	Point to taller-shorter, tallest-shortest objects.
	36	S525	Match equal.
	37	S548	Mark measure (cup and pint), that contains more-less.
	38	S555	Circle time shown on clocks (to the hour).
Second grade	39	S508	Complete number sentences converting feet/inches.
	40	S537	Name amounts of money contained in groups of coins.
	41	S551	Order measures (pint, quart, half-gallon, gallon) according to size.
	42	S563	State time shown on clocks to hour, half-hour, quarter-hour.
Third grade	43	S515	Write solutions to story problems involving length and distance.
	44	S542	Write amounts of money shown using cent and dollar symbols.
	45	S552	Mark greatest of three measures.
	46	S567	State day of week on which a specific date occurs.

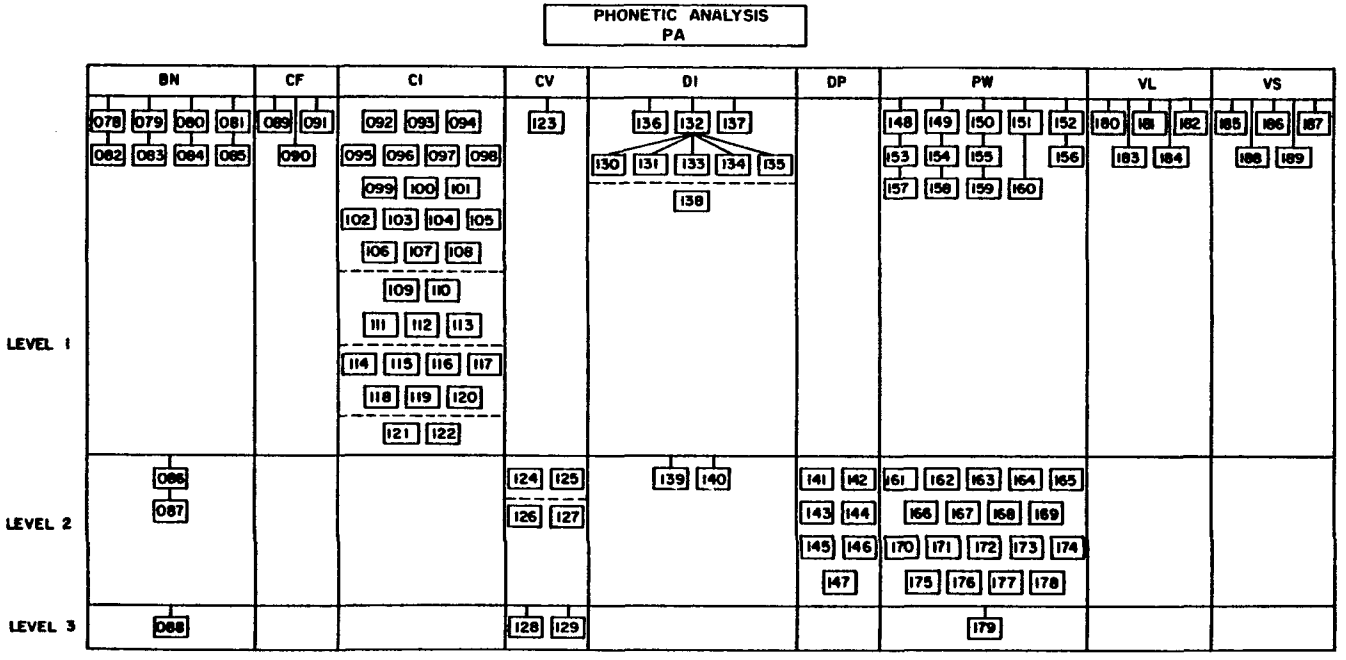
APPENDIX D

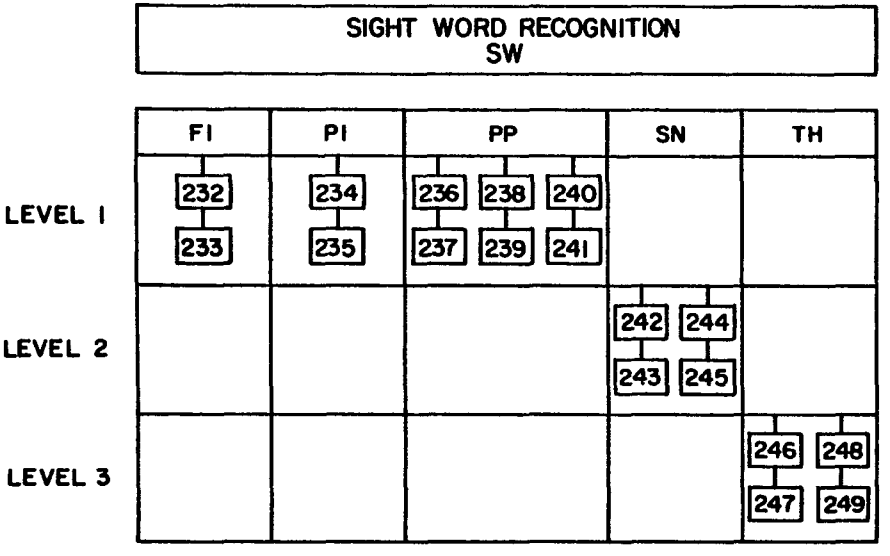
READING AND MATH SKILL TREES

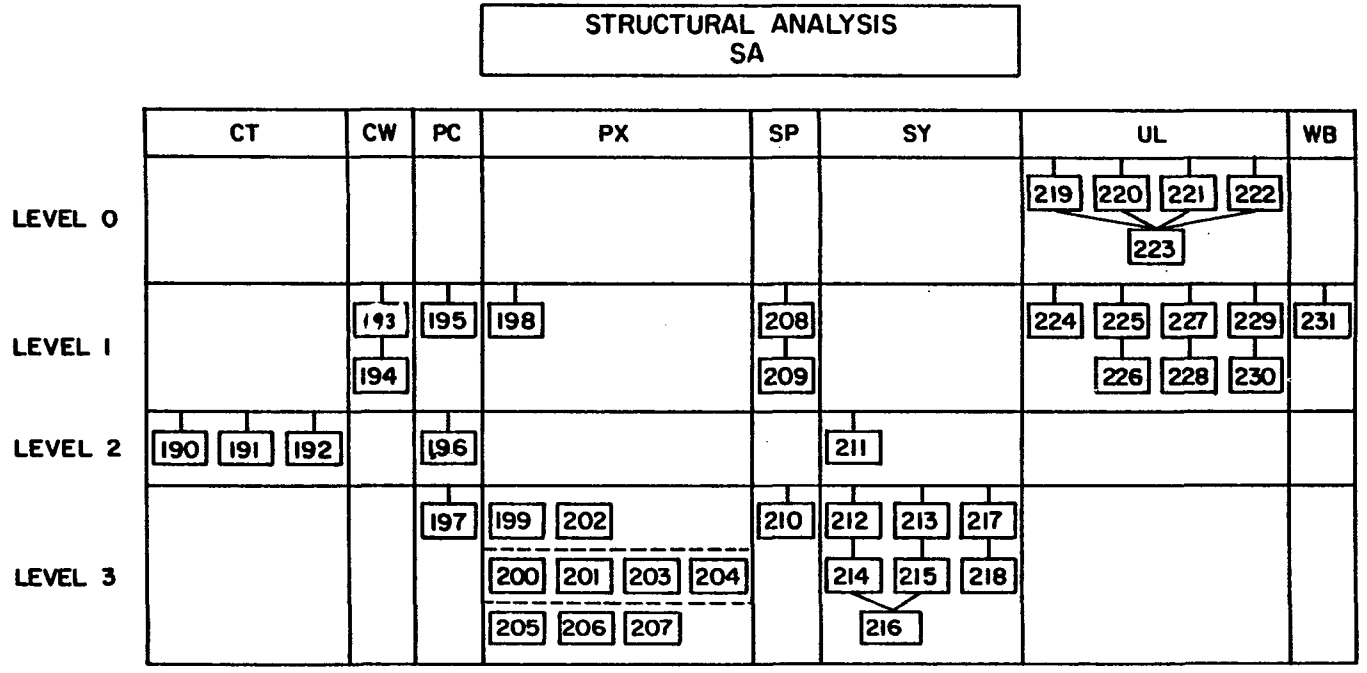

AUDITORY DISCRIMINATION
AD
ES
IR
MS
RS
VI
001
002
003
004
005
006
007
008
009
010
011
LEVEL 0

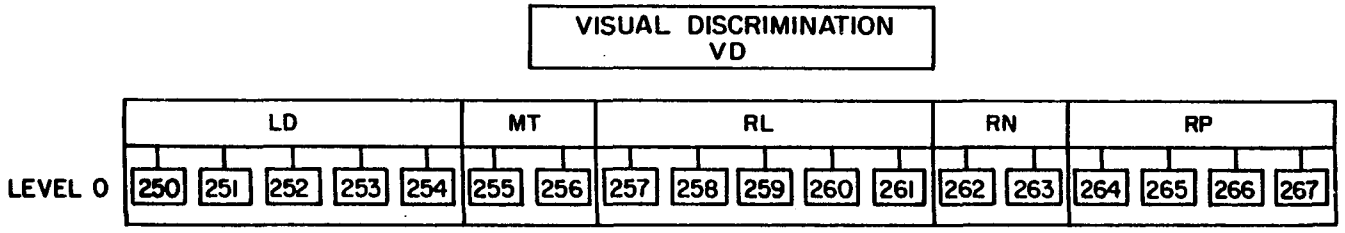

COMPREHENSION
CO
CC
DC
ID
IF
IT
LA
LS
MI
MY
OP
RE
SE
WD
WM
LEVEL 0
LEVEL 1
LEVEL 2
LEVEL 3
012
013
031
032
050
051
052
054
055
057
061
058
059
060
063
053
056
062
014
015
016
021
023
041
043
045
047
064
065
017
018
022
025
026
029
030
033
034
042
044
048
049
066
067
068
069
019
020
024
027
028
035
036
037
038
039
040
046
070
071
072

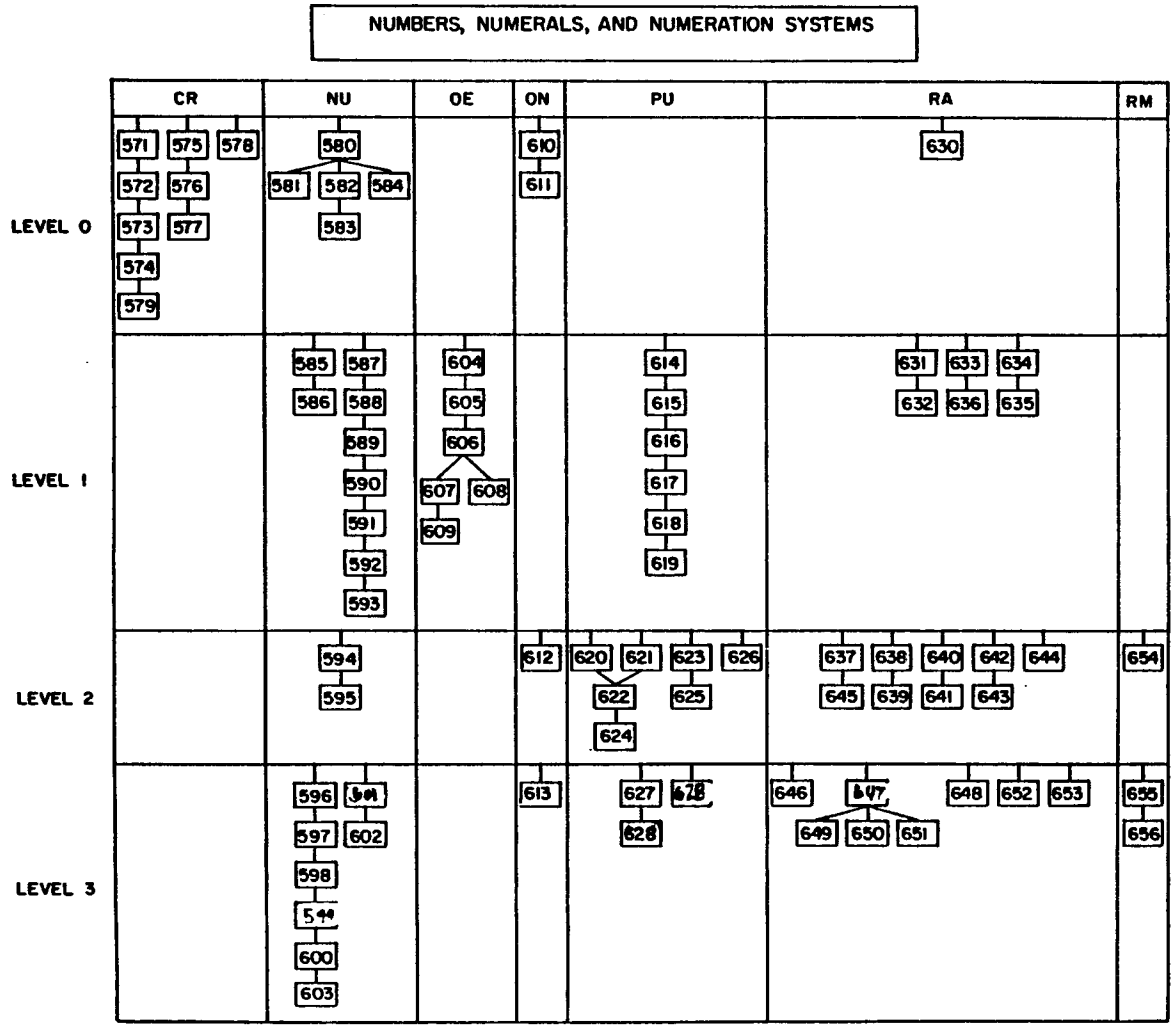

ORAL READING
OR
CY
IE
LEVEL 1
075
076
LEVEL 2
073
074
077

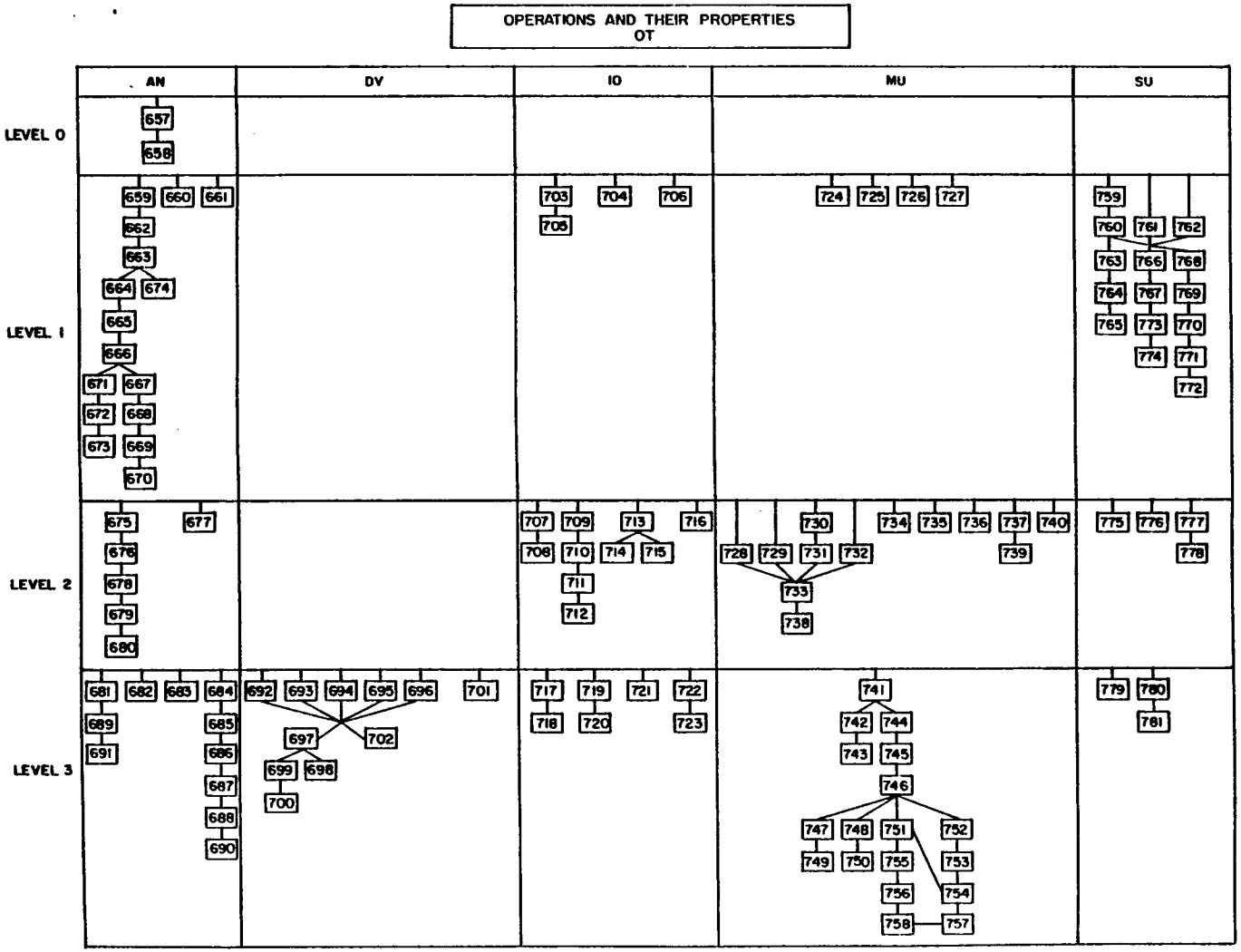

PHONETIC ANALYSIS
PA
BN
CF
CI
CV
DI
DP
PW
VL
VS
LEVEL 1
LEVEL 2
LEVEL 3
078 079 080 081
082 083 084 085
089 091
090
092 093 094
095 096 097 098
099 100 101
102 103 104 105
106 107 108
109 110
111 112 113
114 115 116 117
118 119 120
121 122
123
136 132 137
130 131 133 134 135
138
148 149 150 151 152
153 154 155 156
157 158 159 160
180 181 182
183 184
185 186 187
188 189
086
087
124 125
126 127
139 140
141 142
143 144
145 146
147
161 162 163 164 165
166 167 168 169
170 171 172 173 174
175 176 177 178
088
128 129
179

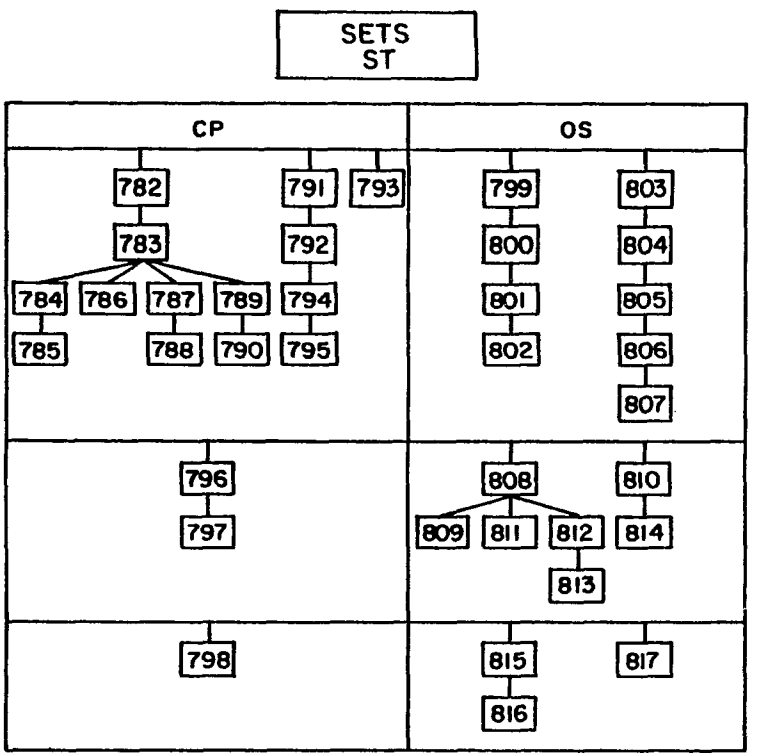

SIGHT WORD RECOGNITION
SW
FI
PI
PP
SN
TH
LEVEL 1
LEVEL 2
LEVEL 3
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249


STRUCTURAL ANALYSIS
SA
CT
CW
PC
PX
SP
SY
UL
WB
LEVEL 0
LEVEL 1
LEVEL 2
LEVEL 3
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231


VISUAL DISCRIMINATION
VD
LD
MT
RL
RN
RP
LEVEL 0
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267


NUMBERS, NUMERALS, AND NUMERATION SYSTEMS
CR
NU
OE
ON
PU
RA
RM
LEVEL 0
LEVEL 1
LEVEL 2
LEVEL 3
571
572
573
574
579
575
576
577
578
580
581
582
583
584
610
611
630
585
586
587
588
589
590
591
592
593
604
605
606
607
608
609
614
615
616
617
618
619
631
632
633
636
634
635
594
595
612
620
621
622
624
623
625
626
637
645
638
639
640
641
642
643
644
654
596
597
598
599
600
603
602
613
627
628
646
647
649
650
651
648
652
653
655
656


OPERATIONS AND THEIR PROPERTIES
OT
AN
DV
IO
MU
SU
LEVEL 0
LEVEL 1
LEVEL 2
LEVEL 3
657
658
659
660
661
662
663
664
674
665
666
671
667
672
668
673
669
670
703
704
706
705
724
725
726
727
759
760
761
762
763
766
768
764
767
769
765
773
770
774
771
772
675
677
676
678
679
680
707
709
713
716
708
710
714
715
711
712
728
729
730
731
732
733
734
735
736
737
740
738
739
775
776
777
778
681
682
683
684
689
691
685
686
687
688
690
692
693
694
695
696
701
697
702
699
698
700
717
719
721
722
718
720
723
741
742
744
743
745
746
747
748
751
752
749
750
755
753
756
754
758
757
779
780
781


SETS
ST
CP
OS
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
811
812
813
810
814
815
816
817

APPENDIX E

CRC PREASSESSMENT INSTRUMENTS MANUAL

CRITERION REFERENCED CURRICULUM PLACEMENT TEST PILOT MANUAL

PURPOSE

The CRC placement test is designed to allow teachers to determine a point of departure for further assessment and instruction within the Criterion Referenced curriculum. The probe will point out the range of a student's performance deficits and pinpoint the skill cluster areas where deficits exist. Teachers may conduct an indepth assessment of skills within these cluster areas to determine what has been mastered and what specific skills should be taught.

CONTENT & SEQUENCE

Stimulus materials are presented in a booklet form and are to be administered individually. The probe assesses two content areas, reading and math. Reading and math skills were grouped into the three subcategory areas identified in the charts in figures 1 and 2.

Reading Skills

READING READINESS	READING RECOGNITION	COMPREHENSION
1. auditory discrimination	1. phonetic analysis	1. classifying
2. visual discrimination	2. structural analysis	2. labeling
	3. sight words	3. word meaning
		4. main idea

Figure 1 Reading Skills by subcategory area

Math Skills

Content	Operations	Applications
1.numbers	1. addition	1. measurement
2.numeration & number systems	2. subtraction	
3.geometric figures	3. multiplication	
4.sets	4. division	

Figure 2 Math Skills by subcategory area

The reading test contains 54 items and math contains 46 items. Directions for administering each item are provided in a separate booklets and should be read verbatim by the evaluator. Since the number of items per subtest area ranges from 8 to 24, the administration time will vary according to the student's needs and work habits. The evaluator is encouraged to become familiar with the test format, item directions and response scoring procedures prior to administering the probe. Although it is unlikely that an evaluator would be required to administer an entire test, a complete administration of both tests should be obtainable in less than one hour.

Test Environment

The setting in which testing occurs should be one which allows a minimum of distractions. In some instances the classroom teacher may have an area within the classroom where testing is conducted. Such an area requires ample space for examiner and examinee, sufficient lighting and appropriate seating arrangements. The student should be seated directly in front of the examiner. The examiner should be positioned so that the Student Response Booklet is in full view.

General Directions for Administration

1. Establishing rapport is essential since it is assumed that the student will be performing at an optimal level. The examiner is encouraged to establish a pleasant climate that is reinforcing and will motivate the student to respond to the items, because best results are obtained when the examiner and examinee are relaxed. The examiner may care to initiate only a minute or two of small talk at the onset of testing to make students feel comfortable.

2. Specific instructions for test items in reading and math are included in a separate booklet. The examiner should become familiar with the test before administering it. The examiner should have

one Performance Data sheet for each student tested. Directions for responding to the items should be read verbatim. THE DIRECTIONS MAY BE REPEATED ONE ADDITIONAL TIME IN THEIR ENTIRETY IF THE STUDENT REQUESTS IT. It is not permissable to give clues by coaching or looking at the correct answer. If the student does not respond within 15 SECONDS or does not know the answer, the examiner should go to the next item. Student should work out all math problems in the Response Booklet. Scratch paper should not be used.

3. There are three categories in the Reading Probe (READINESS, RECOGNITION, COMPREHENSION), and three categories in the Math Probe (CONTENT, OPERATIONS, APPLICATIONS).

   Testing should begin with the first item in reading or math. When the student obtains a ceiling of 4 consecutive incorrect items in a category, testing in that particular category should be discontinued and examiner should begin administering the first item in the next category. The discontinue rule applies for both reading and math probes. (When testing kindergarten students, examiner may wish to place a blank piece of paper over items that appear on a page so that student is better able to focus on the particular item being tested.)

4. Examiner should clarify any verbal response that is unclear by asking the student to repeat the answer. If the student changes his/her response, the last answer given should be scored.

5. The examiner should also monitor the student's performance during the testing session. If the student works hurriedly and appears inattentive, examiner may ask the student to listen closely to the directions. Please note the student's behavior on the Performance Data sheet if you feel it has affected his score.

SCORING

1. Each item is worth 1 point. All scores should be tallied on the PERFORMANCE DATA SHEETS which accompany the test (one for each student in reading and one for math).

   Score 1 for a correct response, score 0 for an incorrect response. Once four consecutive 0's within a category are reached, examiner discontinues and begins testing first item in next category. Leave items blank that student does not reach.

2. After completing both tests, tally the scores for each subcategory area and the total test to determine the student's performance in relation to the total test.

PROCEDURES FOR IDENTIFYING AREAS FOR FURTHER ASSESSMENT

The skill trees listed in the appendix of this manual identify all skills in the Criterion Referenced Curriculum. The list presents the skills in sequential order, shows their relationship to each other and suggests the order in which they should be taught. When the incorrect items on each test have been identified the teacher may evaluate the preceding skills to ensure mastery of prerequisite skills within each cluster. Administering the criterion referenced assessments in the curriculum will allow teachers to determine the level of mastery for each skill and pinpoint where instruction should begin.

1. The skills list identifies the skill number for each skill on the test. Make a list of the skill number of all items missed on each test.
2. Find the incorrect items by skill number in the skill trees.
3. Select the corresponding criterion referenced assessments by skill number from the CRC assessment tasks.
4. Administer each criterion referenced assessment task until the student does not meet mastery criterion for that skill. This is where instruction should begin.

APPENDIX F

DIRECTIONS FOR THE CRC READING PROBE

CRITERION REFERENCED CURRICULUM

READING SKILLS PLACEMENT TEST

READING READINESS

1. Listen to the two words that I read. Tell me if they rhyme.

   SINGLE SHINGLE

2. Listen to the two words. Tell me if they end alike.

   TAKE MAKE

3. I am going to say a letter sound. Then I want you to say that sound. (Soft g sound -- i.e., George).

4. I am going to read a sentence. I want you to repeat the sentence after I finish. (Student should repeat entire sentence verbatim)

   THE CLASSROOM IS PRETTY WHEN WE DECORATE IT.

5. Look at the words in this row. Put an X on the words that are alike. (pan, pan) (Examiner does not read the words to student.)

6. Look at the words in this row. Find all of the words that begin alike and put an X on them. (car, cat)

7. Tell me the name of this letter. (k)
   Examiner: Accept response of "k" or "small k"

8. Tell me the name of this letter. (h)
   Examiner: Accept either "h" or "small h"

WORD RECOGNITION SKILLS

9. Look at the group of letters in the box. Put an X on the two letters that have the same name. (f)

10. (Repeat directions given in #9) (d)

11. (Repeat directions given in #9) (m)

12. (Repeat directions given in #9) (g)

13. Look at the letter combinations in each box. Put an X on the sound that I say. (tr)

14. Look at the words in the box. Put an X on the word that begins with the /sh/ sound. (ship)

15. Read the words, and put an X on the word which has a short vowel sound. (rat)

16. Look at the pictures. Put an X on the picture that shows "CHAIRS".

17. Look at this word. Draw a circle around the root word. (run)

18. Read this sentence aloud. (THE RED HOUSE IS WHERE I LIVE.)
(Student must read complete sentence.)

19. Look at the letter combinations. Put an X on the letter combination when I say its sound. (spl)

20. Read this word aloud. (spoil)

21. Read the word in this box. Draw a circle around the letters that make the "ar" sound. correct response (ar)

22. Read this sentence aloud. (ISN'T IT A NICE DAY?)
(Student does not have to use inflection must read complete sentence.)

23. Look at the paragraph and find the punctuation marks that mean someone is talking. Draw a circle around them. (" ")
(must circle beginning and end quotation marks)

24. Read the sentence aloud. (I WILL GO WITHOUT HIM.)
(Complete sentence must be read.)

25. Look at the word in this box. Circle the letter that is silent. (K)

26. Read this word and draw a circle around the prefix. (dis)

27. Read the word in this box. Change this word and make it plural. Write it in the blank space. (knives)

28. Read the word in this box and count the number of syllables it has. Now draw a line between the letters to show where it may be divided into syllables. (zip per)

29. Read the word in this box and count the number of syllables it has. Now draw a line between the letters to show where it may be divided into syllables. (ra di o)

30. Read the sentence aloud. (I HAVE TO GO, EVEN THOUGH YOU ARE STAYING.) (Student must read complete sentence.)

COMPREHENSION

31. Look at these 4 pictures. Put an X on the picture that shows "FURNITURE". (Picture 3.)

32. Look at the pictures. Put an X on the picture which shows an object that can be used to talk with someone else. (telephone)

NOTE: Items 33, 34, 35 and 36 use the same art.

33. Look at the picture. Put an X on the boy's RIGHT hand.

34. Now put an X on the BACK of the CHAIR.

35. Look at the picture and put an X on the TOP of the DESK.

36. Put an X on the BOTTOM of the HEART.

37. Look at the words and mark the one that I describe. Put an X on the word that is a number. (two)

38. I am going to read a paragraph to you. When I am finished, circle the word that names the object that I describe.

BILLY RAN INTO THE HOUSE. HE OPENED THE REFRIGERATOR DOOR. THERE WAS WHAT HE WANTED. IT WAS COLD AND WHITE AS HE POURED IT INTO THE GLASS. WHAT DID BILLY GET? (milk)

39. I am going to read a short story to you. When I finish, I want you to find the main topic of the story and draw a line under it.

THE POSTMAN

EVERYDAY THE MAN IN THE BLUE SUIT COMES WALKING DOWN OUR BLOCK. HE CARRIES A BIG BROWN BAG. THE BAG CAN HOLD MANY LETTERS.

HE IS A VERY NICE MAN AND ALWAYS SAYS "GOOD MORNING."

Now read the topics in you booklet and draw a line under the one that tells the main topic of the story.

40. Look at the picture. Under the picture there are three sentences. Read each sentence and draw a line under the sentence that describes the picture. (The girl eats.)

41. Read the two sentences. Draw a line under the sentence that tells what happened first. (Jane had a toothache.)

42. I am going to read some words. Put an X on the word that means the same as "BEGIN".

"END" "START"

43. Look at the words in each box. Put them in alphabetical order by placing a 1 under the one that comes first; 2 under the second; and 3 under the third. (1-always, 2-many, 3-such)

44. I am going to read a short story. When I finish the story, read the sentences in your booklet and find the one that tells what happens next. Draw a line under the sentence.

SUE'S BASEBALL TEAM HAD A GAME ONE SATURDAY AFTERNOON.
SUE WAS PLAYING LEFT FIELD WHEN A VERY HIGH BALL WAS
HIT RIGHT WHERE SHE WAS STANDING.

Now draw a line under the sentence that tells what happens next. (SUE RAN TO CATCH THE BALL)

45. I am going to read a short story. When I finish, you read the topics in your booklet and draw a line under the one which tells the main idea of the story.

THE MEN ON THE SHIP WERE ASLEEP. SUDDENDLY A LOUD NOISE BROKE THE QUIET. SCREAMS WERE HEARD AND PEOPLE WERE RUNNING ABOUT. "FIRE!" FIRE!" YELLED THE MAN ON DECK. THE OCEAN SEEMED TO TURN RED AROUND THE SHIP.

Draw a line under the topic that tells the main idea of the story. (FIRE ON THE SHIP)

46. Draw a circle around the word that means the opposite of the word "HIGH". (low)

47. Draw a circle around the word that means the same as "HAPPY". (JOLLY)

48. Read the sentence and draw a circle around the correct word. (BUY)

49. Look at the words in this row. Look at the first two letters in each word and place the words in alphabetical order. Put the number 1 under the first word, 2 under the second and 3 under the third word. (1-cell, 2-circle, 3-could)

50. I am going to read a story. When I finish, find the sentence which tells how the story should end. Draw a circle around it.

"THE HUNGRY DOG

JENNIFER HEARD HER DOG BARKING. HE WAS VERY HUNGRY. SHE BROUGHT HIM A DISH OF FOOD. MORGAN QUICKLY RAN INTO THE KITCHEN."

Draw a line under the sentence that tells how the story should end. (Morgan ate all of his food.)

51. I am going to read a question. Draw a line under the word that tells where you would find the information.

WHERE CAN YOU FIND INFORMATION ABOUT JOHN F. KENNEDY? (Encyclopedia)

52. Look at the map and circle the answer to this question.

WHO LIVES CLOSER TO THE SCHOOL, MARY OF JACK? (Mary)

53. I am going to read a short story. When I finish you read the sentences in your booklet. Draw a line under the sentence that tells an important fact about the story.

THE RAINY HIKE

RONNIE WENT FOR A HIKE IN THE WOODS.
HE TOOK HIS DOG WITH HIM. IT STARTED TO RAIN. THEN
IT STARTED TO THUNDER AND HEAVY LIGHTENING STRUCK THE SKY.

Draw a line under the sentence that tells an important fact about the story. (It started to rain.)

54. Draw a line under the word that means "TO REMEMBER SOMETHING" (Recall)

APPENDIX G

CRC READING PROBE

CRC

Reading Probe

STUDENT I D NUMBER_____

AGE:_____ GRADE_____

FUNCTIONAL READING LEVEL:_____NAME OF TEST_____DATE:_____

FUNCTIONAL MATH LEVEL: _____NAME OF TEST_____DATE:_____

EXCEPTIONAL LABEL:_____

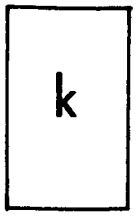
TEST DATE_____

5

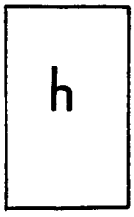
pan ban pan pun

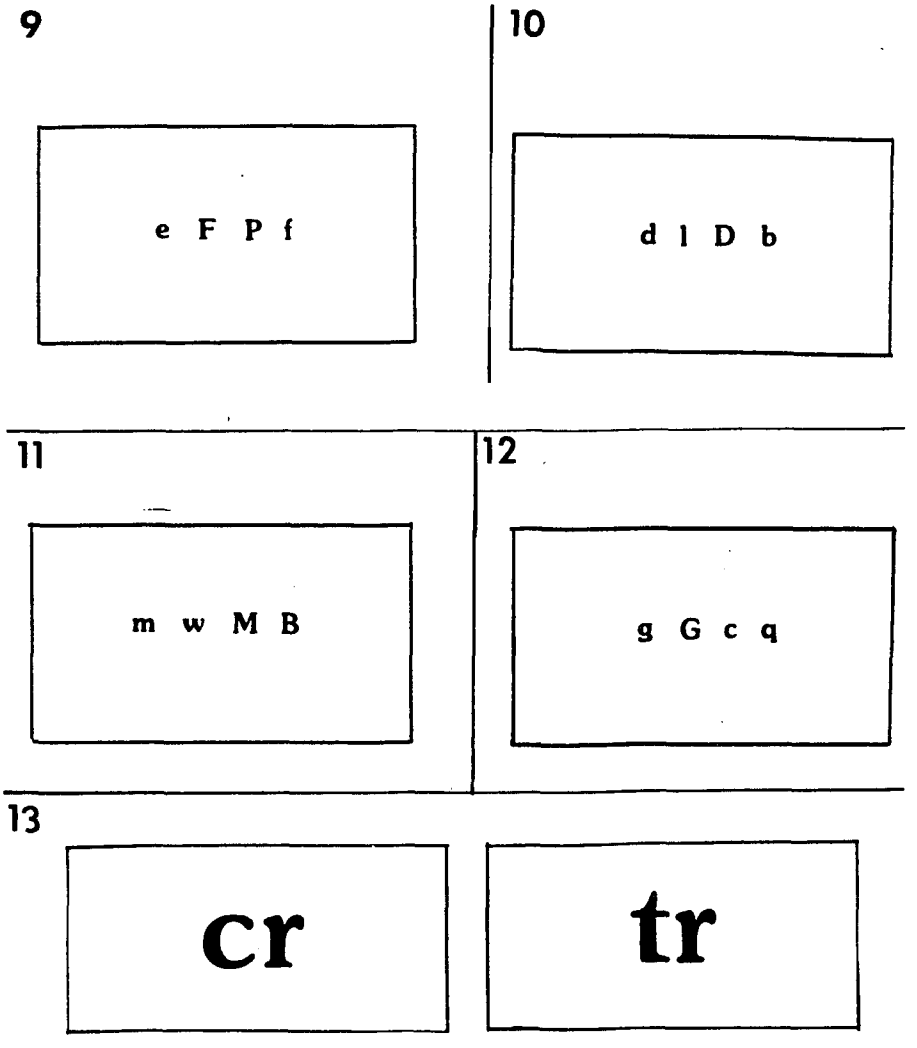
6

7



8




9
e F P f
10
d l D b
11
m w M B
12
g G c q
13
cr
tr

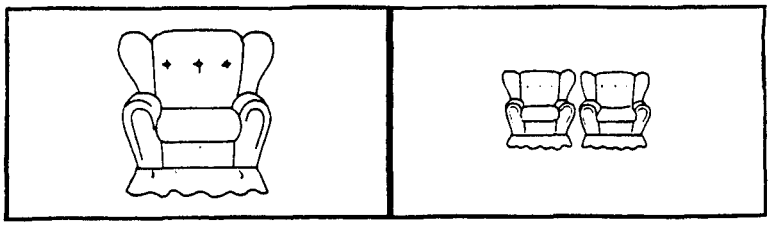
14

wish ship

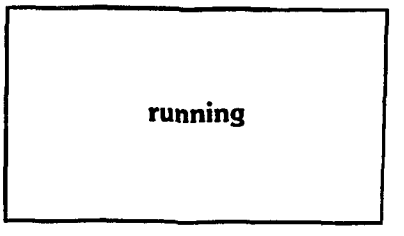
15

rat time

16



17



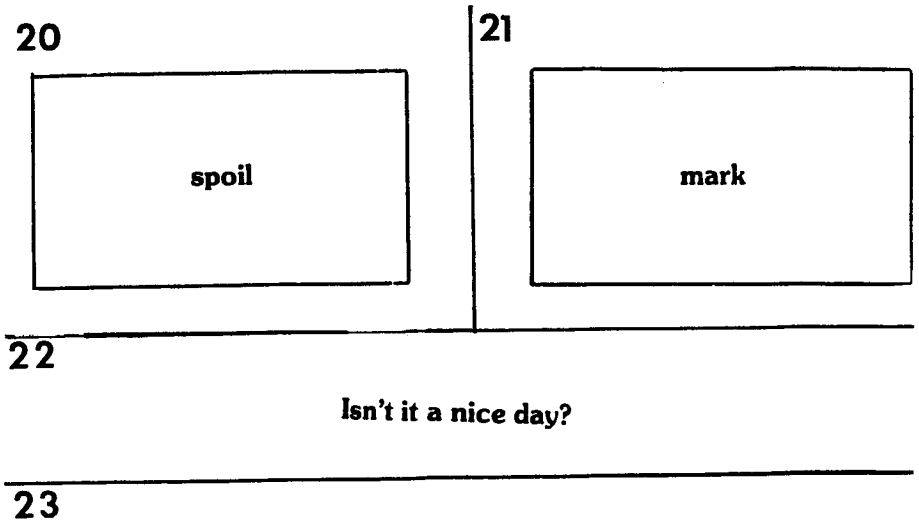
18

The red house is where I live.

19

spl

str



Mary was outside playing with her friend while her mother was fixing dinner. What fun they were having! Mother needed Mary to help set the table so she stood at the door and called, "Mary, will you please come in and help me?"

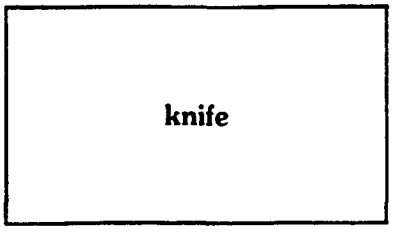
24

I will go without him.

25

26

27



28

zipper

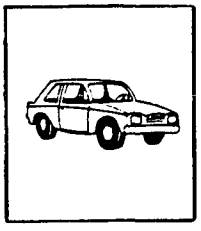
29

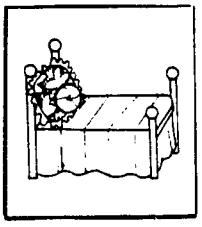
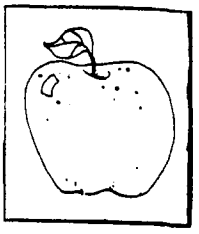
radio

30

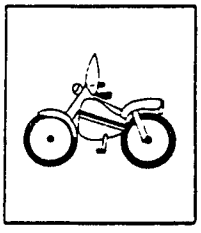
I have to go, even though you are staying.

31

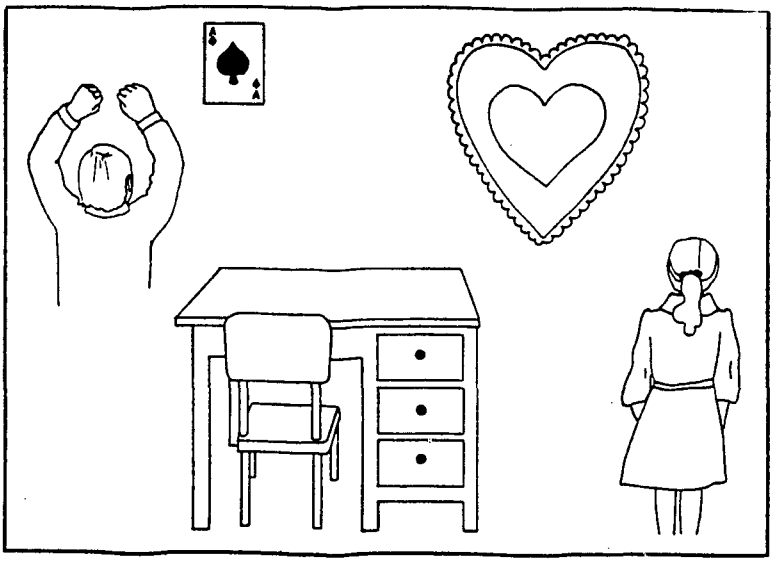


32

33-36



37

Tom	two

38

milk _____ water _____

39

A Nice Man
The Postman

40

The girl is fishing.

The clown is sad.

The girl eats.

41

Jane went to the dentist.
Jane had a toothache.

42

end start

43

44

Sue ran to catch the ball.
Sue ran to the base.

45

The man on deck
Fire on the ship

46

down low

47

jolly music

48

John went to (buy, by) a new coat.

49

cell	could	circle
____	_____	_____

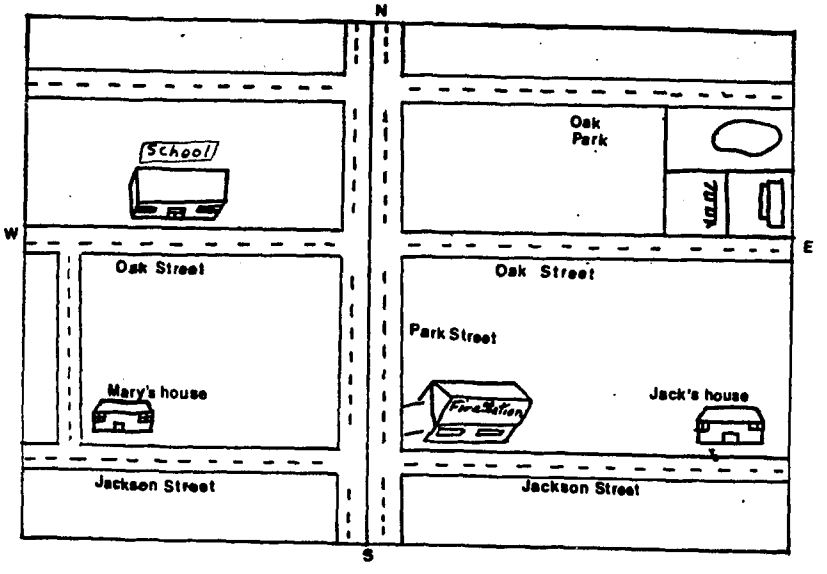
50

Morgan ate all of his food.
The dog wanted to play.

51

encyclopedia glossary

52



53

It started to rain.

The dog ran after the cat.

54

call **recall**

Student Name/I.D.#_____

Test Date_____

READING
PERFORMANCE DATA

READING READINESS		READING RECOGNITION		COMPREHENSION	
item number	score	item number	score	item number	score
*1.	_____	9. pg. 2 (K)	_____	31. pg. 7	_____
*2.	_____	10.	_____	32.	_____
*3.	_____	11.	_____	33.	_____
*4.	_____	12.	_____	34.	_____
5.	_____			35.	_____
6.	_____	13. (1)	_____	36.	_____
*7.	_____	14.	_____		
*8.	_____	15.	_____	37. (1)	_____
TOTAL	_____/8	16.	_____	38.	_____
		17.	_____	39.	_____
		*18	_____	40.	_____
				41.	_____
		19. (2)	_____	42.	_____
		20.	_____		
		21.	_____	43. (2)	_____
		22.	_____	44.	_____
		23.	_____	45.	_____
		*24	_____	46.	_____
				47.	_____
		25 (3)	_____	48.	_____
		26	_____	49. (3)	_____
		27	_____	50.	_____
		28	_____	51.	_____
		29	_____	52.	_____
		*30	_____	53.	_____
		TOTAL	_____	54.	_____
				TOTAL	_____

*Requires verbal response

Score: 1 = correct response
0 = incorrect response

Ceiling is reached when student misses four "consecutive"items in a category.

(1), (2), (3) indicate the approximate grade level of the items.

APPENDIX H

DIRECTIONS FOR THE CRC MATH PROBE

CRITERION REFERENCED CURRICULUM
MATH SKILLS PLACEMENT TEST

CONTENT

1. Look at the two pictures. Put an X on the picture of the CIRCLE.

2. Count the objects in this box. Draw a circle around the number that shows how many objects are in the box. (5)

3. Look at the symbols in the box. Find the numbers and draw a circle around them. (1,4)

4. Put an X on the top that is in the third position.

5. Look at these numbers. Write the number that comes next in the blank space. (30)

6. Count the ballons and write the number of tens that are in that number under T and the number of ones under O. (1t, 10)

7. Look at this row of pictures. Put an X on the circle that has $\frac{1}{2}$ of the circle shaded.

8. The symbols in this box are less than, equal to, and greater than. Look at this math problem. Write the correct symbol in the box. (greater than)

9. Look at these pictures and find the picture of the tree. Now circle the number that shows the position of the tree. (6th)

10. Look at the number and circle the digit that is in the hundreds place. (9)

11. This square has been divided into equal parts. Put an X on the parts you would color to show 3/4's of the square.

12. The two signs in the box are greater than, and less than. One of these signs can be used in this problem. Write the correct sign in the circle. (less than)

13. This number is (eight hundred nighty eight). write the number that would be 100 more than eight hundred night eight. (998)

14. Look at the picture and find the circled ice cream cone. Now circle the word that tells the position of the circled ice cream cone. (6th)

15. Look at the number and circle the digit that is in the thousands place. (1)

16. This equation says 1/8 of 24 = _____. Write the correct answer in the blank. (3)

17. Count all of the objects in the sets. Circle the number which shows how many are in both sets together. (4)

18. Count all of the dots on the domino and circle the number that shows how many dots there are. (9)

19. Add these numbers and write the correct answer in your booklet. (36)

20. These numbers, 6,10,4, can be used to make an addition or subtraction problem. Use these three numbers to make either an addition or subtraction problem. Write your problem in the box under the + or - sign. (accept 6+4=10; 4+6=10; 10-6=4; 10-4=6)

21. Look at the number pattern, and write the number which comes next in the pattern in the blank space. (35)

22. Write the answer to this problem. 55 take away 31. (24)

23. Add these numbers and write the answer in your booklet. (20)

24. (Teacher may read the story problem if the student cannot.)

    SAUNDRA BAKED 15 CHOCOLATE CHIP COOKIES AND 26 PEANUT BUTTER COOKIES. HOW MANY COOKIES DID SHE BAKE?

    Write the answer to the story problem in the blank space. (41)

25. The number pattern is 4,8,___,16. Write the number that comes next in pattern in the blank space. (12)

26. Write the answer to this problem: 36 take away 18. (18)

27. Add these numbers and write the answer in your booklet. (763)

28. Divide 9 into 85 and write the correct answer in your booket. (9r4)

29. Write the answer to this problem: 9 X 2 =. (38)

30. Write the answer to this problem, 579 take away 496. (83)

31. Look at the boats in the picture. Put an X on the boat that is <u>longer</u>.

32. Put an X on the picture that shows a <u>dime</u>.

33. Count all of the coins in the box. Write the number which tells how many there are in the blank below the box. (6)

34. Look at the coin in the box. Under the box, write how much it is worth. (5¢)

35. Look at the pictures in the box and put an X on the one that is <u>tallest</u>.

36. Put an X on the set of coins that is equal to the coin in the box on top. (2 nickles)

37. Put an X on the carton that holds more.

38. Draw a circle around the number which shows the time on the clock. (12:00)

39. This problem says 12 inces = ____ foot. Write the correct answer in the box. (1)

40. Count the money in the box and write the amount on the line below the box. (50¢)

41. Look at the containers and place them in order from smallest to largest. Start with the one that holds the least amount and place a 1 on the line below it. Put a 2 under the next size and 3 under the largest. (quart, half gallon, gallon)

42. Look at the clock. Write the time on the line below the clock. (2:45)

43. (Teacher should read the story problem.)

    THE BLUE BOAT WAS 40 FEET LONG AND THE GREEN BOAT WAS 25 FEET LONG. HOW MUCH LONGER WAS THE BLUE BOAT?

    Write the correct answer in the blank space. (15)

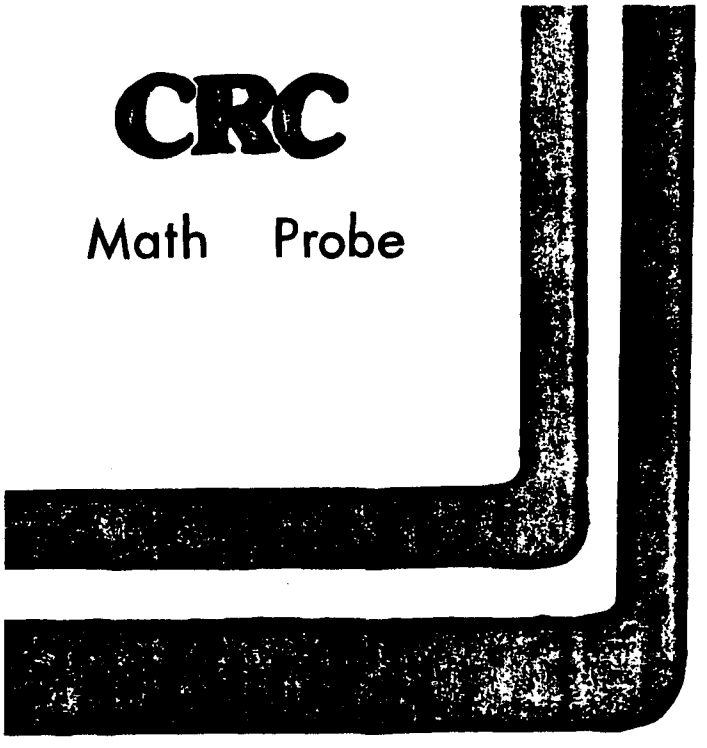
44. Count the money. Write the amount in the box. Use a dollar sign and decimal to write your answer. ($1.21)

45. These measures are 2 cups, 2 pints, 2 ounces. Circle the one which is is the most. (2 pints)

46. Look at the picture of the calendar. Find September 6th. Circle the word that tells what day of the week September 6th is on. (Tue.)

APPENDIX I

CRC MATH PROBE



STUDENT I D NUMBER_____

AGE:_____ GRADE_____

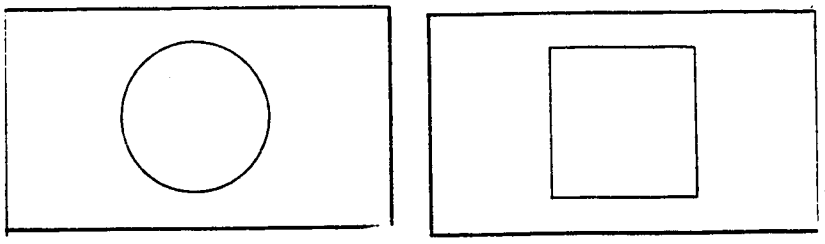
FUNCTIONAL READING LEVEL_____ NAME OF TEST:_____DATE:_____

FUNCTIONAL MATH LEVEL _____ NAME OF TEST:_____DATE:_____

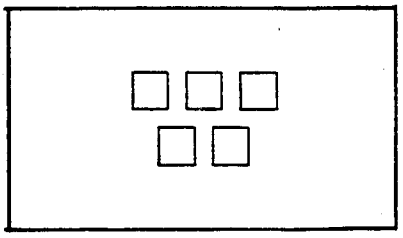
EXCEPTIONAL LABEL_____

TEST DATE_____

1

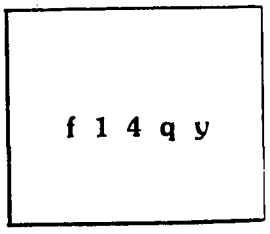


2

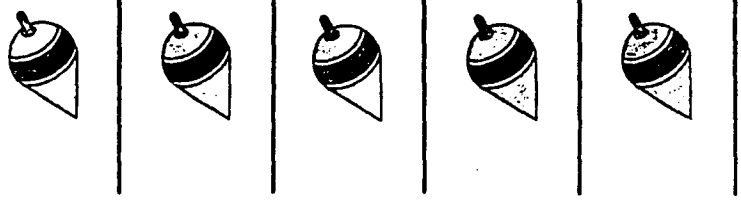


3 6 5

3



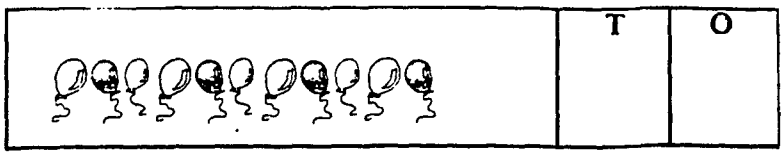
4



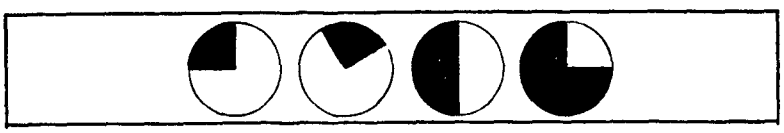
5

27 28 29 __ 31 32 33 34 35 36

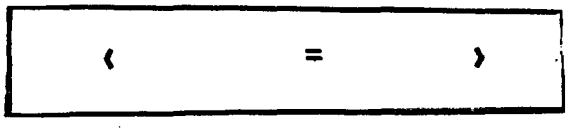
6

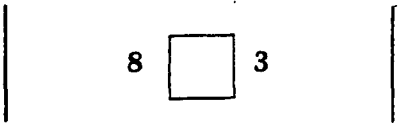


7

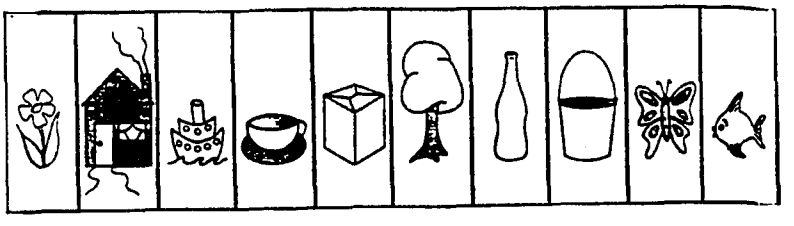


8



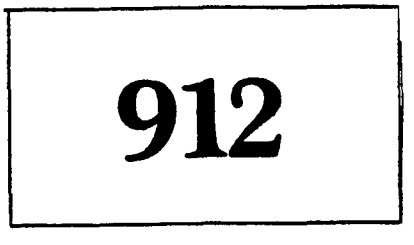


9

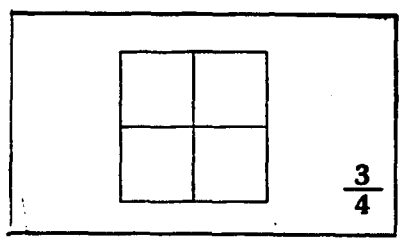


2nd 6th 10th

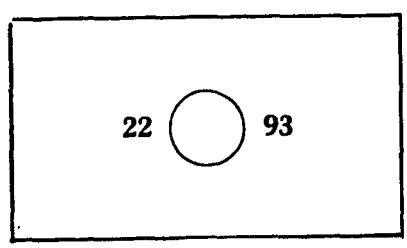
10



11



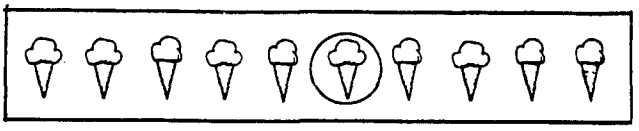
12



13

898

14



first
second
third
fourth
fifth
sixth

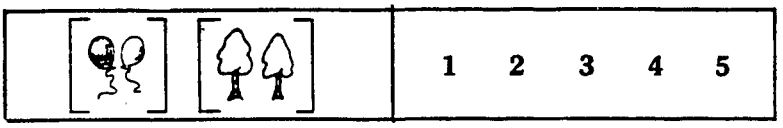
15

3,271,264

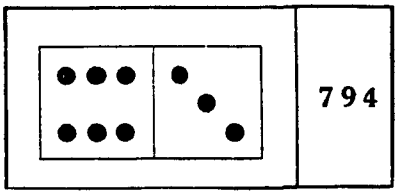
16

$\frac{1}{8}$ of 24 = _____

17



18



19

$$\begin{array}{r} 32 \\ +\ 4 \\ \hline \end{array}$$

20

	+	−
1 6 10 4		

21

25 30 ____

22

$$\begin{array}{r} 55 \\ -31 \\ \hline \end{array}$$

23

$$\begin{array}{r} 7 \\ 9 \\ +4 \\ \hline \end{array}$$

24

Saundra baked 15 chocolate chip cookies and 26 peanut butter cookies.
How many cookies did she bake? _____

25

4 8 ____ 16

26

$$\begin{array}{r} 36 \\ -18 \\ \hline \end{array}$$

27

$$\begin{array}{r} 629 \\ +134 \\ \hline \end{array}$$

28

$9\overline{)85}$

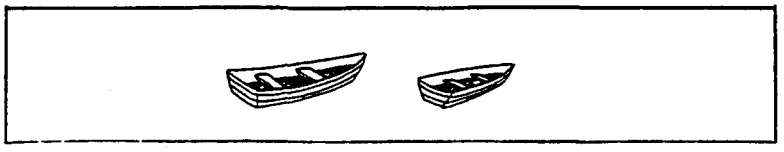
29

$$\begin{array}{r} 19 \\ \times 2 \\ \hline \end{array}$$

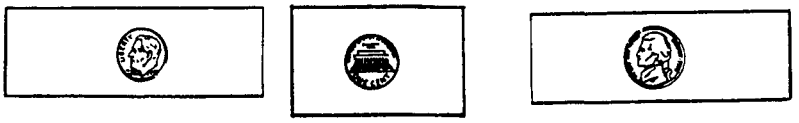
30

$$\begin{array}{r} 579 \\ -496 \\ \hline \end{array}$$

31

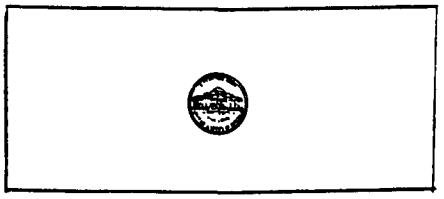


32

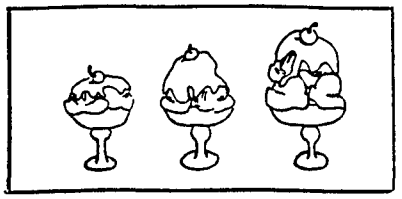


33

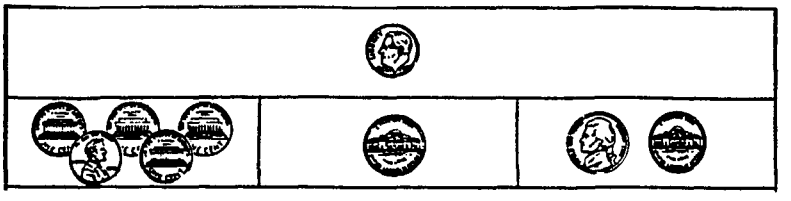
34



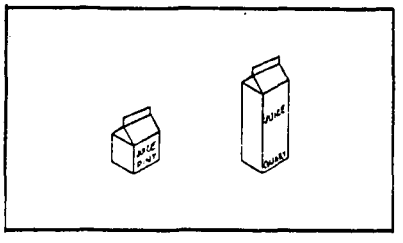
35



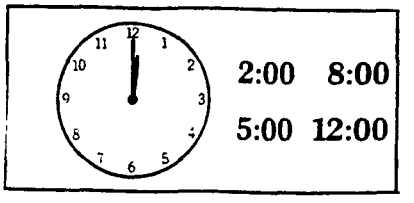
36



37



38

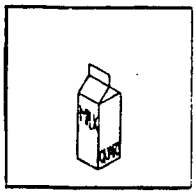


39

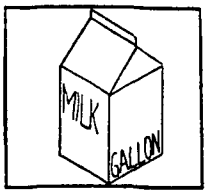
12 inches = ☐ foot

40

41



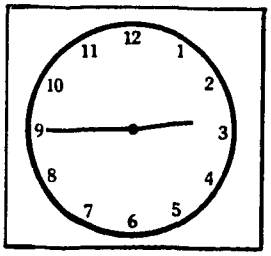
_____



_____

_____

42



_____

43

The blue boat was 40 feet long and the green boat was 25 feet long. How much longer was the blue boat? _____

44

45

2 Cups	2 Pints	2 Ounces

46

SEPTEMBER

Sun	Mon	Tue	Wed	Thur	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Student Name/ I.D.#_____

Test Date _____

MATH

PERFORMANCE DATA

CONTENT item number	score	OPERATIONS item number	score	APPLICATIONS item number	score
1. pg. 1	_____	17. pg. 6	_____	31. pg.8	_____
2.	_____	18.	_____	32.	_____
3.	_____			33.	_____
4.	_____	19. (1)	_____	34.	_____
		20.	_____		
5. (1)	_____	21.	_____	35. (1)	_____
6.	_____	22.	_____	36.	_____
7.	_____			37.	_____
8.	_____	23. (2)	_____	38.	_____
		24.	_____		
9. (2)	_____	25.	_____	39. (2)	_____
10.	_____	26.	_____	40.	_____
11.	_____			41.	_____
12.	_____	27. (3)	_____	42.	_____
		28.	_____		
13. (3)	_____	29.	_____	43. (3)	_____
14.	_____	30.	_____	44.	_____
15.	_____	TOTAL	_____/14	45.	_____
16.	_____			46.	_____
TOTAL	_____/16			TOTAL	_____/16

Score: 1 = correct response
0 = incorrect response

Ceiling is reached when student misses four "consecutive" items in a category.

(1), (2), (3) indicate the approximate grade level of the items.

BIBLIOGRAPHY

BIBLIOGRAPHY

Adelman, H., & Taylor, L. Learning disabilities in perspective. Dallas: Scott, Foresman & Co., 1983.

Algozzini, B. Using assessment information to plan reading instructional programs: Error analysis and word attack skills. Minneapolis, Minnesota: Minnesota Institute for Research on Learning Disabilities, 1980. (ERIC Document No. ED203606)

Bennett, R. Professional competence and the assessment of exceptional children. Journal of Special Education, 1981, 18, 437-446.

Carroll, J. B. Review of the Illinois test of psycholinguistics. In O.K. Buros (Ed.), The Seventh Mental Measurements Yearbook, (Vol. 2). New Jersey: The Gryphon Press, 1972.

Cartwright, G. P., Cartwright, C. A., & Ysseldyke, J. E. Two decision models: Identification and diagnostic teaching of handicapped children in the regular classroom. Psychology in the Schools, 1973, 10, 4-11.

Caterall, C. D. Taxonomy of prescriptive interventions. Journal of School Psychology, 1970, 8, 5-12.

Cawley, J. F. Curriculum: One perspective for special education. In R. Kneedler (Ed.), Changing Perspectives in Special Education. Columbus, Ohio: Charles E. Merrill, 1977.

Connolly, A., Nachtman, W. E., & Pritchett, E. Manual: The key math diagnostic arithmetic test. Circle Pines, Mn.: American Guidance Service, 1971.

Cronbach, L. J. Coefficient alpha and the internal structure of tests. Psychometrika, 1951, 16, 297-334.

Dunn, L. M. Minimal brain dysfunction: A dilemma for educators. In H. E. Haywood (Ed.), Brain Damage in School-Aged Children. Arlington, Va.: C E C, 1968.

Dunn, L. M., & Markwardt, F. C. Manual: Peabody individual achievement test. Circle Pines, Mn.: American Guidance Service, 1970.

Glaser, R. Components of a psychology of instruction: Toward a science of design. Review of Educational Research, 1976, 46, 1-24.

Gronlund, N. Measurement and evaluation in teaching (3rd ed.). New York: McMillian, 1976.

Hammond, R. Context evaluation of instruction in local school districts. Educational Technology, 1969, 9, 13-18.

Hickey, M. E., & Hoffman, D. Diagnosis and prescription in education. Educational Technology, 1973, 6, 35-37.

Iscoe, I., & Payne, S. Development of a revised scale for the functional classification of exceptional children. In D. Sabatino (Ed.), Describing Learner Characteristics of Handicapped Children and Youth. New York: Grune & Stratton, 1979.

Jastak, J., & Jastak, S. Manual: The wide range achievement test. Wilmington, Delaware: Jastak Associates, 1978.

Larsen, S., & Hammill, D. The relationship of selected visual perceptual abilities to school learning. Journal of Special Education, 1975, 4, 281-291.

Lindvall, J. Testing and evaluation: An introduction. New York: Harcourt Brace, 1964.

Lucus, V. A. Development of an informal reading assessment inventory for teachers trained in directive teaching. Unpublished doctoral dissertation, The Ohio State University, 1973.

Magliocca, L. A., & Stephens, T. M. Directive teaching model. Unpublished manuscript, The Ohio State University, 1977.

Merriman, P. Impact of directive teaching in 1969-1970 on children: A follow-up study (Faculty for Exceptional Children). Unpublished manuscript, The Ohio State University, 1973.

Nedelsky, L. Absolute grading standards for objective tests. Educational & Psychological Measurement, 1954, 14, 3-19.

Neisworth, J. T. Assessment in special education. Rockville, Md.: Aspen Systems Corp., 1982.

Newland, T. E. Psychological assessment of exceptional children and youth. In W. Cruickshank (Ed.), Psychology of Exceptional Children and Youth. Englewood Cliffs, N.J.: Prentice-Hall, 1971.

Popham, W. J. Educational evaluation. Englewood Cliffs, N.J.: Prentice-Hall, 1975.

Popham, W. J. Modern educational measurement. Englewood Cliffs, N.J.: Prentice-Hall, 1981.

Quay, H. C. The facets of educational exceptionality: A conceptual framework for assessment, grouping instruction. Exceptional Children, 1968, 35, 25-32.

Quinn, S. C. The effectiveness of the directive teaching instructional management system with secondary learning and behavior disordered students. Unpublished doctoral dissertation, The Ohio State University, 1980.

Romeo, D. J. Effectiveness of the directive teaching method and a data retrieval system on the arithmetic achievement scores of emotionally disturbed children. Unpublished doctoral dissertation, University of Pittsburg, 1974.

Sabatino, D. A., & Miller, T. L. Describing learning characteristics of handicapped children and youth. New York: Grune & Stratton, 1979.

Sabatino, D., Ysseldyke, J. E., & Woolston, J. Diagnostic prescriptive perceptual training with mentally retarded children. American Journal of Mental Deficiency, 1973, 78, 7-14.

Salvia, J., & Ysseldyke, J. E. Assessment in special and remedial education. Dallas: Houghton Mifflin, 1978.

Salvia, J., & Ysseldyke, J. E. Assessment in special and remedial education (2nd ed.). Dallas: Houghton Mifflin, 1981.

Scriven, M. The methodology of evaluation. In B. Worthen (Ed.), Educational Evaluation: Theory and Practice. Worthington, Ohio: Charles Jones, 1973.

Shertzer, B., & Linden, J. Fundamentals of appraisal: Assessment techniques for counselors. Boston: Houghton Mifflin, 1979.

Starke, R. E. The countenance of educational evaluation. Teachers College Record, 1967, 68, 523-540.

Stephens, T. M. The criterion referenced curriculum. Columbus, Ohio: Charles E. Merrill, 1982.

Stephens, T. M. Directive teaching of children with learning and behavioral handicaps (2nd ed.). Columbus, Ohio: Charles E. Merrill, 1976.

Stephens, T. M. Teaching skills to children with learning and behavior disorders. Columbus, Ohio: Charles E. Merrill, 1977.

Stephens, T. M., Hartman, C. A., & Lucus, U. Teaching children basic skills: A curriculum handbook (2nd ed.). Columbus, Ohio: Charles E. Merrill, 1982.

Stufflebeam, D. L., Foley, W. J., Gephart, W. J., Guka, E. G., Hammond, R. L., Merriman, H. D., & Provus, M. M. Educational evaluation and decision making in education. Itasca, Ill.: Peacock, 1971.

Thorndike, R. L. Educational measurement. Washington, D.C.: American Council on Education, 1971.

Thorndike, R. L. Measurement and evaluation in psychology and education. New York: John Wiley & Sons, 1969.

Thurlow, M., & Ysseldyke, J. E. Current assessment and decision-making practices in model programs for the learning disabled. Learning Disabilities Quarterly, 1979, 2, 15-24.

Tyler, R. General statement on evaluation. Journal of Educational Research, 1942, 35, 492-501.

Wallace, G., & Larson, S. Educational assessment of learning problems: Testing for teaching. Boston: Allyn & Bacon, 1978.

Worthen, B., & Saunders, J. Educational evaluation: Theory and practice. Worthington, Ohio: Charles A. Jones, Publishing, 1973.

Zigmond, N., Vallecorsa, A., & Silverman, R. Assessment for instructional planning in special education. Englewood Cliffs, N.J.: Prentice-Hall, 1983.