THE ELEMENTS OF LESSON DESIGN, ELEMENTARY PUBLIC SCHOOL STUDENTS' MASTERY OF MATHEMATICS OBJECTIVES, ACCRUED TEACHING EXPERIENCE, AND TEACHER INSERVICE TRAINING

DISSERTATION

Presented to the Graduate Council of the North Texas State University in Partial Fulfillment of the Requirements

For the Degree of

DOCTOR OF EDUCATION

by

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Denton, Texas

May, 1987

The purpose of this study was to investigate the relationship among the teachers' use of the individual elements of lesson design, students' mastery of mathematics objectives, the hours of inservice training completed by the teachers and the teachers' years of experience. The individual elements of lesson design are defined by Madeline Hunter and are anticipatory set, objective and purpose, input, modeling, checking for understanding, guided practice, and independent practice.

Thirty-four first- through sixth-grade teachers were selected from two public schools for the study. They were each observed two times by an observer using a portable computer to determine their use of lesson design while teaching mathematics. Correlation coefficients were calculated between each of the elements and mastery of mathematics, teacher inservice, and teaching experience. Coefficients were also calculated between mathematics and inservice and experience. Significance was established at the .05 level.
Negative relationships were determined between mastery of mathematics and the use of both input and modeling. A positive relationship was determined between mathematics' mastery and independent practice. A negative relationship was also determined between years of experience and both use of other activities and mastery of mathematics. Additional data indicated that the teachers used lesson design effectively more than 94 percent of the time and the average level of mastery of mathematics objectives was greater than 90 percent. The teachers averaged more than thirty-six hours of inservice training.

It was concluded that the use of lesson design was effective with students being instructed in mathematics; however, modeling and input were least effective of the elements and independent practice was most effective. Teacher inservice was not a significant factor in the use of an individual element nor student mastery of mathematics. Years of experience was inversely related to student success, but the data were not evenly distributed.

It was recommended that the use of lesson design be continued, teacher inservice training be improved, and use of computer technology be further developed.
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CHAPTER I

INTRODUCTION

A number of publications and reports pointing out the shortcomings of American public education reached the public's attention in the time between 1982 and 1984 (16). The study that generated the most attention and furor was "A Nation At Risk" (2, 15). Important books by Adler (1), Goodlad (9), and Sizer (19) were also released during this time period and demanded educational reform. Although these books were different in many ways and comprehensive in their approach to reform, they all recognized that the levels of student achievement in American public schools are unacceptable (16).

Reforms came to Texas in the form of House Bill 246 (which is now Chapter 75 of the Texas Education Code) and House Bill 72. Chapter 75 is predominately a modification of curriculum and instructional processes and House Bill 72 modified the system of state finance, transportation, compensation and appraisal, professional responsibilities and instructional requirements (21). House Bill 72 requires the building principal to be both an educational leader and administrative manager (17). One of the responsibilities of the principal is to supervise and evaluate teachers (21).
The research by Cuban indicates that in effective schools "district supervisory practices and evaluation instruments used in schools and classrooms are revised in light of the focus on student outcomes and what the literature on effective teaching has provided" (6, p. 696). Adler (12), Boyer (5), and Goodlad (9) also emphasize the instructional role of the school principal. Therefore, the principal is an instructional leader and must use effective teaching methods as criteria for evaluating teachers.

This study focuses on one small part of what is considered to be effective instructional practices: the elements of lesson design. Generally speaking, it can be explained as a format used by teachers in planning what will be covered in the lesson and how it will be covered. The study utilized data collected from classroom observations of actual lessons and correlated the data with the students' mastery of mathematics objectives. The study provides information about the effectiveness of the individual and combined use of the elements. The study also provides information about teacher inservice training and teaching experiences as they apply to the use of lesson design and students' mathematics performance.

Statement of the Problem

The problem of this study was to ascertain whether there are any relationships between the teachers' use of the
elements of lesson design, the elementary students' mastery of mathematics objectives, the teachers' training in the use of lesson design, and the teachers' years of experience.

Purposes of the Study

The purposes of the study were to investigate the relationships between (1) teachers' use of the elements of lesson design and students' mastery of mathematics objectives; (2) teachers' use of the elements of lesson design and the amount of completed inservice training related to the use of the elements of lesson design; (3) teachers' use of the elements of lesson design and the teachers' years of teaching experience; (4) the students' mastery of mathematics objectives and the amount of completed inservice training related to the use of the elements of lesson design; and (5) the students' mastery of mathematics objectives and the teachers' years of teaching experience.

This study is important because it provides specific information about the duration of use of the individual elements with a lesson and determines certain relationships between the elements and student performance. The study also provides information about the relationships between the teachers' effective use of the elements and the experience and inservice training of the teachers. An additional significance in the study lay in the development and use of a computerized system for the observation of
teachers engaged in instructional activities. The computer provides for the rapid recording of a larger quantity of information than can be recorded by taking handwritten notes and also provides for more time for the observer to watch class activities.

This study is important to school districts as they provide inservice training for teachers, develop and improve inservice training for teachers, develop and improve evaluation systems, and determine what activities increase student productivity. Teachers are provided with information that can be used to improve their skills in planning and conducting lessons. Principals and principal organizations will find this study important in assisting teachers with improving and developing their instructional skills, in developing efficient and accurate ways of collecting information while observing instructions, and in expanding their understanding of effective instructional processes.

Hypotheses

$H_0$—There will be no significant relationship between the duration of use of the following elements of lesson design by the teachers and the students' mastery of mathematics objectives: (a) anticipatory set, (b) objective and purpose, (c) input, (d) modeling, (e) checking for understanding, (f) guided practice, and (g) independent practice.
$H_2$.—There will be no significant relationship between the duration of use of the following elements of lesson design by the teachers and the teachers' accrued inservice training time related to lesson design: (a) anticipatory set, (b) objective and purpose, (c) input, (d) modeling, (e) checking for understanding, (f) guided practice, and (g) independent practice.

$H_3$.—There will be no significant relationship between the duration of use of the following elements of lesson design by the teachers and the teachers' years of teaching experience: (a) anticipatory set, (b) objective purpose, (c) input, (d) modeling, (e) checking for understanding, (f) guided practice, and (g) independent practice.

$H_4$.—There will be no significant relationship between the students' mastery of mathematics objectives and the teachers' accrued inservice training time related to lesson design.

$H_5$.—There will be no significant relationship between the students' mastery of mathematics objectives and the teachers' years of teaching experience.

Definition of Terms

*Lesson design* is a format for the development of an instructional unit that enables the planner to consider the inclusion and sequencing "of seven elements, which research has shown to be influential in learning." The elements are
anticipatory set, objective and purpose, input, modeling, checking for understanding, guided practice, and independent practice (11, 18).

Anticipatory set is the focusing or mentally preparing of the students for the lesson. It may create interest in the lesson, review previously covered information, or provide the teacher with diagnostic information about the students' prerequisite skills (11, 18).

Objective and purpose are statements that indicate what the students will be learning or did learn during the lesson and why it is important for them to have learned the information (11, 18).

Input is the decision about what information is to be taught and presenting it to the students in a simple, meaningful manner (11, 18).

Modeling is the demonstration or exemplification of information to the students in a meaningful manner (11, 18).

Checking for understanding includes the activities which provide the teachers with verification that the students "exhibit the skills necessary to achieve the instructional objective" (18, pp. 4-5).

Guided practice denotes the students' initial activities which utilized the information or skills to be mastered. Student performance is closely monitored by the teacher (11, 18).
Independent practice includes the drills and activities performed by the students to reinforce lesson objectives without assistance from the teacher (11, 18).

Effective teacher behaviors are activities performed by teachers that result in student learning as verified by research (3, 6, 12).

Computer Assisted Teacher Observation System (CATOS) is a system that allows for the recording of observed teacher activities in the classroom on a portable computer. The system provides for noting the use of the elements of lesson design, specific activities during the lesson, and general impressions at the conclusion of the lesson. The system also allows for the recording of the ineffective execution of activities or elements (Appendix A).

Teacher inservice training is defined as professional growth activities afforded to teachers by the school district, or professional organizations. For the purpose of this study, the professional growth activities will be directed toward the area of lesson design.

A criterion-referenced test is a test in which the items are samples drawn from a very specific and defined content area. Mastery for each item is either accomplished or not, and the final score indicates what percentage of the items were mastered (4).

An elementary school includes students enrolled from kindergarten through sixth grades.
An administrator is a principal or assistant principal designated as the educational leader of a school and is responsible for the instructional program.

A teacher is a person assigned in a school with the responsibility of instructing a group of students or class. Each group or class in this study is of a single grade from first through sixth.

Limitations

The scope of this study was limited to two elementary schools in one school district. The findings and conclusions are generalizable to the population studied and others which have similar characteristics. The study was limited to mathematics and the results may not be generalizable to other academic areas.

Assumptions

With regard to this study, it is assumed that a similar presentation of a lesson will lead to similar results. It is also assumed that the observations recorded are typical of the lessons taught by the teacher and the observations are typical of ones recorded by the observer.

Background

Public education is experiencing massive change and "... after more than a decade of neglect, education became
a top priority again" (5, p. 525). The impetus for the change has come from the public's dissatisfaction with public schools. Elam (7) reported that the downward trend in public confidence in public education was gradual and began in 1974, as evidenced by the results of the Gallup Poll of the Public's Attitudes Toward the Public Schools. However, the most important study in many years and the turning point in the public's contemporary attitudes toward public education was a report titled, "A Nation at Risk: The Imperative for Educational Reform" (8). The report was developed by the National Commission on Excellence in Education, and it was presented to the public and government officials at the White House on April 26, 1983. The report was alarming because it made intense statements about the poor results of our current system of public education. It made recommendations in five broad areas: content, standards and expectations, time, teaching, and leadership and financial support. As a result, many new studies and plans for reform have been initiated since 1983.

The response to educational reform in the State of Texas came in a special session of the Sixty-Eighth Texas Legislature in the form of House Bill 72. It was also broad-based and was a comprehensive modification of Texas school law. The law covers school finance, transportation, curriculum and special programs, students, teachers, and
administrators, and other miscellaneous areas. House Bill 72 calls for the yearly appraisal of certified personnel and the placement of certified personnel on a career ladder. The career ladder is important to reform because it rewards teachers for outstanding performance (21). Another function of the appraisal process is "to help teachers improve performance" (15, p. 1). Sweeney (20) and Hunter (11) both emphasize the importance of frequent teacher appraisal in helping improve the instructional skills of teachers. Teacher appraisal is important to teacher reform for the improvement of instruction and the assignment of teachers to the career ladder.

The increased pressure to improve appraisal systems for teachers has required that they be based on sound instructional premises (11, 14, 15). Hunter has been an important person in the development of effective educational programs and has been in charge of developing the Professional Development Center for the Long Beach Unified School District, has been principal of the laboratory school for the University of California at Los Angeles' College of Education, and is presently on staff at the University of California at Los Angeles. She has developed a theory of instruction titled Instructional Theory Into Practice (ITIP; 10) and has continued to promote and refine the theory (13). This study focuses on lesson design which is only one part of her theory. Her statement,
A launching pad for excellence in teaching is built with motivation, reinforcement, and practical theory translated into lesson design. From there people who use the model need to know transfer theory to encourage creativity, problem solving, and decision making (13, p. 59),

puts lesson design into the proper perspective with other tenets of her theory.

Organization of the Study

The study is organized into five chapters. Chapter I provides an introduction to and background of the study. Chapter II presents the review of the related literature. Four general areas are involved: (1) Hunter's Model of Lesson Design, (2) Effective Programs and Teacher Behaviors, (3) Research from Alternate Viewpoints, (4) Teacher Inservice Training, and (5) Teacher Experience. Chapter III consists of the design of the study and outlines the procedures used in collecting and analyzing the data.

The populations of the study and research instruments are reviewed. The presentation and analysis of the data are in Chapter IV. Chapter V presents the findings, conclusions, and recommendations of the study. Suggestions for further research are also included.
CHAPTER BIBLIOGRAPHY


CHAPTER II

REVIEW OF SIGNIFICANT LITERATURE

This chapter is divided into five parts. The first explains Hunter's model of lesson design. The second part cites research that supports her model, and the third cites research from alternate viewpoints. The fourth and fifth parts address teacher inservice training and teacher experience, respectively.

Hunter's Model of Lesson Design

Lesson design is a structured, seven-part format to be used by teachers in planning and conducting a lesson. It is not necessary for a teacher to include the elements into every lesson; however, "each element must be thought about by the teacher and its exclusion be a matter of professional decision making rather than default" (31, p. 176). Along with decisions about the elements of lesson design, teachers will make diagnostic decisions and content decisions before class begins (30). Critical decisions made during class include when to change objectives for the class, when to interrupt the instructional activities to care for organizational or discipline matters, when to use transitional activities, or when to reteach. These are all acceptable,
spontaneous decisions that teachers make that break from the lesson plans that incorporate the element of lesson design (31).

Hunter explains the elements of lesson design in the following ways.

1. **Anticipatory set** includes activities at the beginning of the lesson or when a teacher needs to focus the students' attention on the lesson objectives. The set may review objectives previously learned, test the students prerequisite skill level, or simply get their minds on the subject to be covered in the upcoming lesson.

2. **Objective and purpose** is simply a statement of what is to be learned in the lesson and why it is important.

3. **Input** refers to the process of deciding what is to be taught to the student and the activities used to convey the information.

4. **Modeling** is the demonstration, exemplification, or discussion used to explain the information of the lesson. Hunter believes that "it is facilitating for the learners to directly perceive the process or product they are expected to acquire or produce" (31, p. 176).

5. **Checking for understanding** involves the teacher's verification that the students correctly understand and can use the information in the lesson to minimal level. Activities provide for the teacher's finding out the students' level of understanding.
6. Guided practice involves classroom activities performed by the students under the close supervision of the teachers that provide an opportunity for them to use their newly acquired skill or knowledge.

7. Independent practice is the continuation of drill that reinforces the skill or knowledge of the lesson, but the teacher is more certain of student mastery and does not directly supervise the activities (31, 32, 46).

**Effective Teaching**

Other researchers and educators have given credence to Hunter's theory and points from their works follow. The terminology is frequently different, but the components of effective lessons are conceptually the same.

Good and Grouws (24) developed a teacher training model that includes but is not totally comprised of the following steps.

1. Teacher should check the work from the previous day and, if necessary, the lesson should be retaught.

2. Teacher should present new information with detailed instructions and explanations.

3. Students should practice using the information with teachers monitoring their work.

4. Students should work on the information independently.

5. Weekly and monthly reviews should occur.
Follow-up studies indicate the model was successful in terms of student achievement. This model for an effective lesson follows a close likeness to the Hunter model.

The Program for Effective Teaching in the Newport News Public Schools reports successful training for teachers that leads to increased time-on-task, teaching to the objective, and increases in student learning. Leibold (38) and Evans (18) both report success in the program and the similarities to the Hunter Model. All of the same elements are present, but anticipatory set is expanded. More emphasis is placed on the congruency of the lesson, meaning that information and activities are carefully tied to the total objective.

Development of the Program for Effective Teaching was assisted by Ernest Stachowski, a former associate of Hunter.

The use of lesson design adds structure and organization to the instructional activities. Several studies support the importance of organization and the effect on student learning (13, 21). Stallings and associates (54) report that an effective teacher is well organized and structured. Also, student engagement increases as the teacher's organization of instruction increases (2). These thoughts lend credence to the belief that the use of lesson design positively affects student achievement.

Anticipatory set has been previously explained as introductory activities of the lesson that result in
focusing the student's attention and may review previous learning for the purpose of creating interest or diagnostics. Securing student attention at the beginning of the lesson is used by effective teachers (8). Reviewing previous learning related to the upcoming lesson is an effective activity (24). The effective use of lesson design is usually initiated by an anticipatory set.

The second element of lesson design is the stating of the objective and purpose of the lesson. Emmers, Evertson and Anderson (16) support this and emphasize the point that effective teachers communicate the objective of the lesson and also give a rationale for the lesson to increase the student's motivation to learn. Kounin (35) elaborates on the importance of the teacher's promoting the purpose of the lesson and value of learning, and the teacher's attention to these activities also has a positive effect on classroom management.

Another element is called input; content planning and presentation. Good and Grouws (23) explain the importance of clarity in the presentation of information and the positive effect it has on student learning. Effective teachers present new content or skills directly to the students (45). Stallings (51) stresses the importance of varied materials which are relevant to and appropriate for the objectives of the lesson. Varied materials during the
presentation result in on-task, student behavior, and achievement gains. Clarity, new content, and varied materials are all important during the input phase of lesson design.

Modeling is the demonstration, exemplification, or discussion used to clarify information presented during the input element of lesson design. A relationship between effective teachers and the use of examples was explained by Rosenshine (45). The use of examples and non-examples is more effective than examples used alone. Clarity of information presented is enhanced by the use of relevant examples. Step-by-step explanations, responses to student questions, and demonstrations of how to do work are all effective techniques (29). The use of a variety of techniques to demonstrate the information adds to the student's understanding.

Students are more successful if their teacher attends to their understanding of the information and directions before they begin the seatwork (9, 24). Effective teachers monitor student responses in order to determine if students are performing successfully (13, 53). These are both teacher actions that occur during checking for understanding which is the teacher's verification of correct student learning.

The sixth element of lesson design is guided practice, and involves the close supervision of the students by the
teacher while they are using the newly acquired knowledge in some activity. The effectiveness of student practice in a controlled, supervised environment is well documented by Anderson, Evertson, and Brophy (1), Good and Grouws (24), and Stallings, Needles, and Stayrook (54). All of these studies stress the importance of the teacher's taking an active role in the monitoring of student performance on the practice activities. The monitoring of students' work is a primary factor in guided practice.

An effective teacher gives students assignments related to the lesson objectives to complete without assistance from others. The purpose is to reinforce or strengthen the concepts or skills in the student's mind. Teachers should limit the amount of in-class time to spend on independent activities, thus creating the need for homework. It is also important for teachers to hold students accountable for these assignments (16, 24). These teacher activities are all included in the final step of lesson design—-independent practice.

What Works: Research About Teaching and Learning (56) was published in 1986 by the United States Department of Education. The publication is a collection of suggested activities and techniques that research indicates is effective in instruction of students. The recommendations in the book are general and divided into three broad
categories—home, classroom, and school. To relate the book to this study, home and school suggestions have been deleted. Some of the categories of classroom techniques are relevant to the study of lesson design, although the elements of lesson design are not specifically stated in the book.

Direct instruction is a procedure stated in the book as having a positive effect on student learning. It has basic components of setting clear goals, presenting assignments, giving clear explanations and illustrations, asking frequent questions, and providing for student practice. The activities are sequential, planned, and aid students in learning content and developing their own skill in learning. Lesson design is a direct instructional technique and carries the basic components of direct instruction to greater detail.

The book also explains the importance of managing classroom time, which is explained as planning, communicating, and regulatory student activities in the most efficient manner. Lesson design is a sequential format for planning lessons and when properly utilized will result in little wasted instructional time. The explanation of time management places the teacher in charge of communicating expectation to the learners, pacing and sequencing the activities, monitoring student progress, and adjusting activities to
meet the needs of the learners. All of these points are also stressed in the explanation of the use of lesson design.

The final element of lesson design is independent practice, and it includes practice during class and outside of class. The book *What Works*, stresses the importance of homework. The effective quantity of homework is variable for individual students, grades improve as students complete homework. Homework is most effective when it relates to the classroom activities and is graded by the teacher. All of these suggestions are consistent with those of independent practice.

The book also recommends assessment of students which is included in the elements checking for understanding, guided practice, and independent practice of lesson design. Suggested assessment techniques included student questioning, tests, student behaviors, and performance on assignments. Student motivation and achievement are increased when the assessment is prompt and specific.

In the Spring of 1986, the Texas Education Agency developed a new system for evaluating all of the teachers in the state. It is titled the Texas Teacher Appraisal System (TTAS; 55). The system includes indicators of teacher performance that have been researched and deemed to be effective activities that result in student learning. The following criterion or indicator relates to an element of lesson design.
A. Anticipatory set
Indicator 3a—secures student attention, or students are attending,
Indicator 6a—begins instruction/activity with an appropriate introduction,
Indicator 6c—relates lesson content to prior or future learning.

B. Objectives and purpose
Indicator 2a—communicates learning expectation,
Indicator 6c—relates lesson content to prior or future learning,
Indicator 9b—emphasize the value/importance of the activity or content.

C. Input
Indicator 1a—appropriately varies instruction,
Indicator 1f—implements instruction at an appropriate level of difficulty,
Indicator 2f—re-teaches, or none needed,
Indicator 4c—maintains appropriate pace,
Criterion 6—teaches for cognitive, affective, and/or psychomotor learning and transfer,
Indicator 6b—presents information in an appropriate sequence,
Criterion 7—presents information accurately and clearly,
Indicator 7c—explains content and/or lesson tasks clearly,
Indicator 7d—stresses important points and dimensions of content,
Indicator 9a—relates content to student interests/experiences.

D. Modeling
Indicator 6e—provides for elaboration of critical attributes of concepts, psychomotor skills, and/or attitudes and interests.

E. Checking for understanding
Criterion 2—evaluates and provides feedback on student progress during instruction,
Indicator 2c—solicits responses or demonstrations from specific students for assessment purposes.

F. Guided practice
Indicator 2b—monitors student performances as they engage in learning activities,
Indicator 2c—solicits responses or demonstrations from specific students for assessment purposes.

G. Independent practice
Indicator 4e—keeps students engaged,
Indicator 5b—uses techniques to prevent off-task behavior, or none needed (53, pp. 25-27).
Some of the TTAS criteria and indicators relate to the use of lesson design as a system more than the specific elements. They are "Indicator 3b--uses administrative procedures and routines which facilitate instruction" (53, p. 25), "Criterion 4--maximizes amount of time available for instruction" (53, p. 26), "Indicator 4b--implements appropriate sequence of activities" (53, p. 26), "Indicator 4e--keeps students engaged" (53, p. 26), "Indicator 6b--presents information in an appropriate sequence" (53, p. 26), and "Criterion 9--uses strategies to motivate students for learning" (53, p. 27).

In Rosenshine's study of teaching functions (45), he stresses the benefits to student learning of structured or direct approaches as opposed to discovery or individualized approaches. Hunter's elements of lesson design lend themselves to structured or direct lessons and recommends a statement of objectives and purpose. Her model also includes input as an element and students achieve more when they receive direct instruction from their teacher.

Rosenshine (45) states that an effective lesson should have these functions: (1) review, check previous day's work, and reteach if necessary; (2) present new content or skills; (3) initial student practice and checking for understanding, (4) feedback and correctives; (5) independent practice; and (6) weekly and monthly reviews. He also notes
in his research that "effective teachers of mathematics spend more time in demonstrating than do less effective teachers" (45, p. 339). He discusses the importance of guided practice in both the teacher asking questions and standing by to assist the students. Checking for understanding was defined as "frequent assessments of whether all the students understand the content or skill being taught or the steps in the process" (45, p. 342). His study stresses the importance of monitoring students' work and independent practice. These points are included in lesson design by Hunter and exhibited similarities to the Good and Grouws model of instruction.

Rosenshine stresses the need for independent practice stating that the purpose should be "to provide the students with sufficient practice so that they can do the work automatically" (45, p. 348). His research indicates the following four steps to successful seatwork: (a) provide clear instructions, (b) circulate around the room assisting students, (c) have brief contacts with students, and (d) provide several segments of instruction and seatwork during the period for difficult material.

In Berliner's study (4), he concludes that students achieve more and pay more attention when the teacher structures the lesson and clearly communicates the intent of the lesson. This structure includes focusing the
students at the beginning of the lesson and explaining what was to be learned. Berliner cites Bruner (1981), Tikunoff, Berliner, and Rist (1975), and Fisher and others (1980) as supporting these assertions. These points coincide with Hunter's set, objective and purpose, and input elements.

The importance of student success is emphasized by Berliner in his synthesis of research. He concludes that "success rate . . . appears to be another powerful variable with known effects on achievement. Like other such classroom variables, it needs to be monitored, evaluated, and often modified" (4, p. 59). He reviewed research from Rosenshine (1983), Brophy (1983), and Fisher (1978), to support his statements. These tenets correspond to Hunter's elements of checking for understanding and guided practice.

Berliner (4) refers to the importance of content decisions and how what is eventually taught is the result of a teacher decision or the element of input. His synthesis of research indicates that content decisions are among the determining factors in student learning, and he cites studies from Cooley and Linehardt (1980), Husen (1967), Walker and Schoffarzick (1974), and Berliner and Rosenshine (1977).

Berliner (4) also stresses the importance of questioning students to enhance their learning. Questions may be categorized as high level and low level and higher level questions are thought to expand learning (7). More recent
research by Brophy and Evertson (8) indicates that lower order questions also serve a purpose in the classroom and enhance student learning. Checking for understanding (one of Hunter's elements of lesson design) utilizes questioning the students as a way for the teacher to monitor their progress.

Studies are cited by Berliner (34) that examine the amount of time elementary-aged students work privately in the classroom. He notes the importance of the teacher in guiding and monitoring the students in order to give them feedback on their work and keep them on task. Studies are cited that indicate a relationship between the number of teacher and student interactions and the academic progress of the students. Hunter also stresses this classroom activity within the element of guided practice.

Englert states that strategies that can increase correct academic responding include: (a) increasing the amount of teacher modeling and demonstration, (b) preprompts or pre-questions that focus attention on the relevant features of the concept, (c) increased student responding, (d) mixed (single skill) to mixed (multi-skill) practice, (e) cumulative introduction of facts or skills rather than simultaneous presentation, and (f) presentation of information in small instructional steps. As these techniques imply, effective teachers modify the way information is presented--rather than modify consequences or reduce the pace of the lesson--to achieve high levels of correct responding (17, p. 13).

This statement covers most of the elements of lesson design as proposed by Hunter.
In a 1980 study, Fisher and others (19) arrived at two major conclusions that are consistent with lesson design. The first was that teachers who raise more questions and answers during group work have more engagement during seatwork. This concept corresponds with active participation during input, checking for understanding, and guided practice. Second was that teachers who are more successful at managing seatwork are involved with their students during seatwork time by circulating the room, asking questions, and giving information, and these activities are consistent with what comprises guided practice.

Griffin and his associates (27) indicate, in their study of changing teacher practice, that effective instruction involves preparing the student for the lesson, clear and meaningful presentation of the information by the teacher, practice by the students in using the information under the guidance of the teacher, and independent practice by the student to reinforce the lesson. These ideas are consistent with the elements of Hunter's model called anticipatory set, objective and purpose, input, guided practice, and independent practice.

Block (6) seems to give the strongest philosophical basis to Hunter's model. His theory of mastery learning is a stimulus-response, behavioristic theory. It delineates techniques and procedures to be used in classrooms with
characteristics typical of today's public schools, i.e.
large numbers of students with a variety of skill levels,
fixed curriculum scope and sequence, and mastery determined
by grades and test scores. Hass (28) and Westerberg (57)
support the approach of mastery learning and report that
the body of evidence indicates that mastery learning works
very well.

In summary, the present is a time of educational reform
prompted by a decrease in the confidence of public education.
The appraisal of teachers based on a sound theory of effec-
tive instruction is one of the actions believed to improve
public education. The instruction theory developed by
Hunter is one of the accepted theories that is being put
into practice. This study explores one component of her
theory: lesson design and the specific elements that
compose it. The tenets of lesson design are promoted by a
number of other educators and researchers as being effec-
tive in the classroom and resulting in student learning.

Alternate Viewpoints to Hunter's Model

Hunter's model of instruction is widely accepted and
used across the country, but it is also criticized by some
educators (10, 11). She attempts to negate some of these
criticisms in an article published in 1985. She claims that
the problems arise from the misunderstanding of her model
and changes in her model as others learn and use her ideas. The misunderstandings are called myths (33).

The first myth is that "the model is rigid and stifles creativity" (33, p. 58). Costa (10) sees her model as a precise set of decisions, steps in a lesson, and techniques to be used. Davidman (11) sees the model as requiring teachers to be close-minded, rigid practitioners because of its structure. He also sees a contradiction in her statements about the importance of decision making by teachers that her model supports and the implication that there is a "right" decision for each situation in the classroom.

The second myth or misunderstanding that she reports is that "the model was created to evaluate teachers" (33, p. 58). Her position on this myth is that her model is not to be used to evaluate teachers. However, in another article, she states,

The principal evaluates teachers. In the final outcome, a teacher's evaluation is directly related to the "impressions" of the principal. It is important to the mental health of both teacher and principal that those impressions have a documented basis of reality in the cause/effect relationships of human learning with evidence from many observations of teaching performance (33, p. 189).

She seems to contradict herself in these two publications and, in one case, disregards the evaluation responsibilities of the principal.

Hunter states that another myth is that "the model is great for direct teaching but does not apply to the arts,
to discovery learning, or cooperative learning" (33, p. 59). She goes on to explain that her model is effective with every mode of teaching. Costa (10) says that other instructional strategists might conceive teaching differently because of other philosophical and psychological orientations. Taba, Lozanov, Adler, Glasser, Bruner, and Montessori were all named as taking exception with Hunter.

"Myth: There has been no research to support this model" (33, p. 59). Hunter contradicts this myth by stating that every proposition in the model originated from research in human learning and that studies of her model have "demonstrated substantial increases in student learning and teacher satisfaction, decreases in discipline problems and vandalism" (33, p. 59). Costa (10) questions the scientific basis for her model by arguing that sources of the data are absent that would support the psychological basis. Her model also lacks any reference to neurological, sociological, and anthropological factors. Davidman (11) also criticized her model for not considering cultural factors of learning and failure to be specific about psychological research.

Another myth she states was that "the model consists of a limited set of learning principles" (33, p. 59). She discusses the link between several learning theories as support for complexity of the model. Davidman (11) implies that the model is an oversimplification of learning and is narrow in scope.
Hunter concludes the article by listing problems that have resulted from misunderstandings of her theory. The problems are: (a) "some administrators believe that teachers should try to use every element of effective instruction in every lesson" (33, p. 59); (b) "some teachers and administrators believe that if a little is good, more is better" (33, p. 59); (c) "observers judge teachers' decisions without finding out the reasons for those decisions" (33, p. 59); (d) "too much is expected too soon" (33, p. 60); (e) "promoters of the model want to begin with teachers" (33, p. 60); (f) "districts provide a one-shot or one-year exposure, then move on to a new focus" (33, p. 60); (g) "once teachers or administrators have been trained, they think they are finished" (33, p. 60); and (h) "leaders are not adequately trained" (33, p. 60). She concludes that her model is not at fault in situations where it has not been successful, but the fault lies in the use and understanding the content of her model and the ineffectiveness of its implementation.

The lack of philosophical basis is a criticism of Hunter by Davidman (11). Eisner and Vallance (14) explain five theories in their book and Hunter's model is consistent with the philosophy that views the curriculum as technology—learning occurs in systematic predictable ways, and it can be made more efficient by selecting methods to control it. An extreme of this concept is the fallacy of formalism when
the how of teaching is stressed at the expense of what is being taught. Hunter's model stresses the pedagogy of teaching.

The cognitive-development theories of education are in conflict with Hunter's model of mastery teaching. Progressive education, open classrooms, non-graded students, and the Montessori method are some educational labels placed on programs that support the tenets of cognitive development (26). The theory recognizes the natural, sequential stages of the development of the individual and views school as an environment to facilitate the development with each person being individual and needing the latitude to develop based on their abilities and interests. Schools supporting the cognitive-development theories have no specific curriculum; rather a broad selection of activities from which students may choose. The traditional role of the teacher is shifted from being the presenter of content, controller of the curriculum, and authority in the classroom to being a counselor and model for the students who aids the students in developing and completing their selected educational goals. The teacher takes a less direct role in the classroom, and each student is responsible for his or her own learning. The teacher is responsible for creating a nurturing environment for his or her students (22, 26, 42, 44).

Katz (34) explains an ideological difference between the support of academic goals for schools and the support of
intellectual goals. The activities that support academic goals emphasize teaching children the student role. Teachers help children adjust to school, develop testable skills, learn to conform to routines and expectations of the public school, and motivate children toward achievement. Intellectual goals are exemplified by teaching children their role as learners by developing skills in problem seeking, developing skills in problem solving, and emphasizing a child's motivation to learn as opposed to achievement. Hunter's pedagogical approach is an academic approach, and Piaget's Theory is an intellectual approach. The contrast between activities of the teacher in the two approaches exemplifies the differences.

Central to Piaget's Theory, as explained by Penrose (41), is that knowledge (information) cannot be transmitted verbally to students. The information must be constructed and reconstructed in the learner's mind, and the experience of thinking results in the development of intelligence. The activity of the learner is the most critical aspect of the process and without activity, intelligence is not developed. Also, no distinction is made between cognitive and affective in the learning-thinking process. Feeling is an aspect of thought and without cognitive understanding, there is no feeling. Hunter's model distinguished between affective learning and cognitive learning.
A school utilizing a Piagetian Model of education would emphasize self-activity of the children (37). The teachers are extremely skilled in asking the students questions to help them correct their own errors and extend their intelligence. The activities may be conducted in groups or individually, and students in the class may be working on a variety of different materials and subjects. Students often teach one another. Teachers are extremely knowledgeable of children's developmental stages and learning theory but may not be content or subject specialists. Activity is a key attribute of learner success, and the teacher facilitates the student activities to stimulate and guide the learning process. Hunter's model is a direct instructional model.

Elkind (15) criticizes schools that are structured and standardized in their approach to educating children. He relates it to the factory model of industrialization and a reflection of our society as we push for greater productivity. Our schools are not considerate of individual students, and the students who cannot be successful may drop out of school or demonstrate emotional problems. The incidence of these social problems is on the rise. No implication is made that Hunter's model results in acceleration of occurrence of these problems. The model does reflect the current emphasis on productivity. Lesson design has been criticized by others as being very structured and systematic—not a personal or
individual approach, though it certainly could be with emphasis in training on awareness of student social-emotional needs.

Myers (40) is critical of teaching approaches that prevent the teacher from being free to use a variety of techniques. Often researchers, such as Hunter, have developed teaching techniques, measured their effectiveness, convinced schools to utilize the techniques, trained teachers in their use, and developed evaluation instruments that focus on the teachers' part of the techniques in their performance appraisal. Several examples were cited, and he contends that this rigidity removes the teacher's ability to make important, creative decisions for his or her class. While the techniques have been documented as effective, they are not the only activities that enhance learning, and teachers should not be rigidly evaluated on their use.

Myers cites several studies in teacher efficacy that indicate that student learning is enhanced by the teacher's feeling of professional authority. Teachers will be more effective when they are free to make decisions about what and how they teach. Structured, rigid techniques that are converted into an evaluation system reduce the teacher's freedom to make decisions and feelings of efficacy. Hunter's model has (in some cases) been converted into an evaluation system.
Teacher Inservice

Research concerning teacher inservice training was discussed by Bentzen (3) as he described findings of the five-year Study of Educational Change and School Improvements (SECSI). The study explored the characteristics of the staffs of schools that were receptive to changes in the instructional activities of the school and implemented changes that had long-term effectiveness. The study indicated that the events that occurred in effective programs were dialogue within the staff, shared decision making, action, and evaluation. The success of this program was credited to the involvement of the teachers.

Goodlad (25) studied change resulting from teacher inservice training from the perspective of the organization coping with new practices. He describes this coping as an internal process of the organization; therefore, inservice plans and activities are more successful from within than programs that are generated externally. Although his thoughts were on coping with change, they apply very well to inservice education and coincide with Bentzen's thoughts.

The Rand Study (5) determined that local staff development activities could improve teacher practices significantly. The study also determined that no single factor was responsible for change, but successful change is the result of interaction between the change process and the setting to
be changed. Teacher training did seem to be most effective when it was concrete, ongoing, and teacher-specific. The study noted that teacher participation in the decision-making process is also important to the effectiveness of the program.

An effective model for teacher inservice training, that which results in significant behavior change, was developed by Showers (47) at the University of Oregon. Her study indicates that teachers can effectively achieve skills in new models of teaching by (a) study of the theory, (b) seeing several demonstrations of the activities, (c) practicing the activities, and (d) receiving feedback from knowledgeable persons. All of these steps were found to be critical to the success of the inservice.

Sparks (49, 50) has developed a three-part model of staff development based on the synthesis of numerous studies. The model includes decisions about what will be taught (called content), the environment encompassing staff development (called context), and the process of staff development which considers all the activities to be completed with considerations for the effect of these activities on the teachers. She cites a number of major studies and notes how important a well-planned program is to effecting teacher change.

Phi Delta Kappa (43) assimilated research from a variety of sources on teacher inservice training. Collected research
indicates that different programs of inservice are effective for different goals. One-day or ad hoc inservice can be an effective way to improve teacher morale, to increase teacher awareness, or to provide an overview of programs or policy. Inservice training intended to change teacher behaviors should be long term with opportunities for teachers to interact. Programs that are more effective receive support, day-to-day interventions, and leadership from the building principal.

A project by the Southwest Educational Developmental Laboratory (48) assimilated the results of numerous studies and information from a questionnaire to provide educators with up-to-date suggestions for inservice training. The first factor mentioned is the role of the school principal in facilitating change. Successful inservice programs are led by principals who have open communication and share decisions with the teachers, provide strong leadership, have a high degree of goal clarity and goal orientation, and support innovation.

Another factor important to successful inservice training is the use of long-range plans and building short-term activities around them. Several models for planning and implementation were discussed and all included some sort of needs assessment as the initial step and involved teachers in the planning. The study suggests that effective inservice
training should utilize presentation of information, modeling activities, practice by teachers, feedback, and coaching (36).

Stallings (52) suggests that lack of follow-up is the most frequently overlooked element of inservice programs. She also suggests that there is little accountability to inservice plans and developed a model for staff development. The model includes a baseline or pretest to determine the knowledge and skills of the teachers, the presentation of information, practice for the teachers in using the information, and posttest observations. Other suggestions for effective staff development are to provide adequate time to select and develop a program, recommend changes that are based on research, emphasize the application and use of skills in the training, and select the trainer to be an effective role model.

Teacher Experience

Katz (34) explains four developmental stages that teachers go through as they gain experience. The first stage is survival, and the teacher's main concern is being able to complete a period of time—day, week, school year. The teacher feels unprepared and incapable of success. Consolidation is the next stage. After a teacher has completed the first year, the focus shifts in the development of certain techniques and skills needed to work with certain
The teacher has the background to know generally what to do and expect. Renewal is the third stage and teachers develop the desire to try new strategies, materials, and techniques. The teacher in the renewal stage is considered experienced and has been teaching for three or more years. The final and fourth stage is maturity. This stage is characterized by a search for broader insights and perspectives. The nature of growth and learning, educational philosophy, and the role of education in society are examples of some of the broad topics related to the profession that the experienced teacher questions and contemplates.

The exploration of these stages has implications for inservice and staff development programs as teachers in each stage have different training needs. The training needs for the survival stage are for support, encouragement, understanding, and guidance. It is advisable for on-site trainers to provide frequent and individual support to the beginning teacher. The suggested training needs for teachers in the consolidation stage include on-site assistance, more specialized guidance, and interaction with colleagues. The renewal stage training programs should include conferences and professional organization meetings, demonstration projects, and professional readings. Finally, training needs for the maturity stage might include advanced degree programs, seminars, institutes, and conferences.
The point is clearly made that teachers have a variety of needs based on their experience and for inservice training programs to be successful, they must consider these needs. Katz points out that experience alone will not result in the best teacher. The early stages of training are most effective on-site with the teaching duties, but the sites for the training of more experienced teachers may successfully be extended. The point is also made that preservice training is of less value to the teacher than effective inservice programs.

The four-year Rand study provided data concerning the nature of change. Berman and McLaughlin (5) determined, among many other things, that teachers with many years of teaching experience are less likely to change their teaching practices as the result of teacher inservice training. However, a strong, positive relationship was determined between change in teaching practices of all teachers and their belief that the innovations would help students.

The study by Fogarty, Wang and Creek (20) presents support for effective teachers being able to make decisions while actively teaching and taking action upon those decisions to facilitate student learning. A comparison was made between a group of novice teachers and a group of experienced teachers as they actively instructed a group of students. The results indicated that the experienced
teachers observed more cues for the need of a spontaneous decision during the instructional time period than novice teachers and experienced teachers actually made more instructional decisions. Experienced teachers responded more often to cues that indicated lack of understanding of the majority of the class while novice teachers responded more often to individual students exhibiting misbehavior that would disturb the lesson. Experienced teachers employed a greater number of different instructional activities than did novice teachers. Novice teachers stated fewer instructional goals of the instructional activities than the experienced teachers. All of these findings were discussed as being related to student learning. The study by Fogarty, Wang, and Creek (20) collected data from observations of lessons in which the teacher was free to choose the subject and the format or design.

Leming (39) studied the relationship between the internal or external locus of control perceived by teachers and the number of years of teaching experience. The research defined internal control as "seeing one's efforts to influence the world as having an effect" (39, p. 7) and external control as the converse or having no effect. The sense of efficacy or internal control by teachers is related to their effectiveness (8). The data from the study indicate a negative correlation between years of teaching experience
and external locus of control. His conclusion was that experienced teachers see themselves more in control of their students' learning, and this perception results in student achievement.

A comparison of experienced teachers and student teachers was made in a study that collected data from observations of instruction (12). Two different observation instruments were used—a low influence inventory and a high inference inventory. Experienced teachers demonstrated more subtle behaviors, particularly in the area of communication with learners. Student teachers had higher scores on technical behaviors that were required of them such as providing assignments for different ability levels and planning lessons. The study mentions differences among teachers of different subjects and between reports from low inference and high inference tests. Experienced teachers were not found to be more effective than student teachers, but there were differences in their observed behaviors.

There seems to be little research available that explores the relationship between years of experience of a teacher and effectiveness. There are observed and measured differences between the behaviors of experienced teachers and inexperienced teachers, and many of the behaviors of experienced teachers do have a positive effect on learning. Dickson and others (12) mention the enthusiasm observed in
beginning teachers and the "burned-out" or non-enthusiastic behavior of some experienced teachers. The results of studies of teacher experience seem to be inconclusive.
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CHAPTER III

METHODS AND PROCEDURES OF THE STUDY

This chapter identifies the subjects of the study and the instruments used in the study including the development of the Computer Assisted Teacher Observation System (CATOS). The procedures for collecting the data and the statistical treatment of the data are also provided.

Selection of Subjects

This study utilized the observed teaching activities and the responses to a questionnaire of thirty-four teachers assigned to first through sixth grades. The study also utilized the mathematics scores of the students of these teachers.

The teachers were from two elementary schools in a large, suburban school district in North Central Texas. The teachers involved in the study were typical of other teachers in the district in that they were predominately Anglo and most had several years of teaching experience. Thirty-three of the teachers were female and one was male. Most teachers instructed self-contained classes and taught all academic subjects. They had all been involved in various inservice activities specific to the use of lesson
design, and their range in hours of training was from ten to seventy-six hours.

The schools were typical for a suburban school district and the enrollments were 371 students and 608 students in first grade through sixth grade. Kindergarten was also offered in the schools but was excluded from this study. The schools were ethnically mixed with about 13 percent of the students being classified as minority students. The minority population in the schools included Hispanic, Negro, Oriental, and American Indian students. The combined socio-economic level of the schools was not discernably different from other suburban schools in North Central Texas.

The schools were selected because they have a well-defined mathematics curriculum in place with a scope and sequence of objectives to be taught at each grade level. They also utilized a computer to score the six weeks' criterion-referenced tests that determine student mastery of the objectives. The computer also stored the information from each test and assembled it into various formats. The well-defined curriculum and the utilization of computer assistance were important to the study.

Instruments

The Richardson Assessment of Mastery (RAM) was used to determine the level of performance of each teacher's students (Appendix B). The RAM is a series of criterion-referenced
tests used to determine the level of student mastery of specific mathematics objectives. The tests were constructed by the school district to coincide with the district's mathematics curriculum for each grade level. The curriculum includes all of the essential elements for mathematics as identified by Chapter 75 of the Texas Education Code as well as objectives added by the school district (Appendix C). This study considered only the RAM tests for the first through sixth grades.

A RAM test may be administered each six weeks to measure mastery of the objectives identified by the scope and sequence of the curriculum to be taught during that period of time. A student demonstrates mastery of an objective by answering three out of four questions correctly. The tests may be scored by a scanner or by hand. Records of student mastery are stored in a computer and may be recalled in several different formats including student progress each six weeks or cumulative during the year. For the purposes of this study, only scores from the RAM tests for the fourth, fifth, and sixth six weeks of the school year were considered. This time period coincided with the time of the observations.

Statistical validity of the RAM tests had not been established; however, the test does have face validity as it was written with the curriculum. The RAM tests used for the study had been revised in July of 1985.
Statistical reliability of the RAM test had not been established at the time of the study. Standard directions for administration had been established and teachers utilizing the RAM had been trained in administration and scoring procedures. The teachers had also received inservice training and curriculum guides for mathematics for their specific grade level.

The instrument used to record the occurrences of specific elements of lesson design and the teacher behaviors was the Computer Assisted Teacher Observation System (CATOS). The CATOS was developed for this study for the purpose of utilizing current computer technology in collecting observational data. The system is a computer program that contains the seven elements of lesson design (4), and forty-six specific and general teacher behaviors that have been identified as being effective in the instructional process (1, 4, 5, 6). The elements of lesson design and the teacher behaviors may be recorded in negative terms if, in the opinion of the observer, they are being performed in an ineffective or inappropriate manner.

The selection of teacher behaviors for CATOS resulted from study of the eleven observation forms that could be used by the supervisor in the school district during a class visit. Specific statements were selected from these forms for their clarity and relevance to the literature on
effective teaching. Statements were selected for CATOS only one time, even though several were repeated on various observational forms of the school district. A committee of five people, four of whom would be using the instrument in the collection of data for this study, made the final selection of teacher behaviors and organized them and other information on the CATOS Observation Form.

To record an observation using the CATOS, an observer uses a portable computer that contains the program. Certain demographic information is entered for identification purposes before the observation begins. The elements and teacher behaviors listed on the observation form are recorded by a bar code reader attached to the portable computer. The form enables the observer to record the element of lesson design that the teacher is using and specific activities that occur during the element by tracing the bar code reader over the bar code adjacent to each element, behavior, or function. The elements are identified on the observation form by the letters A through G. Other elements not part of lesson design are identified by letter H and a reference to handwritten notes as I. Specific teacher behaviors are numbered one through thirty-one on the observation form and general observations or judgments to be made at the conclusion of the lesson are numbered thirty-three through forty-seven. The control functions allow the observer to eliminate
an erroneous entry, indicate an element or behavior that was not appropriate or effective, or stop the computer at the conclusion of an observation. The data are stored in a data file for future reference at the conclusion of the observation.

The Teacher Behaviors and Elements of Lesson Design form is a list of short and complete statements of the elements and behaviors to be observed. The code number or letter on the left margin corresponds to the bar code in the computer program. The letter G indicates the behavior is to be considered generally or in a collective manner by the observer and the letter S indicates a specific behavior observed by the observer. The numbers in parentheses correspond to the school district's observation form that contains the behavior (5). The CATOS is closely related to the school district's observation forms and has been approved as a substitute for the observation forms that comprise the evaluation system.

Two printouts are available to the teacher. One report is a time-line report that prints the elements and behaviors that were recorded by the observer in chronological order. The time to the nearest second is also printed for each element and behavior. The complete teacher behavior statement is printed on this report. The second report is a summary of the duration and frequency of each element and
behavior. The time spent in each element and the short version of the teacher behaviors is printed on this report.

The elements of lesson design have been developed to be used as parts of an effective lesson. The underlying concept is for the teachers to select and sequence the elements in the most effective way for the lesson and students to be taught. It is not recommended that every lesson use the same elements in the same manner (1, 4).

The validity of CATOS has not been statistically calculated. A close similarity does exist with the observation system utilized by the school district, as the statements of teacher behaviors came verbatim from the Staff Evaluation Plan. The observers for this study were trained supervisors and used both the written form of the Staff Evaluation Plan and the computer form of CATOS.

An observation report from the CATOS was accepted by the school district as suitable for consideration in the evaluation of a teacher.

The preliminary measures of consistency involved the calculation of an estimate of inter-observer agreement (2). The four observers of the study viewed the same videotaped lesson and recorded their observations. A uniform set of directions was given to the observers on the use of the system. The duration of each recorded element of lesson design was determined to the nearest second. The estimate
of agreement between each observer for each of the seven steps was calculated. The six possible combinations for each element were averaged. The average for all seven elements was averaged to determine an overall estimate of inter-observer agreement and is presented in Table I.

Extended use of the CATOS will provide additional data for more stringent determinations of reliability.

Table I

Average Estimates of Inter-Observer Agreement

<table>
<thead>
<tr>
<th>Element of Lesson Design</th>
<th>Average Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set</td>
<td>.725</td>
</tr>
<tr>
<td>Objective and purpose</td>
<td>.550</td>
</tr>
<tr>
<td>Input</td>
<td>.795</td>
</tr>
<tr>
<td>Modeling</td>
<td>.300</td>
</tr>
<tr>
<td>Checking for understanding</td>
<td>.710</td>
</tr>
<tr>
<td>Guided practice</td>
<td>.826</td>
</tr>
<tr>
<td>Independent practice</td>
<td>.928</td>
</tr>
<tr>
<td>Other</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Overall average .729

The table indicates high inter-observer agreement for other activities (1.00), independent practice (.928), and guided practice (.826). Relatively low agreement was indicated for modeling (.300). The overall average of inter-observer agreement was .729.

CATOS was developed in January of 1986. Since that time the observers had accumulated at least fifteen hours of training in the use of the system. The training consisted
of the use of the computer hardware, study of the various printed forms, practiced tape and live observations, and follow-up discussions with the other observers.

The four observers for this study had all been administrators in their present assignment since the 1983-1984 school year. At that time, the school district adopted a model of instruction titled Principles of Effective Teaching and Learning (PETL) and employed consultants to coordinate the staff training. PETL is based on the Hunter model. All four observers had completed the eighteen hours of training and much of the information covered the use of lesson design and the elements. In addition, all four observers had attended principals' meetings where approximately twenty additional hours of training had been provided over the preceding two school years.

The Teacher Information Questionnaire was constructed to gather certain information about each teacher participating in the study (Appendix D). Information from question three under "Experience" was used to determine the experience for each teacher. The number of hours of teacher inservice training was determined for each teacher by totaling the number of hours indicated by each individual. Principals who conducted the teacher inservice training and faculty meetings determined the number of hours spent during each year. It is assumed that the information is correct as each
teacher completed his or her own questionnaire. The questionnaires were explained, and the teachers were under no pressures to give erroneous information.

Data Collection Procedures

The determination of the percentage of mastery of mathematics objectives was made by giving all of the students of teachers in the study the RAM tests at the end of each six weeks over the objectives that were taught during that six weeks. The percentage of mastery scores for each student was calculated by averaging the mastery scores from the three selected six weeks. The students' scores in a teacher's class were then averaged to determine the overall level of mastery for the class. The determination of the duration of use of the elements of lesson design was made by use of the CATOS. Four observers collected information about the teaching behaviors of the thirty-four teachers in the study by observing them while they were teaching a mathematics class during the fourth, fifth, or sixth six weeks of the 1985-1986 school year. Each teacher was observed during at least two lessons by one or more of the observers. Each observation was at least twenty minutes in duration.

The Teacher Information Questionnaire was completed by most of the teachers at a faculty meeting during May, 1986.
Statistical Procedures

The data for the study include the duration of each of the elements of lesson design and a category of activities labeled as "other." This information was calculated to the nearest second. The percentage of time spent in each of the eight categories during every lesson was calculated. These percentages were subjected to multiple regression to determine the correlation of the eight categories to the students' mastery of mathematics. Along with the use of the elements of lesson design, teacher inservice training and teaching experience were also used in the calculation of multiple regression as predictor variables. Pearson product-moment coefficient was calculated to determine the correlation between each of the elements of lesson design and teaching experience and teacher inservice training (3).
CHAPTER BIBLIOGRAPHY


CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

The results of the study are presented in this chapter. It includes the procedure for the study, data representing the teacher's use of the elements of lesson design, students' mastery of mathematics objectives, teacher inservice training related to lesson design, total years of teaching experience, and reliability of the observation system. The hypotheses are restated and the pertinent correlation coefficients and levels of significance are stated.

Procedure

Verbal permission to conduct the study was secured from the district's Deputy Superintendent for Instruction. The district assisted in the development of the Computer Assisted Teacher Observation System (CATOS) and the purchase of the necessary equipment (computer hardware). The observers were selected and trained to use CATOS. The observations of teachers began in February and were concluded in May. The Teacher Information form was distributed to the teachers in May to collect information concerning the hours of inservice training they had received related to the use of lesson design and the number of years each had been
teaching. Inter-observer agreement of the CATOS was determined in May. Data concerning the student mastery of mathematics objectives were collected from the Richardson Assessment of Mastery (RAM) during the first part of June. Formal permission to use the data collected within the school district was granted by the Director of Research and Evaluation in June.

Subjects and Necessary Data

The subjects of this study were thirty-four teachers in a suburban school district in North Central Texas. They were selected for the study because of their training in the use of the elements of lesson design, use of a well-defined, computer-managed mathematics curriculum, and the skill and interest of the building principals. The data collected for the study consisted of the duration of use of each of the elements of lesson design by each teacher as he or she taught mathematics, the percentage of mathematics objectives that were mastered by each teacher's students, the number of hours of inservice training for each teacher related to the use of the elements of lesson design, and the years of teaching experience for each teacher.

The duration of use and the elements of lesson design for each teacher are displayed in Table II. The data are presented in the form of percentage of time that the teacher was observed performing activities associated with the
TABLE II
PERCENT OF TEACHING TIME ON SET, OBJECTIVE AND PURPOSE INPUT, MODELING, CHECKING FOR UNDERSTANDING, GUIDED PRACTICE, INDEPENDENT PRACTICE, AND OTHER ACTIVITIES BY EACH TEACHER

<table>
<thead>
<tr>
<th>Teacher by Code</th>
<th>Elements of Lesson Design (Percent of Lessons)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Set</td>
</tr>
<tr>
<td>111</td>
<td>4.14</td>
</tr>
<tr>
<td>121</td>
<td>11.07</td>
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<tr>
<td>132</td>
<td>7.52</td>
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<tr>
<td>141</td>
<td>4.08</td>
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<tr>
<td>151</td>
<td>5.72</td>
</tr>
<tr>
<td>161</td>
<td>3.70</td>
</tr>
<tr>
<td>171</td>
<td>3.79</td>
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<tr>
<td>181</td>
<td>7.74</td>
</tr>
<tr>
<td>191</td>
<td>16.91</td>
</tr>
<tr>
<td>201</td>
<td>2.33</td>
</tr>
<tr>
<td>221</td>
<td>22.47</td>
</tr>
<tr>
<td>222</td>
<td>5.28</td>
</tr>
<tr>
<td>232</td>
<td>.00</td>
</tr>
<tr>
<td>242</td>
<td>7.93</td>
</tr>
<tr>
<td>252</td>
<td>4.02</td>
</tr>
<tr>
<td>262</td>
<td>4.96</td>
</tr>
<tr>
<td>272</td>
<td>4.61</td>
</tr>
<tr>
<td>282</td>
<td>3.79</td>
</tr>
<tr>
<td>292</td>
<td>2.06</td>
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TABLE II--Continued

<table>
<thead>
<tr>
<th>Teacher by Code</th>
<th>Elements of Lesson Design (Percent of Lessons)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Set</td>
</tr>
<tr>
<td>303</td>
<td>.52</td>
</tr>
<tr>
<td>313</td>
<td>1.70</td>
</tr>
<tr>
<td>324</td>
<td>6.59</td>
</tr>
<tr>
<td>334</td>
<td>21.55</td>
</tr>
<tr>
<td>344</td>
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<td>354</td>
<td>3.84</td>
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<td>364</td>
<td>2.44</td>
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<tr>
<td>374</td>
<td>11.09</td>
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<tr>
<td>385</td>
<td>1.33</td>
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<td>395</td>
<td>7.17</td>
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<tr>
<td>405</td>
<td>1.10</td>
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<tr>
<td>415</td>
<td>3.50</td>
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<tr>
<td>425</td>
<td>.27</td>
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<tr>
<td>436</td>
<td>11.46</td>
</tr>
<tr>
<td>446</td>
<td>9.69</td>
</tr>
<tr>
<td>Average</td>
<td>6.23</td>
</tr>
</tbody>
</table>

elements: anticipatory set, objective and purpose, input, modeling, checking for understanding, guided practice, and independent practice. An eighth category was added and titled "other activities." Activities that were not
described by Hunter as one of the elements of lesson design but were observed during the instructional period were classified as "other." Examples of these activities included checking of roll, discipline and management tasks, and ineffective instructional activities. Each teacher was observed at least two times, and the lessons observed were at least twenty minutes in length. The time was recorded to the second by the four observers using the CATOS.

The data in Table III represent the percentage of mathematics objectives mastered by the students in each teacher's class as indicated by the RAM. The range in percentage of mastery is from 100 percent to 60.3 percent.

The number of hours of inservice training spent by each teacher on activities specific to the use of lesson design is also represented in Table III. The number of hours for each teacher ranges from ten to seventy-three hours. The two schools had been part of pilot studies for several years and the teachers accumulated numerous hours of training.

Table III also indicates the category for total years of teaching experience for each teacher. Category 1 represents one to three years' experience, and seven teachers are in this category. Categories 2 and 3 represent four to six years and seven and more years of experience, respectively. Five teachers are in category 2 and twenty-two teachers are
### TABLE III

**PERCENTAGE OF MASTERY OF MATHEMATICS OBJECTIVES, INSERVICE TRAINING HOURS, AND TEACHING EXPERIENCES BY CATEGORIES FOR EACH INDIVIDUAL TEACHER**

<table>
<thead>
<tr>
<th>Teacher by Code</th>
<th>Mathematics Mastery (Percent)</th>
<th>Inservice Hours</th>
<th>Experience Category*</th>
</tr>
</thead>
<tbody>
<tr>
<td>111</td>
<td>99.3</td>
<td>24</td>
<td>1</td>
</tr>
<tr>
<td>121</td>
<td>88.7</td>
<td>31</td>
<td>3</td>
</tr>
<tr>
<td>131</td>
<td>98.6</td>
<td>30</td>
<td>3</td>
</tr>
<tr>
<td>141</td>
<td>100.0</td>
<td>30</td>
<td>3</td>
</tr>
<tr>
<td>151</td>
<td>98.6</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>161</td>
<td>98.6</td>
<td>19</td>
<td>3</td>
</tr>
<tr>
<td>171</td>
<td>94.4</td>
<td>45</td>
<td>3</td>
</tr>
<tr>
<td>181</td>
<td>97.9</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>192</td>
<td>98.9</td>
<td>35</td>
<td>1</td>
</tr>
<tr>
<td>202</td>
<td>94.9</td>
<td>55</td>
<td>2</td>
</tr>
<tr>
<td>221</td>
<td>96.0</td>
<td>63</td>
<td>2</td>
</tr>
<tr>
<td>222</td>
<td>100.0</td>
<td>63</td>
<td>2</td>
</tr>
<tr>
<td>232</td>
<td>88.0</td>
<td>51</td>
<td>3</td>
</tr>
<tr>
<td>242</td>
<td>93.4</td>
<td>17</td>
<td>3</td>
</tr>
<tr>
<td>252</td>
<td>96.3</td>
<td>51</td>
<td>3</td>
</tr>
<tr>
<td>263</td>
<td>93.9</td>
<td>32</td>
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<td>273</td>
<td>83.2</td>
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<td>3</td>
</tr>
<tr>
<td>283</td>
<td>88.0</td>
<td>24</td>
<td>1</td>
</tr>
<tr>
<td>293</td>
<td>87.7</td>
<td>35</td>
<td>3</td>
</tr>
<tr>
<td>303</td>
<td>78.0</td>
<td>52</td>
<td>3</td>
</tr>
</tbody>
</table>
TABLE III--Continued

<table>
<thead>
<tr>
<th>Teacher by Code</th>
<th>Mathematics Mastery (Percent)</th>
<th>Inservice Hours</th>
<th>Experience Category*</th>
</tr>
</thead>
<tbody>
<tr>
<td>313</td>
<td>74.0</td>
<td>19</td>
<td>2</td>
</tr>
<tr>
<td>324</td>
<td>94.8</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>334</td>
<td>96.0</td>
<td>30</td>
<td>3</td>
</tr>
<tr>
<td>344</td>
<td>96.7</td>
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<td>3</td>
</tr>
<tr>
<td>354</td>
<td>100.0</td>
<td>30</td>
<td>3</td>
</tr>
<tr>
<td>364</td>
<td>89.7</td>
<td>49</td>
<td>2</td>
</tr>
<tr>
<td>374</td>
<td>92.1</td>
<td>49</td>
<td>3</td>
</tr>
<tr>
<td>385</td>
<td>60.3</td>
<td>30</td>
<td>3</td>
</tr>
<tr>
<td>395</td>
<td>84.4</td>
<td>48</td>
<td>3</td>
</tr>
<tr>
<td>405</td>
<td>96.1</td>
<td>24</td>
<td>3</td>
</tr>
<tr>
<td>415</td>
<td>77.4</td>
<td>30</td>
<td>3</td>
</tr>
<tr>
<td>425</td>
<td>84.9</td>
<td>53</td>
<td>3</td>
</tr>
<tr>
<td>436</td>
<td>91.6</td>
<td>32</td>
<td>3</td>
</tr>
<tr>
<td>446</td>
<td>64.6</td>
<td>76</td>
<td>3</td>
</tr>
<tr>
<td>Average</td>
<td>90.48</td>
<td>36.09</td>
<td></td>
</tr>
</tbody>
</table>

*1 = 1 to 3 years experience, 2 = 4 to 6 years experience, and 3 = 7 or more years experience.

in category 3. This information was also collected from the Teacher Information form.

Statistical Analysis

A correlation coefficient was determined for each of the following hypotheses to determine the degree of relationship
and direction of relationship of each of the variables. The level of significance of each coefficient was also determined. Significance was set at the .05 level.

Hypothesis 1 states that there will be no significant relationship between the duration of use of the elements of mathematics objectives. This hypothesis was tested by calculating the Pearson Product-Moment Coefficient for each of the elements of lesson design: (a) anticipatory set, (b) objective and purpose, (c) input, (d) modeling, (e) checking for understanding, (f) guided practice, and (g) independent practice, and the mastery of mathematics objectives by the students from each teacher's class. The coefficient for other activities, observed but not included in a specific element, and students' mastery of mathematics objectives was also calculated. The level of significance for each coefficient was also determined. The duration of use of the elements was determined by calculating the average percentage of time spent on each of the elements by each teacher as recorded by the observers using the CATOS. The mastery of mathematics objectives for each teacher's students was determined by averaging the mastery of mathematics objectives on the RAM for the students in each teacher's class. Coefficients and levels of significance are presented in Table IV.
TABLE IV

CORRELATION AND LEVELS OF SIGNIFICANCE OF THE USE OF SET
OBJECTIVE AND PURPOSE, INPUT, MODELING, CHECKING FOR
UNDERSTANDING, GUIDED PRACTICE, INDEPENDENT
PRACTICE, OTHER ACTIVITIES AND MASTERY
OF MATHEMATICS

<table>
<thead>
<tr>
<th>Lesson Design</th>
<th>Mastery of Mathematics</th>
<th>r*</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticipatory set</td>
<td></td>
<td>0.253</td>
<td>0.075</td>
</tr>
<tr>
<td>Objective and purpose</td>
<td></td>
<td>0.038</td>
<td>0.415</td>
</tr>
<tr>
<td>Input</td>
<td></td>
<td>-0.327</td>
<td>0.030**</td>
</tr>
<tr>
<td>Modeling</td>
<td></td>
<td>-0.397</td>
<td>0.010**</td>
</tr>
<tr>
<td>Checking for understanding</td>
<td></td>
<td>0.041</td>
<td>0.409</td>
</tr>
<tr>
<td>Guided practice</td>
<td></td>
<td>0.042</td>
<td>0.406</td>
</tr>
<tr>
<td>Independent practice</td>
<td></td>
<td>0.301</td>
<td>0.042**</td>
</tr>
<tr>
<td>Other activities</td>
<td></td>
<td>0.038</td>
<td>0.417</td>
</tr>
</tbody>
</table>

n = 34

*Pearson Product-Moment Coefficient.

**Significant at the .05 level.

Examination of Table IV reveals that there is a significant, negative relationship (r = -0.327, p = 0.030) between the duration of use of input and student mastery of mathematics objectives and a significant negative relationship (r = 0.397, p = 0.010) between the duration of use of modeling and student mastery of mathematics objectives. A significant, positive relationship (r = 0.301, p = 0.042)
exists between the duration of use of independent practice and student mastery of mathematics objectives. No other significant relationships were determined to exist between individual elements of lesson design and student mastery of mathematics objectives.

Relationships between the duration of use of anticipatory set, objective and purpose, checking for understanding, guided practice, and other activities are all positive but not significant at the .05 level. The correlation coefficients and levels of significance are (a) anticipatory set $r = .253$, $p = .075$; (b) objective and purpose $r = .038$, $p = .415$; (c) checking for understanding $r = .041$, $p = .409$; (d) guided practice $r = .042$, $p = .406$; and (e) other activities $r = .038$, $p = .417$.

Hypothesis 2 states that there will be no significant relationship between the duration of use of the elements of lesson design and the teachers' accrued inservice time related to lesson design. This hypothesis was tested by calculating the Pearson Product-Moment coefficient for the duration of use of (a) anticipatory set, (b) objective and purpose, (c) input, (d) modeling, (e) checking for understanding, (f) guided practice, (g) independent practice, and (h) other activities, and the teachers' accrued inservice time related to lesson design. The level of significance for each coefficient was also determined. The duration of
use of the elements was determined by calculating the average percentage of time spent on each of the elements by each teacher as recorded by the observers using the CATOS. The amount of accrued inservice time was determined from the Teachers' Information form filled out by each teacher. Coefficients and levels of significance are presented in Table V.

TABLE V

CORRELATIONS AND LEVELS OF SIGNIFICANCE OF SET, OBJECTIVE AND PURPOSE, INPUT, MODELING, CHECKING FOR UNDERSTANDING, GUIDED PRACTICE, INDEPENDENT PRACTICE, OTHER ACTIVITIES, AND INSERVICE TRAINING TIME

<table>
<thead>
<tr>
<th>Lesson Design</th>
<th>Inservice Training Time</th>
<th>r*</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticipatory set</td>
<td></td>
<td>.086</td>
<td>.315</td>
</tr>
<tr>
<td>Objective and purpose</td>
<td></td>
<td>.112</td>
<td>.265</td>
</tr>
<tr>
<td>Input</td>
<td></td>
<td>-.078</td>
<td>.330</td>
</tr>
<tr>
<td>Modeling</td>
<td></td>
<td>-.089</td>
<td>.308</td>
</tr>
<tr>
<td>Checking for understanding</td>
<td></td>
<td>.180</td>
<td>.155</td>
</tr>
<tr>
<td>Guided practice</td>
<td></td>
<td>-.249</td>
<td>.078</td>
</tr>
<tr>
<td>Independent practice</td>
<td></td>
<td>.063</td>
<td>.362</td>
</tr>
<tr>
<td>Other activities</td>
<td></td>
<td>.060</td>
<td>.368</td>
</tr>
</tbody>
</table>

n = 34.

*Pearson Product-Moment Coefficient.

Examination of Table V indicates no relationships significant at the .05 level exist between any of the
elements of lesson design and accrued inservice time. Negative relationships exist between inservice time and input \( r = -0.078, p = 0.330 \), modeling \( r = -0.089, p = 0.308 \), and guided practice \( r = 0.249, p = 0.078 \), Positive relationships exist between inservice time and anticipatory set \( r = 0.086, p = 0.315 \), objective and purpose \( r = 0.112, p = 0.265 \), checking for understanding \( r = 0.180, p = 0.155 \), independent practice \( r = 0.063, p = 0.362 \), and other activities \( r = 0.060, p = 0.368 \).

Hypothesis 3 states that there will be no significant relationships between the duration of use of the elements of lesson design and the teachers' years of teaching experience. This hypothesis was tested by calculating the Pearson Product-Moment Correlation Coefficient for the duration of use of each of the elements of lesson design: (a) anticipatory set, (b) objective and purpose, (c) input, (d) modeling, (e) checking for understanding, (f) guided practice, (g) independent practice, and (h) other activities, and the years of teaching experience of each teacher. The duration of use of the elements of lesson design was determined by calculating the average percentage of time spent on each of the elements by each teacher as recorded by the observers using the CATOS. The years of teaching experience was determined from the Teacher Information form completed by each teacher. The teachers indicated their experience
as teachers, categorizing themselves as having from one to three years of experience, four to six years of experience or seven or more years of experience. Coefficients and levels of significance are presented in Table VI.

TABLE VI
CORRELATIONS AND LEVELS OF SIGNIFICANCE OF SET, OBJECTIVE AND PURPOSE, INPUT, MODELING, CHECKING FOR UNDERSTANDING, GUIDED PRACTICE, INDEPENDENT PRACTICE, OTHER ACTIVITIES, AND TEACHING EXPERIENCE

<table>
<thead>
<tr>
<th>Lesson Design</th>
<th>Teaching Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>r*</td>
</tr>
<tr>
<td>Anticipatory set</td>
<td>.091</td>
</tr>
<tr>
<td>Objective and purpose</td>
<td>.031</td>
</tr>
<tr>
<td>Input</td>
<td>-.062</td>
</tr>
<tr>
<td>Modeling</td>
<td>.196</td>
</tr>
<tr>
<td>Checking for understanding</td>
<td>.098</td>
</tr>
<tr>
<td>Guided practice</td>
<td>.203</td>
</tr>
<tr>
<td>Independent practice</td>
<td>-.060</td>
</tr>
<tr>
<td>Other activities</td>
<td>-.454</td>
</tr>
</tbody>
</table>

n = 34.

*Pearson Product-Moment Coefficient.

**Significant at the .05 level.

Examination of Table VI indicates a significantly negative relationship (r = -.454, p = .004) exists between the
duration of use of other activities, not an element of lesson
design, and years of teaching experience. Other negative
relationships exist between experience and anticipatory set
(r = -.091, p = .304), input (r = -.062, p = .363), and
independent practice (r = .060, p = .368). However, these
coefficients are not significant at the .05 level. The
other elements exhibit a positive relationship with years
of teaching experience, but the coefficients are not signifi-
cant at the .05 level. They are objective and purpose (r =
.031, p = .431), modeling (r = .196, p = .133), checking for
understanding (r = .098, p = .290), and guided practice
(r = .203, p = .135).

Hypothesis 4 states that there will be no significant
relationship between the students' mastery of mathematics
objectives and the teachers' accrued inservice training
time related to lesson design. This hypothesis was tested
by calculating the Pearson Product-Moment Coefficient
between the students' mastery of mathematics objectives for
each teacher and the amount of inservice training each
teacher had completed on the use of lesson design. The
level of significance was also determined. The students'
mastery of mathematics objectives was determined by calculat-
ing the average percentage of mastery of mathematics objec-
tives from the RAM for the students in each teacher's class.
The number of hours of inservice training was determined
from the teachers' responses on the Teacher Information form. Coefficients and levels of significance are presented in Table VII.

### TABLE VII

**CORRELATION AND LEVEL OF SIGNIFICANCE OF MASTERY OF MATHEMATICS AND TEACHING INSERVICE TRAINING TIME**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Inservice Time</th>
<th>r*</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery of mathematics</td>
<td></td>
<td>-.258</td>
<td>.071</td>
</tr>
</tbody>
</table>

n = 34.

*Pearson Product-Moment Coefficient.

Examination of Table VII indicates that there is a negative relationship between the hours of lesson design inservice training for the teachers and the students' mastery of mathematics objectives. The coefficient (r) is -.258 and the level of significance (p) is .071, approaching but not significant at the .05 level.

Hypothesis 5 states that there will be no significant relationship between the students' mastery of mathematics objectives and the teachers' years of teaching experience. This hypothesis was tested by calculating the Pearson Product-Moment Coefficient between the mastery of mathematics objectives by the students from each class and the categorized years of teaching experience. The level of
significance of the coefficient was also calculated. The students' mastery of mathematics objectives was determined by calculating the average percentage of mastery of mathematics objectives from the RAM for the students in each teacher's class. The number of years of teaching experience was determined from the Teacher Information form and the number of years of teaching experience for each teacher was categorized as one to three years, four to six years, or seven and more years. The coefficient and level of significance are presented in Table VIII.

**TABLE VIII**

CORRELATION AND LEVEL OF SIGNIFICANCE OF MASTERY OF MATHEMATICS AND TEACHING EXPERIENCE

<table>
<thead>
<tr>
<th>Factor</th>
<th>Teaching Experience</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>r*</td>
<td>P</td>
</tr>
<tr>
<td>Mastery of mathematics</td>
<td>-.312</td>
<td>.036**</td>
</tr>
</tbody>
</table>

n = 34.

*Pearson Product-Moment Coefficient.

**Significant at the .05 level.

Examination of Table VIII indicates that there is a significant negative correlation (r = -.312, p = .036) between the teachers' students' mastery of mathematics objectives and the number of years of teaching experience.
Findings from the study are also displayed in Table IX. This table indicates the average percentage of time spent on each element of lesson design, the estimate of inter-observer agreement for each element which was calculated to establish the reliability of the CATOS, and the Pearson-Product Moment Correlation Coefficient calculated for each element of lesson design and the students' mastery of mathematics objectives.

**TABLE IX**

AVERAGE PERCENTAGE OF USE, ESTIMATE OF INTER-OBSERVER AGREEMENT, AND CORRELATION WITH MATHEMATICS OF EACH ELEMENT OF LESSON DESIGN

<table>
<thead>
<tr>
<th>Elements</th>
<th>X of % Use</th>
<th>Estimate of Agreement</th>
<th>Correlation (r) with Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set</td>
<td>6.23</td>
<td>.725</td>
<td>.253</td>
</tr>
<tr>
<td>Objective</td>
<td>3.78</td>
<td>.550</td>
<td>.038</td>
</tr>
<tr>
<td>Input</td>
<td>18.51</td>
<td>.795</td>
<td>-.327*</td>
</tr>
<tr>
<td>Modeling</td>
<td>5.78</td>
<td>.300</td>
<td>-.397*</td>
</tr>
<tr>
<td>Check for understanding</td>
<td>15.40</td>
<td>.710</td>
<td>.041</td>
</tr>
<tr>
<td>Guided practice</td>
<td>27.44</td>
<td>.826</td>
<td>.043</td>
</tr>
<tr>
<td>Independent practice</td>
<td>17.28</td>
<td>.928</td>
<td>.301*</td>
</tr>
<tr>
<td>Other</td>
<td>5.57</td>
<td>1.000</td>
<td>.038</td>
</tr>
</tbody>
</table>

*Significant to the .05 level.

A notable observation from Table XI is the low percent of use of modeling (5.78 percent), low estimate of
inter-observer agreement (.3), and negative correlation coefficient with mathematics mastery (-.397) which is significant to the .05 level. Other data indicate independent practice has a relatively high percent of use (17.28 percent), high estimate of inter-observer agreement (.928), and positive correlation coefficient with mathematics mastery (.301) that is significant to the .05 level. Other data are informative, but inconclusive.
CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents the summary, findings, and conclusions of the study. Recommendations and recommendations for further research are also made.

Summary

Lesson design is a format used by teachers for planning and conducting instructional lessons. It includes seven elements or steps which are anticipatory set, objective and purpose, input, modeling, checking for understanding, guided practice, and independent practice. This study investigated the relationship between student mastery of mathematics objectives and the teachers' use of the individual elements of lesson design, teacher inservice training related to the use of the individual elements of lesson design and teacher experience. The study also investigated the relationship between the teachers' use of the individual elements of lesson design and teacher inservice training and teacher experience.

Thirty-four teachers were selected from the public elementary schools in North Central Texas. The teachers
were assigned to first through sixth grades in a large suburban school district. They were selected because of their training in the use of the elements of lesson design, having a well-defined mathematics curriculum, the utilization of a computer-managed system for determining student mastery of objectives, and the interest of the building principals to participate in the study.

Each teacher was observed at least two times by a trained observer using a computer to determine the duration of use of each element of lesson design. The observers used the Computer Assisted Teacher Observation System (CATOS) to collect the data related to the use of set, objective and purpose, input, modeling, checking for understanding, guided practice, independent practice, and other activities. The other activities category included teacher behaviors that did not relate to one of the seven elements or ineffective execution of one of the elements. Teacher behaviors were recorded on a lap computer by the light wand which read bar codes assigned to each teacher activity or teacher behavior. Practice sessions for the observers were conducted before the collection of data began. The observers discussed the teachers' activities, became familiar with the equipment, and discussed their observations after each practice session. The reliability of the CATOS was established at an acceptable level.
Preceding the study, the four observers had completed training in the use of anticipatory set, objective and purpose, input, modeling, checking for understanding, guided practice, and independent practice. They had also conducted teacher inservice training sessions on the use of the elements of lesson design, and they had used systems other than CATOS for observing the teachers' use of lesson design.

The students were given a criterion-referenced mathematics test to determine what percentage of the objectives in the curriculum were mastered. The test measured the mastery of the objectives that were taught during the time of the observation. The teachers were given a questionnaire to collect information relevant to the hours of training each had completed relevant to the use of lesson design and their years of teaching experience.

The Pearson Product-Moment Coefficient and the level of significance of the coefficient were determined for each element of lesson design, anticipatory set, objective and purpose, input, modeling, checking for understanding, guided practice and independent practice, and student mastery of mathematics objectives, teacher inservice training time, and teacher experience. The Pearson r and level of significance were also determined for mastery of mathematics objectives and teacher inservice training time and teacher experience.

The results indicate no relationships existed between the use of each element of lesson design and the amount of
teacher inservice training time completed by each teacher. No relationships were established between the use of any of the individual elements of lesson design and the number of accrued years of teaching experience or between the students' mastery of mathematics objectives and the amount of accrued teacher inservice training time completed by the teachers. The results did indicate a negative correlation, significant at the .05 level, between the use of input and student mastery of mathematics objectives and the use of modeling and student mastery of mathematics objectives. A positive correlation, significant at the .05 level, was determined between the use of independent practice and student mastery of mathematics objectives. A negative correlation, significant at the .05 level, was determined between the teachers' use of activities other than those in lesson design and years of teaching experience. A negative correlation, significant at the .05 level, was also determined between student mastery of mathematics and years of teaching experience. The results of this study specifically apply to the instruction of mathematics and may or may not apply to the instruction of other subjects.

Findings

The following findings resulted from the study.

Hypothesis 1.—There will be no significant relationship between the duration of use of the following elements
of lesson design by the teachers and the students' mastery of mathematics objectives: (a) anticipatory set, (b) objective and purpose, (c) input, (d) modeling, (e) checking for understanding, (f) guided practice, and (g) independent practice.

Hypothesis 1 was rejected. A negative relationship, significant at the .05 level, was determined between the students' mastery of mathematics objectives and the teachers' use of input and modeling. A positive relationship, significant at the .05 level, was determined between students' mastery of mathematics objectives and the teachers' use of independent practice. Positive, non-significant relationships were determined between the students' mastery of mathematics objectives and anticipatory set, objective and purpose, checking for understanding, guided practice, and other activities.

Hypothesis 2.—There will be no significant relationship between the duration of use of the following elements of lesson design by the teachers and the teachers' accrued inservice training time related to lesson design: (a) anticipatory set, (b) objectives and purpose, (c) input, (d) modeling, (e) checking for understanding, (f) guided practice, and (g) independent practice.

Hypothesis 2 was accepted. No significant relationships were determined between the teachers' use of lesson
design and the number of hours of inservice training time they had completed.

Hypothesis 3.—There will be no significant relationship between the duration of use of the following elements of lesson design by the teachers and the teachers' years of teaching experience: (a) anticipatory set, (b) objectives and purpose, (c) input, (d) modeling, (e) checking for understanding, (f) guided practice, and (g) independent practice.

Hypothesis 3 was accepted. No significant relationships were determined between the individual elements of lesson design and the years of teaching experience. A negative relationship, significant at the .05 level, was determined between the years of teaching experience and other activities. The category of other activities includes classroom management tasks, interruptions, and ineffective execution of one of the individual elements.

Hypothesis 4.—There will be no significant relationship between the students' mastery of mathematics objectives and the teachers' accrued inservice training time related to lesson design.

Hypothesis 4 was accepted. No relationship, significant at the .05 level, was determined between students' mastery of mathematics and teacher inservice training time.
Hypothesis 5.—There will be no significant relationship between the students' mastery of mathematics objectives and the teachers' years of teaching experience.

Hypothesis 5 was rejected. A negative relationship, significant at the .05 level, was determined between the students' mastery of mathematics objectives and the years of teaching experience accrued by the teachers.

Additional Findings

The following additional information was concluded from a review of the data. Although it is not directly applicable to one of the hypotheses, it is important to the study.

1. The average percent of mastery of mathematics objectives for each class was 90.5 percent and the percent of mastery of mathematics objectives for the classes ranged from 60.3 percent to 100 percent.

2. The use of other activities or ineffective use of set, objective and purpose, input, modeling, checking for understanding, guided practice, and independent practice accounted for 5.57 percent of the observed instructional time of all teachers.

3. Modeling had the lowest estimate of agreement, .3, in determining the reliability of the CATOS, the highest significant, negative correlation (-.397) with mastery of mathematics objectives and a low percent of use, 5.78 percent, by the teachers.
4. An average of 36.1 hours of inservice training for each teacher relative to the use of lesson design was completed in formal sessions, faculty meetings, grade level meetings, and private study over the past four years.

Major Conclusions

The following conclusions were reached from the findings of the study in relation to the research. These conclusions apply to the subjects of this study and they can be generalized to similar populations in other schools.

1. The teachers in this study used the elements of lesson design including set, objective and purpose, input, modeling, checking for understanding, guided practice, and independent practice effectively a major portion of the time, with 5.57 percent of the time spent ineffectively or on other activities. The mastery of mathematics objectives by the students was very acceptable at 90.5 percent. Therefore, it can be concluded that a high level of mastery of mathematics objectives and effective use of the elements of lesson design were evident in the study, and the relationship is apparent. This conclusion is supported by the research of direct instruction and effective teaching.

2. The computation of the correlation coefficients of each of the elements of lesson design resulted in the negative and positive correlations. The negative correlations did not indicate an adverse effect on students' mastery
of mathematics objectives as indicated by the high level of student mastery. The calculations simply determined that certain elements occurred for a greater duration in classes with high level of mastery and certain elements occurred for a greater duration in the other classes with lower levels of mastery. In both cases, when an element was used, it excluded the use of any other element at that particular time.

Modeling and input are both recognized as important steps of direct instruction. The results of this study indicate a negative, significant relationship with student mastery of mathematics objectives. Independent practice was positively and significantly related to student mastery of mathematics objectives. Research from direct instruction and child development ideologies both stress the importance of student activity in the learning process. The conclusion could be drawn from the results of this study that the relationships exist because of the overt, student-centered nature of the activities during independent practice as opposed to the more passive, teacher-centered activities of the lesson during modeling and input. Therefore, students' level of mastery of mathematics objectives was higher when they were actively involved in the lesson.

Another possible conclusion is that teachers engaged in greater duration of modeling and input activities as
their students experienced difficulty with the particular lessons that were observed. The greater difficulty resulted in lower levels of mastery and less time spent in class on independent practice which occurs at the conclusion of the lesson.

3. The amount of accrued teacher inservice training time was not related to the use of any specific element of lesson design. However, the teachers had accumulated a large number of hours of training and used the model very effectively. The conclusion was that the inservice training had resulted in effective use of the elements of lesson design, anticipatory set, objective and purpose, input, modeling, checking for understanding, guided practice, and independent practice.

Additional Conclusions

These additional conclusions do not apply directly to one of the hypotheses, but the information is important to the results of the study.

1. There was a significant, negative relationship between the use of other activities and the years of teaching experience. The years of teaching experience was also negatively related to the students' mastery of mathematics objectives and the relationship was also significant. These two correlations seem to contradict one another, as it would be assumed that little use of other activities would result
in higher achievement. Further exploration of the population of teachers indicates that twenty-two are in experience category 3, seven are in experience category 1, and five are in experience category 2. The results are questionable due to the uneven distribution of subjects and no conclusions are drawn from the data.

2. The reliability of a computer-assisted observation system was established. The overall estimate of inter-observer agreement was established at .729 for eight variables and four observers. It is concluded that the use of computers in collecting observational data is acceptable. Obvious limitations include the specificity of behaviors to be recorded and the training of the observers.

Recommendations

The following specific recommendations for school districts and educators are based on the findings and conclusions of the study.

1. The use of lesson design leads to positive results in student learning. It is recommended that its use be continued and additional training be provided to the staff on the use of lesson design and other tenets of Hunter's Model.

2. Although the level of student mastery was high for the majority of the classes, some were noticeably lower. The administrators of the schools in the study should
explore the reasons for the lower scores and provide assistance to the teachers.

3. The administrative personnel of the school districts should support the development of computer technology for instructional improvement. This could include information related to students, teachers, materials, and strategies.

4. Inservice training should be continued for the increased development of instructional skill by focusing on the training of effective strategies and techniques. Some thought may be given to the breadth of the activities and the limited long-term continuity of sessions for individual teachers.

5. Principals and other teacher inservice training leaders should be made more aware of the research related to effective inservice training and the characteristics of effective programs. These considerations could lead to more effective results of the current program.

Recommendations for Further Research

The following recommendations for future research are based on the findings and conclusions of the study.

1. It is recommended that additional study be conducted on various teaching activities and teacher behavior to determine effectiveness, including the use of lesson design. The increase in research-based knowledge transmitted to educators will increase the use of effective techniques and
practices and increase the level of professionalism in education. This will also improve the image of education in the eyes of the public. However, consideration for the importance of interpersonal emotional aspects of teacher-student interactions still must be considered, and they are more difficult or impossible to measure.

2. Specific recommendations for the study of effective teaching behaviors would include studies utilizing an experimental design. An experimental design focused on very specific behavior or behaviors with a larger population would give more conclusive results. Particular attention should be given to the active participation of the learners and the effects on learning and in comparisons of student-centered and teacher-directed activities and strategies.

3. This study did not explore in detail specifics concerning teacher inservice training; however, the research indicates some very significant ways of structuring and conducting inservice programs that warrant further study.

4. This study did result in the development of a computer-assisted observation system for collecting data related to the act of teaching. Given the state of the art of computer technology, it is seen as timely and effective. Other observational studies shall be conducted utilizing computers for the collection and assimilation of data, and they will lead to improvements in current systems.
5. It is recommended that studies be conducted on the differences between beginning and experienced teachers. Little information is available, and the rapidity of changes in education in the last several years has forced currently employed teachers to alter their activities and view of the profession. Also, demands are being placed on new teachers for high levels of productivity regardless of their training and lack of experience. Ways to assist both groups should be developed, and their needs are very different.
APPENDICES
Appendix A

The following are the observation form and the text of the Computer Assisted Teacher Observation System (CATOS).

The observation form contains a series of lines (bar code) to be read by a light wand attached to a computer. This process was used to record information about the teachers' use of the elements of lesson design. Each bar code on the observation form corresponds to an element of lesson design (structure) or a control function for the system. Bar codes are also assigned to specific teacher behaviors or actions.

The text-file printout is a list of the complete statements of the information on the observation form. The numbers at the end of the teacher action statements correspond to the teacher competencies listed in the Staff Evaluation Handbook of the school district involved in the study. Elements of lesson design and control functions are also listed.
--- GENERAL OBSERVATIONS ---
33 Follows Systematic Plan
34 Teaches to an Objective
35 Determines Correct Content
36 Coherent Lesson Organization
37 Evidence of High Expectations
38 Provides Success Experiences
39 Correctly Challenges Students
40 Varied Teaching Strategies
41 Encourages Questions
42 Distributes Praise
43 Handles Rmt. Tasks
44 Monitors Students Participation
45 Enforces Classroom Guidelines
46 Conducts Physical Environment
47 Generates Interest & Enthusiasm

--- CONTROL FUNCTIONS ---
N STAKE
N "NOT" SWITCH
ZZ QUIT
05/17/84 LIST OF TEXT-FILE ENTRIES BY CODE NUMBER

<table>
<thead>
<tr>
<th>Code</th>
<th>Descriptions</th>
</tr>
</thead>
</table>
| 01   | Focused Attention ^ | €
|      | Focused attention when beginning lesson. (1.05-5) |
| 02   | Determined Skills (Test) ^ | €
|      | Used formal and informal instruments to determine which students do and do not have requisite skills. (1.03-1) |
| 03   | Defined Purpose of Assignment ^ | €
|      | Told students the purpose of their assignments. (2.00-11) |
| 04   | Correctly Answered Question ^ | €
|      | Correctly answered student question about subject. (1.01-7) |
| 05   | Modeled Desired Response ^ | €
|      | Demonstrated through modeling the correct process or type of response desired from the students. (1.01-5) |
| 06   | Informal diagnosis ^ | €
|      | Engaged in informal diagnosis through group feedback or observation. (1.03-3) |
| 07   | Explained Assignment Clearly ^ | €
|      | Explained assignment clearly. (1.05-7) |
| 08   | Monitored / Assisted Students ^ | €
|      | Monitored students work during class time and offered assistance to students. (2.00-14) |
| 09   | Appropriate Practice ^ | €
|      | Provided appropriate practice for achieving the lesson objectives. (1.01-6) |
| 10   | Lesson Closure ^ | €
|      | Developed closure to the lesson through (1) generalization, (2) repetition at the end of a point, or (3) connecting to previous learning. (1.05-9) |
| 11   | Differentiated Assignments ^ | €
|      | Used differentiated assignments. (1.04-11) |
| 12   | Different Inst Methods ^ | €
|      | Used different methods of instruction to accommodate various learning styles. (1.04-7, 1.06-1) |
| 13   | Varied Teaching Strategies ^ | €
|      | Used varied teaching strategies that stimulate learning. (1.06-1) |
| 14   | Specific Feedback ^ | €
<p>|      | Provided specific feedback on performance. Labeled knowledge or skills learned. (1.06-7) |</p>
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>G/S Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Immediate Feedback</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Provided immediate feedback on performance. (1.06-9)</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Encouraged Questions</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Encouraged students to ask questions. (1.07-10)</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Used Recall Type Question</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Used recall type question.</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Asked Probing Question</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Asked probing type questions - elaboration, examples,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>clarification, etc. (1.07-9)</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>&quot;Wait Time&quot; for Response</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Provided adequate &quot;wait time&quot; for students to respond to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>questions. (1.07-6)</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Question Redirection to Class</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Redirected student question to the class when</td>
<td></td>
</tr>
<tr>
<td></td>
<td>appropriate. (1.07-6)</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Acknowledged Correct Answer</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Acknowledged that an answer was correct or partially</td>
<td></td>
</tr>
<tr>
<td></td>
<td>correct. (1.07-7)</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Handled Management Tasks</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Efficiently handled the management tasks such as roll</td>
<td></td>
</tr>
<tr>
<td></td>
<td>taking, distributing materials. (1.08-5)</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Monitored Student Participant</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Monitored to ensure that each student purposefully</td>
<td></td>
</tr>
<tr>
<td></td>
<td>engages in accomplishing appropriate objectives of</td>
<td></td>
</tr>
<tr>
<td></td>
<td>instruction most of the time. (1.08-4)</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Used Transitional Activities</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Used transitional activities that were orderly and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>quickly terminated when a new lesson began. (1.08-6)</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Praise for Progress</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Praised students for progress toward achievement. (1.08-2)</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Praise for Compliant Behavior</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Praised students for compliant behavior and/or paying</td>
<td></td>
</tr>
<tr>
<td></td>
<td>attention. (1.08-7)</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Praise for Neat Work</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Praised students for neat and/or careful work. (1.08-6)</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Praise for Prosocial Behavior</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Praised students for prosocial behavior (thoughtfulness,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>courtesy, offering to share, etc.) (1.08-5)</td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Descriptions</td>
<td>G/S Code</td>
</tr>
<tr>
<td>------</td>
<td>--------------</td>
<td>----------</td>
</tr>
<tr>
<td>29</td>
<td>Dignified Discipline</td>
<td>S  &lt;br&gt; Disciplined students in a manner which respected the individual dignity of the student. (2.06-4)</td>
</tr>
<tr>
<td>30</td>
<td>Praise Distribution</td>
<td>S  &lt;br&gt; Distributed praise among the students. (1.06-13)</td>
</tr>
<tr>
<td>31</td>
<td>Generated Interest &amp; Enthus</td>
<td>S  &lt;br&gt; Established interest and enthusiasm in the lesson. (1.06-5)</td>
</tr>
<tr>
<td>33</td>
<td>Followed Systematic Plan</td>
<td>G  &lt;br&gt; Followed a systematic plan for the lesson, and it was followed except for appropriate digressions. (1.08-1)</td>
</tr>
<tr>
<td>34</td>
<td>Taught to an Objective</td>
<td>G  &lt;br&gt; Taught to an objective. (1.08-2)</td>
</tr>
<tr>
<td>35</td>
<td>Determined Correct Content</td>
<td>G  &lt;br&gt; Determined content that was appropriate for the specified objectives and organized it in a manner consistent with the logic of the content and the needs of the learners. (1.05-9)</td>
</tr>
<tr>
<td>36</td>
<td>Coherent Lesson Organization</td>
<td>G  &lt;br&gt; Organized lesson in a coherent way. (1.05-6)*</td>
</tr>
<tr>
<td>37</td>
<td>Evidence of High Expectations</td>
<td>G  &lt;br&gt; Showed evidence of high expectation for all students. (1.04-1)</td>
</tr>
<tr>
<td>38</td>
<td>Provided Success Experiences</td>
<td>G  &lt;br&gt; Provided success experiences for each student. (1.05-3)</td>
</tr>
<tr>
<td>39</td>
<td>Correctly Challenged Students</td>
<td>G  &lt;br&gt; Challenged the student without exceeding the student's rate of development. (1.05-2)</td>
</tr>
<tr>
<td>40</td>
<td>Varied Teaching Strategies</td>
<td>G  &lt;br&gt; Used varied teaching strategies that stimulate learning. (1.06-1)</td>
</tr>
<tr>
<td>41</td>
<td>Encouraged Questions</td>
<td>G  &lt;br&gt; Encouraged students to ask questions. (1.07-10)</td>
</tr>
<tr>
<td>42</td>
<td>Distributed Praise</td>
<td>G  &lt;br&gt; Distributed praise among the students. (1.06-13)</td>
</tr>
<tr>
<td>43</td>
<td>Handled Management Tasks</td>
<td>G  &lt;br&gt; Efficiently handled the management tasks such as roll taking, distributing materials. (1.08-5)</td>
</tr>
<tr>
<td>44</td>
<td>Monitored Students Time</td>
<td>G  &lt;br&gt; Monitored to ensure that each student is purposefully engaged in accomplishing appropriate objectives of instruction most of the time. (1.08-4)</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>O/S Code</td>
</tr>
<tr>
<td>------</td>
<td>--------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>45</td>
<td>Enforced Classroom Guidelines</td>
<td>G</td>
</tr>
<tr>
<td></td>
<td>Consistently enforced classroom guidelines.</td>
<td>(2.00-5)</td>
</tr>
<tr>
<td>46</td>
<td>Conducive Physical Environment</td>
<td>G</td>
</tr>
<tr>
<td></td>
<td>Developed and maintained a physical environment in the classroom which was conducive to effective learning.</td>
<td>(1.02-4)</td>
</tr>
<tr>
<td>47</td>
<td>Generated Interest &amp; Enthus</td>
<td>G</td>
</tr>
<tr>
<td></td>
<td>Established interest and enthusiasm in the lesson.</td>
<td>(1.06-5)</td>
</tr>
<tr>
<td>A</td>
<td>ANTICIPATORY SET</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>ANTICIPATORY SET</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>OBJECTIVE AND PURPOSE</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>OBJECTIVE AND PURPOSE</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>INPUT</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>INPUT</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>MODELING</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>MODELING</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>CHECKING FOR UNDERSTANDING</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>CHECKING FOR UNDERSTANDING</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>GUIDED PRACTICE</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>GUIDED PRACTICE</td>
<td></td>
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<tr>
<td>G</td>
<td>INDEPENDENT PRACTICE</td>
<td>O</td>
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<tr>
<td></td>
<td>INDEPENDENT PRACTICE</td>
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<tr>
<td>H</td>
<td>OTHER</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>OTHER</td>
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</tr>
<tr>
<td>I</td>
<td>SEE NOTES</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>SEE NOTES</td>
<td></td>
</tr>
<tr>
<td>011</td>
<td>Differentiated Assignments</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>Used differentiated assignments.</td>
<td>(1.04-11)</td>
</tr>
<tr>
<td>N01</td>
<td>DN Focus Attention</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>Did not focus attention when beginning lessons.</td>
<td>(1.05-5)</td>
</tr>
<tr>
<td>N02</td>
<td>DN Determine Skills (Test)</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>Did not use formal and informal instruments to determine which students do and do not have requisite skills.</td>
<td>(1.02-1)</td>
</tr>
<tr>
<td>N04</td>
<td>DN Ans Quest Correctly</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>Did not correctly answer student questions about the subject.</td>
<td>(1.01-7)</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>G/S Code</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>NO5</td>
<td>DN Model Desired Response</td>
<td>(1.01-5)</td>
</tr>
<tr>
<td></td>
<td>Did not demonstrate through modeling the correct process or type of response desired from the student.</td>
<td></td>
</tr>
<tr>
<td>NO6</td>
<td>DN Use Informal Diagnosis</td>
<td>(1.03-3)</td>
</tr>
<tr>
<td></td>
<td>Did not engage in informal diagnosis through group feedback or observation.</td>
<td></td>
</tr>
<tr>
<td>NO8</td>
<td>DN Monitor / Assist</td>
<td>(2.00-14)</td>
</tr>
<tr>
<td></td>
<td>Did not monitor students' work during class time and offer assistance to students.</td>
<td></td>
</tr>
<tr>
<td>NO9</td>
<td>DN Provide Approp Practice</td>
<td>(1.05-6)</td>
</tr>
<tr>
<td></td>
<td>Did not provide appropriate practice for achieving the lesson objectives.</td>
<td></td>
</tr>
<tr>
<td>N10</td>
<td>DN Provide Closure</td>
<td>(1.05-3)</td>
</tr>
<tr>
<td></td>
<td>Did not develop closure to the lesson through (1) generalization, (2) repetition at the end of a point, or (3) connecting to previous learning.</td>
<td></td>
</tr>
<tr>
<td>N11</td>
<td>DN Differ Assignments</td>
<td>(1.04-11)</td>
</tr>
<tr>
<td></td>
<td>Did not use differentiated assignments.</td>
<td></td>
</tr>
<tr>
<td>N12</td>
<td>DN Differ Methods</td>
<td>(1.04-7, 1.06-1)*</td>
</tr>
<tr>
<td></td>
<td>Did not use different methods of instruction to accommodate various learning styles.</td>
<td></td>
</tr>
<tr>
<td>N13</td>
<td>DN Vary Strategies</td>
<td>(1.06-1)</td>
</tr>
<tr>
<td></td>
<td>Did not use varied teaching strategies that stimulate learning.</td>
<td></td>
</tr>
<tr>
<td>N14</td>
<td>DN Provide Spec Feedback</td>
<td>(1.06-7)</td>
</tr>
<tr>
<td></td>
<td>Did not provide specific feedback on performance. Did not label knowledge or skills learned.</td>
<td></td>
</tr>
<tr>
<td>N15</td>
<td>DN Provide Immed Feedback</td>
<td>(1.06-9)</td>
</tr>
<tr>
<td></td>
<td>Did not provide immediate feedback on performance.</td>
<td></td>
</tr>
<tr>
<td>N16</td>
<td>DN Encourage Questions</td>
<td>(1.07-10)</td>
</tr>
<tr>
<td></td>
<td>Did not encourage students to ask questions.</td>
<td></td>
</tr>
<tr>
<td>N17</td>
<td>DN Use Recall Questions</td>
<td>(1.07-2)*</td>
</tr>
<tr>
<td></td>
<td>Did not use recall type questions.</td>
<td></td>
</tr>
<tr>
<td>N18</td>
<td>DN Ask Probing Questions</td>
<td>(1.07-3)</td>
</tr>
<tr>
<td></td>
<td>Did not ask probing type questions - elaboration, examples, clarification, etc.</td>
<td></td>
</tr>
<tr>
<td>N19</td>
<td>DN Provide “Wait Time”</td>
<td>(1.07-5)</td>
</tr>
<tr>
<td></td>
<td>Did not provide adequate “wait time” for students to respond to questions.</td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Descriptions</td>
<td>G/S Code</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>N20</td>
<td>DN Redirect Questions&lt;br&gt;Did not redirect student questions to the class when appropriate. (1.07-6)</td>
<td></td>
</tr>
<tr>
<td>N21</td>
<td>DN Acknowledge Correct Ans&lt;br&gt;Did not acknowledge that an answer is correct or partially correct. (1.07-7)</td>
<td></td>
</tr>
<tr>
<td>N22</td>
<td>DN Efficiently Manage Tasks&lt;br&gt;Did not efficiently handle the management tasks such as roll taking, distributing materials. (1.08-3)</td>
<td></td>
</tr>
<tr>
<td>N23</td>
<td>DN Monitor Student Participate&lt;br&gt;Did not monitor to ensure that each student purposefully engages in accomplishing appropriate objectives of instruction most of the time. (1.08-4)</td>
<td></td>
</tr>
<tr>
<td>N24</td>
<td>DN Use Transitional Activities&lt;br&gt;Did not use transitional activities that are orderly and quickly terminated when a new lesson begins. (1.08-6)</td>
<td></td>
</tr>
<tr>
<td>N25</td>
<td>DN Praise Progress&lt;br&gt;Did not praise students for progress toward achievement. (1.06-2)</td>
<td></td>
</tr>
<tr>
<td>N26</td>
<td>DN Praise for Compliant Behav&lt;br&gt;Did not praise the students for compliant behavior and/or paying attention. (1.06-7)</td>
<td></td>
</tr>
<tr>
<td>N27</td>
<td>DN Praise Neat Work&lt;br&gt;Did not praise the students for neat and/or careful work. (1.06-6)</td>
<td></td>
</tr>
<tr>
<td>N28</td>
<td>DN Praise Prosocial Behavior&lt;br&gt;Did not praise students for prosocial behavior (thoughtfulness, courtesy, offering to share, etc.). (1.06-8)</td>
<td></td>
</tr>
<tr>
<td>N29</td>
<td>DN Respect Student Dignity&lt;br&gt;Did not discipline students in a manner which respects the individual dignity of the student. (2.00-4)</td>
<td></td>
</tr>
<tr>
<td>N30</td>
<td>DN Distribute Praise&lt;br&gt;Did not distribute praise among the students. (1.06-13)</td>
<td></td>
</tr>
<tr>
<td>N31</td>
<td>DN Generate Int &amp; Enthusiasm&lt;br&gt;Did not establish interest and enthusiasm in the lesson. (1.06-5)</td>
<td></td>
</tr>
<tr>
<td>N33</td>
<td>DN Follow Systematic Plan&lt;br&gt;Did not follow a systematic plan for the lesson except for appropriate deviations. (1.08-1)</td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Descriptions</td>
<td>Code</td>
</tr>
<tr>
<td>------</td>
<td>------------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>N34</td>
<td>DN Teach to Objective &lt;br&gt;Did not teach to an objective. (1.08-2)</td>
<td></td>
</tr>
<tr>
<td>N35</td>
<td>DN Determine Correct Content &lt;br&gt;Did not determine content that is appropriate for the specified obj. &amp; organize it in a manner consistent with the logic of the content and the needs of the learners. (1.05-9)</td>
<td></td>
</tr>
<tr>
<td>N36</td>
<td>DN Organize Lesson Coherently &lt;br&gt;Did not organize lesson in a coherent way. (1.05-6)</td>
<td></td>
</tr>
<tr>
<td>N37</td>
<td>DN Demon High Expectations &lt;br&gt;Did not show evidence of high expectations for all students. (1.04-1)</td>
<td></td>
</tr>
<tr>
<td>N38</td>
<td>DN Provide Success For All &lt;br&gt;Did not provide success experiences for each student. (1.09-3)</td>
<td></td>
</tr>
<tr>
<td>N39</td>
<td>DN Approx. Challenge Students &lt;br&gt;Did not challenge the students without exceeding the students' rate of development. (1.09-2)</td>
<td></td>
</tr>
<tr>
<td>N40</td>
<td>DN Vary Teaching Strategies &lt;br&gt;Did not use varied teaching strategies that stimulate learning. (1.06-1)</td>
<td></td>
</tr>
<tr>
<td>N41</td>
<td>DN Encourage Questions &lt;br&gt;Did not encourage the students to ask questions. (1.07-10)</td>
<td></td>
</tr>
<tr>
<td>N42</td>
<td>DN Distribute Praise &lt;br&gt;Did not distribute praise among the students. (1.06-13)</td>
<td></td>
</tr>
<tr>
<td>N43</td>
<td>DN Efficiently Manage Tasks &lt;br&gt;Did not efficiently handle the management tasks such as roll taking, distributing materials. (1.09-5)</td>
<td></td>
</tr>
<tr>
<td>N44</td>
<td>DN Monitor Students Participat &lt;br&gt;Did not monitor to ensure that each student purposefully engaged in accomplishing appropriate objectives of instruction most of the time. (1.08-4)</td>
<td></td>
</tr>
<tr>
<td>N45</td>
<td>DN Enforce Rules &lt;br&gt;Did not consistently enforce classroom guidelines. (2.00-5)</td>
<td></td>
</tr>
<tr>
<td>N46</td>
<td>DN Develop Conducive Pnv Envir &lt;br&gt;Did not develop and maintain a physical environment in the classroom that is conducive to effective learning. (1.02-4)</td>
<td></td>
</tr>
<tr>
<td>N47</td>
<td>DN Generate Int and Enthusiasm &lt;br&gt;Did not establish interest and enthusiasm in the lesson. (1.06-5)</td>
<td></td>
</tr>
</tbody>
</table>
**LIST OF TEXT-FILE ENTRIES BY CODE NUMBER**

<table>
<thead>
<tr>
<th>Code</th>
<th>Descriptions</th>
<th>G/S Code</th>
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<tbody>
<tr>
<td>NA</td>
<td>NOT ANTICIPATORY SET</td>
<td>G</td>
</tr>
<tr>
<td>NB</td>
<td>NOT OBJECTIVE AND PURPOSE</td>
<td>G</td>
</tr>
<tr>
<td>NC</td>
<td>NOT INPUT</td>
<td>G</td>
</tr>
<tr>
<td>ND</td>
<td>NOT MODELING</td>
<td>G</td>
</tr>
<tr>
<td>NE</td>
<td>NOT CHECKING FOR UNDERSTANDING</td>
<td>G</td>
</tr>
<tr>
<td>NF</td>
<td>NOT GUIDED PRACTICE</td>
<td>G</td>
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<tr>
<td>NG</td>
<td>NOT INDEPENDENT PRACTICE</td>
<td>G</td>
</tr>
<tr>
<td>NH</td>
<td>OTHER</td>
<td>G</td>
</tr>
<tr>
<td>NI</td>
<td>SEE NOTES</td>
<td>G</td>
</tr>
<tr>
<td>NO3</td>
<td>DN Tell Purpose</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Did not tell the students the purpose of their assignments.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.00-11)</td>
<td></td>
</tr>
<tr>
<td>NO7</td>
<td>DN Explain Assignments Clearly</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Did not explain assignments clearly. (1.05-71)</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>-- END OF LESSON --</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>-- END OF LESSON --</td>
<td></td>
</tr>
</tbody>
</table>
Appendix B

The following is a copy of the fifth grade Richardson Assessment of Mastery test (RAM). Each grade level from kindergarten through sixth grade has two parallel forms of a test to measure the students' mastery of objectives for their grade level. Directions for the administration of the test are included.
Given a word problem involving addition and/or subtraction of decimals, the student will solve the problem.

Given a word problem involving operations with fractions which require no reducing, the student will solve the problem. (3B)

Exhibit the ability to solve open sentences

Given a number sentence involving addition, subtraction, multiplication, or division of one-, two-, or three-digit numbers, with an addend, sum, factor, or product missing, the student will identify the missing number. (2C)

Develop a basic understanding of probability and statistics

Exhibit the ability to construct and interpret graphs

Given a bar, line, or picture graph, the student will identify the data represented. (7B)

Given labeled grid and specified data, the student will record the information on a bar or line graph. (7B)

Given a problem requiring data, the student will collect the data and display it on an appropriate chart or graph. (7A)

Exhibit an understanding of probability and statistics

Given an event, the student will count the number of possible outcomes by constructing a tree diagram. (7C)

Given all possible outcomes of a simple event, the student will find the probability of any given outcome. (7D)

Given a problem requiring data from a chart or graph, the student will use the data to solve the problem. (3D)
This is a copy of one of the test booklets for mathematics, third six weeks period. The test was too long for a single booklet: it was divided into two booklets. Follow the usual procedures and administer both booklets.

They are to be used for first-time testing during the third six weeks and, if necessary, for retesting students on objectives not mastered, according to directions given to you by the RISD Department of Testing. The next page contains the actual instructions to the students. Students will be marking their answers on answer sheets in grades three through six.

Read the instructions and look at the test items before administering this test to your students to be sure that you are comfortable and familiar with the items. Have the students fill in the required information on their answer sheets. If you do not believe that your students can satisfactorily bubble in this information on the answer sheets, you must bubble it in for them. When they are ready, tell them to open their booklets to the first page. Tell them to read the instructions for the items carefully and then to work all the items. If you believe that the students will not be able to read the instructions adequately to themselves, then you may read the instructions aloud to the class.

After the students have finished taking the test, tell them to close their test booklets. Then collect the booklets and the answer sheets. The Department of Testing will be providing your school with transparent scoring grids for the answer sheets, so that you may hand score the items until your school has been installed on RIMS. The Department of Testing will furnish you with specific details on the machine-scoring of these answer sheets when you are installed. Until then, store the scan sheets securely after scoring them. Return the booklets to the secure storage location in your building as you finish with them.
Choose the number that is the same as the word name. Mark your answers on your answer sheet.

Read each number sentence below. There is a number missing in each sentence. Choose the number which makes each sentence true. Mark your answers on your answer sheet.

Choose the decimal number that is the same as the fraction or mixed number. Mark your answers on your answer sheet.

In each problem, round the number to the specified place. Mark your answers on your answer sheet.

Choose the correct answer. Mark your answers on your answer sheet.

Choose the correct answer. Mark your answers on your answer sheet.

Find the area of each rectangle. Mark your answers on your answer sheet.

Find the area of each figure. Mark your answers on your answer sheet.

Find the perimeter of each figure. Mark your answers on your answer sheet.

Choose the number that is represented by the point X on each number line. Use the scale on the number line to solve each problem. Mark your answers on your answer sheet.

Choose the correct answer. Mark your answers on your answer sheet.
In each problem, round each number to the nearest whole number. Then add the rounded numbers and estimate their sum. Mark your answers on your answer sheet.

Choose the correct answer. Mark your answers on your answer sheet.
Choose the number that is the same as the word name. Mark your answers on your answer sheet.

1. Twenty-five and five hundredths
   A. 25.5
   B. 25.005
   C. .255
   D. 25.05

2. Two hundred fifty and seven tenths
   A. 250.7
   B. 257
   C. 250.07
   D. 200.57

3. Four and fifty-three hundredths
   A. 4.0053
   B. .453
   C. 4.53
   D. 4.053

4. Five hundred twenty-nine and nine thousandths
   A. 529.009
   B. 529.9
   C. 529.09
   D. 529.0009
Read each number sentence below. There is a number missing in each sentence. Choose the number which makes each sentence true. Mark your answers on your answer sheet.

5. \[ 5.86 \quad \square \]
   - A. 15.02
   - B. 5.92
   - C. 6.13
   - D. 5.60

6. \[ 36.2 \quad \square \]
   - A. 37.1
   - B. .379
   - C. 34.8
   - D. 8.76

7. \[ 7.5 \quad \square \]
   - A. 8.1
   - B. .9
   - C. 4.9
   - D. 6.8

8. \[ 0.78 \quad \square \]
   - A. 1.5
   - B. 8.2
   - C. .78
   - D. .49
Choose the decimal number that is the same as the fraction or mixed number. Mark your answers on your answer sheet.

9. \(4 \frac{3}{10} = \) □
   A. .43
   B. 4.310
   C. 4.3
   D. 4.03

10. \( \frac{9}{10} = \) □
    A. 9.10
    B. .910
    C. .09
    D. .9

11. \( \frac{17}{100} = \) □
    A. .017
    B. 17.100
    C. 17.01
    D. .17

12. \(97 \frac{3}{100} = \) □
    A. 97.03
    B. 97.300
    C. .973
    D. .0973
In each problem, round the number to the specified place. Mark your answers on your answer sheet.

13. Round to the nearest tenth.
   1.42
   A. 1.10  
   B. 1.4  
   C. 1.5  
   D. 1.3

14. Round to the nearest tenth.
   2.76
   A. 2.8  
   B. 2.77  
   C. 2.75  
   D. 2.7

15. Round to the nearest hundredth.
   5.218
   A. 5.3  
   B. 5.22  
   C. 5.21  
   D. 5.29

16. Round to the nearest hundredth.
   27.083
   A. 27.1  
   B. 27.183  
   C. 27.08  
   D. 27.084
Choose the correct answer. Mark your answers on your answer sheet.

17. Which digit is in the tenth's place?
   59.62
   A. 2
   B. 5
   C. 6
   D. 9

18. Which digit is in the hundredth's place?
   1.032
   A. 0
   B. 1
   C. 2
   D. 3

19. Which digit is in the thousandth's place?
   47.829
   A. 2
   B. 7
   C. 8
   D. 9

20. Which digit is in the hundredth's place?
    6.507
    A. 0
    B. 5
    C. 5
    D. 7
Choose the correct answer. Mark your answers on your answer sheet.

21. In the number 3.57, the value of the 5 is _____.
   A. \( \frac{5}{10} \)
   B. 5
   C. \( \frac{5}{100} \)
   D. 50

22. In the number 28.36, the value of the 6 is _____.
   A. \( \frac{6}{10} \)
   B. 6
   C. \( \frac{6}{100} \)
   D. 60

23. In the number 105.32, the value of the 2 is _____.
   A. \( \frac{2}{10} \)
   B. 2
   C. \( \frac{2}{100} \)
   D. 20

24. In the number 0.47, the value of the 7 is _____.
   A. \( \frac{7}{10} \)
   B. 7
   C. \( \frac{7}{100} \)
   D. 70
Find the area of each rectangle. Mark your answers on your answer sheet.

25. 
- 8 in x 4 in
  - A. 12 square inches
  - B. 24 square inches
  - C. 32 square inches
  - D. 84 square inches

26. 
- 6 cm x 14 cm
  - A. 84 square centimeters
  - B. 20 square centimeters
  - C. 40 square centimeters
  - D. 64 square centimeters

27. 
- 17 cm x 11 cm
  - A. 1,711 square centimeters
  - B. 187 square centimeters
  - C. 56 square centimeters
  - D. 28 square centimeters

28. 
- 14 in x 15 in
  - A. 29 square inches
  - B. 210 square inches
  - C. 1,415 square inches
  - D. 58 square inches
Find the area of each figure. Mark your answers on your answer sheet.

29.

A. 18 square units
B. 12 square units
C. 20 square units
D. 36 square units

30.

A. 12 square units
B. 20 square units
C. 36 square units
D. 28 square units
Find the area of each figure. Mark your answers on your answer sheet.

31.

A. 8 square units
B. 10 square units
C. 12 square units
D. 16 square units

32.

A. 6 square units
B. 4 square units
C. 12 square units
D. 9 square units
Find the perimeter of each figure. Mark your answers on your answer sheet.

33. 

![Grid with dimensions: 5 cm x 5 cm, 4 cm x 4 cm, 5 cm x 5 cm]

A. 20 centimeter
B. 18 centimeter
C. 14 centimeter
D. 9 centimeter

34. 

![Pentagon with sides 2 inches]

A. 2 inches
B. 8 inches
C. 10 inches
D. 32 inches
Find the perimeter of each figure. Mark your answers on your answer sheet.

35.

A. 180 meters  
B. 28 meters  
C. 15 meters  
D. 13 meters

36.

A. 625 feet  
B. 50 feet  
C. 25 feet  
D. 20 feet
Choose the number that is represented by the point $X$ on each number line. Use the scale on the number line to solve each problem. Mark your answers on your answer sheet.

### Problem 37.

0 5 10 15 X 50

A. 25  B. 30  C. 35  D. 40

### Problem 38.

0 $\frac{1}{10}$ $\frac{3}{10}$ X $\frac{9}{10}$ 1

A. $\frac{1}{2}$  B. $\frac{5}{7}$  C. $\frac{7}{10}$  D. $\frac{8}{10}$

### Problem 39.

0 .1 .2 .3 X .5 .6 .9 1

A. .4  B. .5  C. .7  D. .8

### Problem 40.

7.0 7.2 7.5 7.8 8.0 X 8.5 9.0

A. 8.3  B. 8.7  C. 7.8  D. 8.0
Choose the correct answer. Mark your answers on your answer sheet.

41. 36.78
   + 21.24
   A. 57.54
   B. 57.92
   C. 58.02
   D. 68.02

41. 129.03
   + 72.19
   A. 101.12
   B. 101.12
   C. 201.22
   D. 201.22

43. 87.51
   + 6.79
   A. 83.20
   B. 93.20
   C. 94.20
   D. 94.30

44. 30.43
   + 9.58
   A. 49.91
   B. 40.01
   C. 39.91
   D. 39.01
In each problem, round each number to the nearest whole number. Then add the rounded numbers and estimate their sum. Mark your answers on your answer sheet.

45. \[ 6.1 + 19.8 \]
   A. 26
   B. 25
   C. 24
   D. 27

46. \[ 6.49 + 17.80 = \]
   A. 12
   B. 23
   C. 24
   D. 25

47. \[ 25.4 + 10.2 \]
   A. 33
   B. 35
   C. 36
   D. 37

48. \[ 19.09 + 40.99 = \]
   A. 60
   B. 59
   C. 69
   D. 70
Choose the correct answer. Mark your answers on your answer sheet.

49. \(215.57 + 83.8 = \) □
   A. 22.395
   B. 223.35
   C. 298.137
   D. 299.37

50. \(36.23 + 128.5 + 469.78 = \)
   A. 634.51
   B. 518.86
   C. 633.151
   D. 533.41

51. \(3.54 + 81.6 + 42.03 = \) □
   A. 53.73
   B. 126.117
   C. 137.27
   D. 127.17

52. \(5,728.3 + 357.89 = \)
   A. 6,085.119
   B. 6,086.19
   C. 930.72
   D. 608.619
Appendix C

The following is a list of mathematics objectives to be taught during the fifth-grade year by the teachers included in the study. Each grade level from kindergarten through sixth grade has a different set of objectives. The RAM tests for each grade level measure the level of student mastery of the objectives assigned to the grade level.
Richardson Mathematics Objectives

Fifth Grade

PG 02.01 Develop an understanding of the number system and its development

TPG 02.01.01 Exhibit an understanding of whole numbers and number theory

02.01.01.05.01 Given several numerals, the student will identify the one that represents a specified number between 100,000 and 1,000,000. (1A)

02.01.01.05.02 Given a six-digit numeral, the student will identify the digit that is in a specified place. (1D)

02.01.01.05.03 Given several numbers between 100,000 and 1,000,000, the student will identify the one that is "greater than" or "less than" a specified number. (1A)

02.01.01.05.04 Given expanded notation which includes ones, tens, hundreds, thousands, ten-thousands and hundred thousands, the student will identify the corresponding six-digit numeral, and conversely. (1D)

02.01.01.05.05 Given a Roman numeral less than or equal to 100, the student will identify its Arabic equivalent.

02.01.01.05.06 Given up to a seven-digit number, the student will round the number as specified. (1C)

02.01.01.05.07 Given a number written in the form $a^n$ with a whole number base no greater than 10 and an exponent no greater than 3, the student will write the number as a product of equal factors or in standard form. (1B)

02.01.01.05.08 Given a set of up to five numbers each less than 10,000, the student will arrange the numbers in sequence from the largest to smallest or from the smallest to largest. (1A)

ES - Essential state objective
E - Essential Richardson objective
D - Desired objective
TEAMS - Texas Educational Assessment of Minimum Skills
TPQ 02.01.04 Exhibit an understanding of real numbers and their properties

02.01.04.05.01 Given an addition number sentence with missing addends and involving the associative or commutative property of addition, the student will find the missing addends.

02.01.04.05.02 Given a multiplication number sentence with missing factors and involving the associative or commutative property of multiplication, the student will find the missing factor.

TPQ 02.01.02 Exhibit an understanding of fractional numbers

02.01.02.05.01 Given a fraction with a denominator as large as 100, the student will identify the fraction in lowest terms. (1G)

02.01.02.05.02 Given an improper fraction, the student will identify an equivalent mixed numeral in lowest terms, and conversely. (1G)

02.01.02.05.03 Given two fractions with unlike denominators as large as 10, the student will name the least common denominator. (1G)

02.01.02.05.04 Given the word name for a decimal number through the thousandths, the student will identify the indicated decimal. (1E)

02.01.02.05.05 Given two one- or two-place decimal numbers, the student will compare the numbers using the symbol for "greater than" or "less than" to indicate their order. (1A)

02.01.02.05.06 Given a fraction or mixed number with a denominator of 10 or 100, the student will identify the equivalent decimal. (1E)

02.01.02.05.07 Given several objects divided into 10 or fewer equal parts, with one or more parts shaded, the student will identify the corresponding fractional number. (1f)

02.01.02.05.08 Given a fraction with the denominator of 16 or less, the student will identify an equivalent fraction. (1G)

02.01.02.05.09 Given a decimal number with up to 3 decimal places, the student will round the number to the nearest tenth or hundredth as specified. (1C)

02.01.02.05.10 Given a decimal number with up to 3 decimal places, the student will identify the digit in a specified place. (1C)

02.01.02.05.11 Given two fractions with denominators no greater than 10, the student will use symbols for "greater than", "less than", or "equal to" to compare the fractions. (1A)
Given a decimal number with up to 2 decimal places, the student will identify the value of a specified digit.

Develop an understanding of geometric figures and their properties.

Exhibit the ability to recognize and construct basic geometric figures and exhibit an understanding of their properties.

Given several geometric figures, the student will identify the one that is a prism, cube, sphere, cone, pyramid, or cylinder as specified. (5A)

Given several geometric figures, the student will identify the one that is a square, triangle, rectangle or parallelogram. (5A)

Given several pairs of lines or line segments, the student will identify the pair in which the lines are parallel, perpendicular, or intersecting as specified. (5A)

Given several angles, the student will identify the one that is a right angle, or greater or less than a right angle as specified. (5A)

Given a circle with several line segments and points, the student will identify the point or segment representing the center, radius, or diameter of the circle as specified. (5A)

Given a set of geometric shapes, two of which are congruent, the student will identify the congruent shapes. (5B)

Given a set of geometric figures, two of which are similar, the student will identify the similar figures. (5B)

Given symmetrical figures, the student will find lines of symmetry. (5B)

Exhibit the ability to find the measurement of basic geometric figures.

Given a rectangle with the lengths of the sides indicated using inches or centimeters, the student will identify the area. (3C)

Given a polygonal figure, the student will find the area by using a specified grid. (4E)

Given the length of a line segment, the student will use a ruler to draw the segment to the nearest centimeter or eighth-inch. (4A)
02.02.02.05.04 Given a circle, the student will use a piece of string and ruler to measure the circumference of the circle, and will compare the circumference to the length of the diameter. (4D)

02.02.02.05.05 Given the measures of the sides of a polygon or polygonal shape, the student will find the perimeter. (9)

02.02.02.05.06 Given a container in the shape of a rectangular prism, the student will find the volume by counting unit cubes which fit into the container. (4F)

02.02.02.05.07 Given the model of a rectangular prism, the student will find the surface area of the prism. (5C)

02.02.02.05.08 Given a protractor, the student will use the protractor to measure or draw an angle to the nearest 10 degrees. (4A)

TPG 02.02.03 Exhibit an understanding of coordinate geometry

02.02.03.05.01 Given a number line and a specified scale, the student will locate the points representing given whole numbers, fractions, or decimals. (6)

PG 02.03 Develop the ability to perform basic math operations on whole numbers

TPG 02.03.01 Exhibit the ability to add whole numbers

02.03.01.05.01 Given three or more one-, two-, three-, or four-digit addends, which require regrouping to add, the student will identify the sum. (2A)

02.03.01.05.02 Given two numbers, each with at least 5 digits, which require regrouping to add, the student will identify the sum. (2A)

02.03.01.05.03 Given an addition problem involving whole numbers of no more than 7 digits, the student will estimate the sum by rounding. (3A)

TPG 02.03.02 Exhibit the ability to subtract whole numbers

02.03.02.05.01 Given two numbers, neither exceeding 99,999, which require regrouping to subtract, the student will identify the difference. (2A)

02.03.02.05.02 Given a subtraction problem involving whole numbers of no more than 7 digits, the student will estimate the difference by rounding. (3A)
TPG 02.03.03 Exhibit the ability to multiply whole numbers

02.03.03.05.01 Given a two-digit number and a two- or three-digit number, the student will identify the product. (2A)

02.03.03.05.02 Given a multiplication problem involving whole numbers, the student will estimate the product by rounding to the nearest 10 or 100. (3A)

TPG 02.03.04 Exhibit the ability to divide whole numbers

02.03.04.05.01 Given a four- or five-digit dividend and a one-digit divisor, the student will identify the quotient and remainder. (2A)

02.03.04.05.02 Given a four-digit dividend and a two-digit divisor which is a multiple of 10, the student will identify the quotient and remainder. (2A)

02.03.04.05.03 Given a division problem involving whole numbers, the student will estimate the quotient by rounding to the nearest 10 or 100. (3A)

02.03.04.05.04 Given a four- or five-digit dividend and a two-digit divisor, the student will identify the quotient and remainder. (2A)

PG 02.04 Develop the ability to perform basic math operations on fractions and mixed numbers and understand their properties

TPG 02.04.01 Exhibit the ability to add fractions and mixed numbers

02.04.01.05.01 Given two fractions or mixed numbers with unlike denominators which do not require regrouping to add, the student will identify the sum. (2B)

TPG 02.04.02 Exhibit the ability to subtract fractions and mixed numbers

02.04.02.05.01 Given two fractions or mixed numbers with unlike denominators which require no regrouping to subtract, the student will identify the difference. (2B)

TPG 02.04.03 Exhibit the ability to multiply fractions and mixed numbers

02.04.03.05.01 Given two fractions whose product requires no reducing to lowest terms, the student will identify the product. (2B)
PG 02.05 Develop the ability to perform basic math operations on decimal fractions and understand their properties.

TPO 02.05.01 Exhibit the ability to add decimal fractions

02.05.01.05.01 Given two decimal numbers, vertically, both expressed in hundredths, the student will identify the sum. (2B)

02.05.01.05.02 Given an addition problem involving decimals to hundredths, the student will estimate the sum by rounding. (3A)

02.05.01.05.03 Given two or three decimal numbers with no more than 5 digits and no more than two decimal places, the student will identify the sum. (2B)

TPO 02.05.02 Exhibit the ability to subtract decimal fractions

02.05.02.05.01 Given two decimal numbers, vertically, both expressed in hundredths, the student will identify the difference. (2B)

02.05.02.05.02 Given a subtraction problem involving decimals to hundredths, the student will estimate the difference by rounding. (3A)

02.05.02.05.03 Given two decimal numbers with no more than 5 digits and no more than 2 decimal places, the student will identify the difference. (2B)

TPO 02.05.03 Exhibit the ability to multiply decimal fractions

02.05.03.05.01 Given a whole number and a decimal number expressed in hundredths, the student will find the product. (2B)

PG 02.08 Develop an understanding of American and Metric systems of measurement

TPO 02.08.01 Exhibit an understanding of the money system

02.08.01.05.01 Given a picture of money having a total value less than $100.00, the student will identify the amount shown. (4B)

02.08.01.05.02 Given the amount of a purchase and the amount given to the clerk, neither of which exceeds $5.00, the student will identify the amount of change that should be returned. (3B)

TPO 02.08.02 Exhibit an understanding of time and temperature

02.08.02.05.01 Given a time of day on the hour, the student will identify the time at a given number of hours before or after the given time. (2B)

02.08.02.05.02 Given several numbers, the student will identify the one that represents the number of seconds in a minute, minutes in an hour, hours in a day, days in a week, days in a year, or weeks in a year. (4B)
02.08.02.05.03 Given a length of time expressed in seconds, minutes, or hours, the student will identify an equivalent length of time expressed in a different specified unit. (4B)

TPC 02.08.03 Exhibit an understanding of length, volume, and weight

02.08.03.05.01 Given several objects, the student will identify the one whose weight would most appropriately be measured in ounces, pounds, grams, or kilograms as specified. (4B)

02.08.03.05.02 Given a length in inches, feet, or yards, the student will identify an equivalent measure using one of the other specified units. (4B)

02.08.03.05.03 Given a container of liquid, the student will measure the volume of liquid in liters, milliliters, cubic centimeters, teaspoons, tablespoons, cups, pints, quarts, or gallons. (4A)

02.08.03.05.04 Given a standard scale or a balance scale and a variety of objects, the student will determine the mass/weight of the objects using metric and customary units. (4A)

02.08.03.05.05 Given a whole number metric measure expressed in centimeters, meters, or kilometers, or centigrams, grams, or kilograms, the student will convert the measure to an equivalent smaller metric unit (millimeters, centimeters, meter, milligrams, centigrams, grams). (4C)

02.08.03.05.06 Given a variety of objects, the student will measure lengths using inches, feet, yards, centimeters, or meters. (4A)

02.08.03.05.07 Given a variety of objects, the student will estimate the weight/mass, liquid volume, or length of the objects using customary or metric measures. (4B)

PG 02.09 Develop the ability to apply mathematical skills and concepts in solving problems

TPO 02.09.01 Exhibit the ability to solve word problems

02.09.01.05.01 Given a one- or two-step word problem involving addition and/or subtraction of whole numbers less than 1,000, the student will solve the problem. (3B)

02.09.01.05.02 Given a one-step word problem involving multiplication or division of whole numbers less than 1,000, the student will solve the problem. (3B)

02.09.01.05.03 Given a word problem involving operations with denominate numbers, the student will solve the problem. (3B)
Appendix D

STUDY OF ELEMENTS OF LESSON DESIGN
TEACHER INFORMATION

<table>
<thead>
<tr>
<th>Name</th>
<th>School</th>
<th>Advisor number</th>
</tr>
</thead>
</table>

Experience

Please check the categories associated with your years of teaching experience. Count the 1985-86 school year and years for which you have received credit from the school district.

1. How many years have you been teaching in the school to which you are presently assigned?
   - 1-3 years
   - 4-6 years
   - 7 or more years

2. How many years have you been teaching in RISD?
   - 1-3 years
   - 4-6 years
   - 7 or more years

3. How many total years of teaching experience have you accrued?
   - 1-3 years
   - 4-6 years
   - 7 or more years

Inservice

Please indicate the amount of time (approximately) you have spent in ETP, AAT, inservice, and/or other professional activities to develop your knowledge or skills in Principles of Effective Teaching and Learning (PETL) and/or the use of the elements of lesson design. Check the appropriate blanks and fill in times where necessary.

Check for Participation: | Hours
---|---
Pilot project in PETL, 1983-84 O'Henry Elementary | 16
First session of RISD PETL training | 8
Staff meetings, 1983-84 (15 hrs. - O'Henry; 6 hrs. - Big Springs) | |
Staff meetings, 1984-85 | 10
Staff meetings, 1985-86 | 6
Individual conferences with consultant or administrator | |
Grade level meetings | |
Additional individual activities (reading workshops, inservice, ETP, etc.) | |
Other | |
Appendix E

Richardson Independent School District

June 13, 1986

James Arthur Smith
6453 Bob-O-Link Drive
Dallas, TX  75216

Dear Mr. Smith:

Your proposal "A Correlation Study of the Elements of Lesson Design and Elementary Public School Students' Mastery of Mathematics Objectives" has been approved for a research study in the Richardson Independent School District by Dr. Rex Carr, Deputy Superintendent and Dr. Blyth Riegel, Director of Research and Evaluation.

Please call my office and arrange for a time when we can discuss your specific statistical design when you are ready to begin analysis.

We are looking forward to receiving a copy of your completed study.

Sincerely,

Blyth Riegel, Ph.D.
Director
Research and Evaluation
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Reports


Public Documents


Unpublished Materials


