

1979

A study of the effects of the Program for Effective Teaching on academic secondary teacher behavior and general mathematics student achievement in the Newport News public schools, Newport News, Virginia

Alfred William Lebold
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A STUDY OF THE EFFECTS OF THE PROGRAM FOR EFFECTIVE TEACHING
ON ACADEMIC SECONDARY TEACHER BEHAVIOR AND GENERAL MATHEMATICS
STUDENT ACHIEVEMENT IN THE NEWPORT NEWS PUBLIC SCHOOLS, NEWPORT
NEWS, VIRGINIA.

The College of William and Mary in Virginia, Ed.D., 1979

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IN THE NEWPORT NEWS PUBLIC SCHOOLS,
NEWPORT NEWS, VIRGINIA

A Dissertation
Presented to the
Faculty of the School of Education
The College of William and Mary in Virginia

In Partial Fulfillment
Of the Requirements for the Degree
Doctor of Education

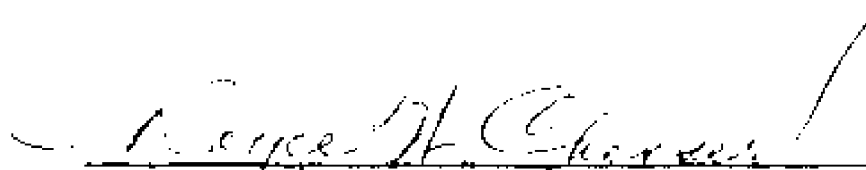
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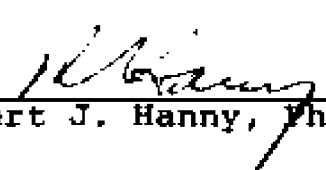
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Alfred W. Lebold


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Armand J. Galfo, Ed.D., Chairman

Dedication

This research is dedicated to my wife Lucille, who initially urged this endeavor, constructively criticized its development, and consistently encouraged its completion. Throughout this entire process, she gave valuable assistance and support.

Acknowledgments

Dr. Armand J. Galfo inspired me, as an undergraduate, to enter the field of Education. He encouraged me, as a graduate student, to pursue further study. He supported and advised me, as a doctoral candidate, to complete this research successfully.

Professor Royce W. Chesser and Professor Robert J. Hanny have generously shared their experience and expertise throughout my graduate program, both in the classroom and in individual conferences. Their teaching has been a strong resource in all my work.

Dr. Don R. Roberts afforded me the opportunity to experience a new dynamic teacher-training program. With J. William Etheridge, my valued colleague, the Program for Effective Teaching was developed.

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Dr. John McGregor turned facts into findings with his assistance at the computer.

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ABSTRACT

A STUDY OF THE EFFECTS OF THE PROGRAM FOR EFFECTIVE TEACHING ON ACADEMIC SECONDARY TEACHER BEHAVIOR AND GENERAL MATHEMATICS STUDENT ACHIEVEMENT IN THE NEWPORT NEWS PUBLIC SCHOOLS, NEWPORT NEWS, VIRGINIA.

LEBOLD, ALFRED W.

THE COLLEGE OF WILLIAM AND MARY IN VIRGINIA, 1979.

ADVISOR: ARMAND J. GALFO, ED.D.

Purpose

The purpose of this study was to determine through empirical data the effect of the Program for Effective Teaching on teacher performance and on student achievement. The Program for Effective Teaching is an in-service program to improve instructional skills of teachers.

Method

From a group of secondary teachers, twenty-four were randomly selected to participate in the program. It was hypothesized that this group would make significant improvement in ratings of their classroom performance in the area of instructional skills from observations made prior to participation in P.E.T. to observations made upon completion of the course. Further, it was hypothesized that the experimental group would score significantly higher ratings on post-observations, covarying for pre-observation scores, than a control group of teachers. To test for the effect the program had on student achievement, the mean scores of general mathematics classes of teachers who completed the program at least five months earlier were compared to mean scores of a randomly selected control group of teachers controlling for student pre-test scores. Analysis of covariance was used. The test used was a locally designed test to measure the minimum mathematics competencies defined by the Virginia State Board of Education.

Findings and Conclusions

The results confirmed that teachers in the experimental group did significantly improve their application of instructional skills in their classrooms. This finding tends to support the assumption that appropriate in-service training is of benefit in teaching teachers certain instructional skills.

Although the data produced greater gains in achievement by classes of experimental group teachers, the results were not significant at the 5 percent level of confidence. It was concluded that perhaps a greater period of time was needed before the value of the program in terms of student achievement could be measured.

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Chapter 1

Introduction

During the 1975-1976 school year, the Newport News Public Schools in Newport News, Virginia, developed and implemented a program to improve the instructional skills of teachers, supervisors, and administrators. The Program for Effective Teaching (P.E.T.)* was developed to meet a recognized need to retrain and to reinforce the instructional skills of the staff. The Newport News Public Schools, not hindered by a large turnover in teaching staff within the district, sought to re-evaluate the quality of teachers already employed and the quality of existing staff development programs. An added pressure for staff re-training was the demand by the community for accountability through staff performance as revealed by test scores.

The traditional means employed for staff improvement had been college courses and workshops. Although these methods are important, they had failed to maintain or to provide reinforcement and growth for many teachers. Some teachers had failed to adapt to new curricular methods.

*Not to be confused with Thomas Gordon's Parent Effectiveness Training.

In-service workshops had usually been short-range, without follow-up, without evaluation of participants' success, and without actual classroom teaching involvement.

The conception of the program was early in February 1976, when Dr. Don R. Roberts, Superintendent of Newport News Public Schools, formulated his five-year goal: "By June 30 of the 1976-77 school year, and by the same time each succeeding year, there shall be a proportionate increase in student performance in reading and in mathematics computation until June 30, 1981, 85% of all fifth grade students will be achieving at or above grade level." (p. 11)

In addition, Dr. Roberts (1976) stated:

The major component of the school division's emphasis on basics will be the implementation of the P.E.T. (Program for Effective Teaching) Project. The retraining involves identifying content to be taught, diagnosing each student's needs, prescribing the instruction for meeting those needs, teaching the necessary skills and evaluating the results--all techniques which are by no means new to teachers. The program will go beyond the input and knowledge level, however, to include demonstration, application, diagnostic-prescription, teaching experiences, implementation in the classroom, evaluation and follow-up through critiques by colleagues. (P. 12)

During the first week of March 1976, the assistant superintendents for instructional services and for personnel services and the supervisors of language arts and mathematics, visited several California professional development centers, state funded programs. These programs were in Long Beach, Los Alamitos, Savannah, Upland, Centralia, and Pasadena. The programs delineated the teaching process into six areas of skills--knowledge of content, planning skills, management skills, skills in the use of materials, human relations skills, and instructional skills. The superintendent decided that the supervisors of language arts and mathematics would be participants in the Long Beach program under the instruction of Ernest Stachowski, Director of the Professional Development Center.

Upon returning to Newport News, the supervisors began to determine the course content for the Program for Effective Teaching. That which was learned in California and a study of the literature, mainly Bloom (1956), Hamacheck (1968), Hunter, Mager (1962), Popham (1965), and Sanders (1966), formed the basis for the Program for Effective Teaching. The first class was held in May and early June 1976 for the superintendent, assistant superintendents, and other central office personnel. The goal of this course was that the participants be able to

comprehend the concepts and skills of P.E.T. Starting with the second group, all participants had to comprehend the concepts and skills of P.E.T. and also had to apply this knowledge while teaching students. Each participant had to teach and participate in a conference which emphasized his use of the instructional skills. By June 1979, all instructional supervisors, all elementary and secondary administrators, and all classroom teachers from kindergarten through grade seven, over 1200 persons, had completed the five week course. Eight days of the course were spent in instruction at the P.E.T. center. The other days were spent by the teacher in his classroom applying the P.E.T. components to his teaching and being observed at least five times by a P.E.T. instructor. In addition, all instructional aides in kindergarten through grade seven completed an abbreviated course specifically designed for their needs.

Explanation of the P.E.T. Program

The following is a description of the content presented to teachers in the Newport News Public Schools Program for Effective Teaching. Terminology is discussed as it has been developed for this program.

For the educators to complete the course, they must show competency by demonstrating, while teaching, their ability to apply basic instructional skills. The skills are:

1. To teach to a specific learning
2. To select an objective at the appropriate level of difficulty
3. To monitor progress and select alternatives while teaching
4. To use, but not abuse, the principles of learning such as anticipatory set, closure, covert and overt behavior, motivation, reinforcement, retention, and transfer.

The first basic instructional skill is to teach to a specific objective. Emphasis is not to be able to write objectives but rather to be able to teach an objective after one has been selected. The teacher is expected to generate relevant overt behavior in the learner. During the lesson the teacher gives explanation, asks questions, provides activities, and offers responses to the efforts of the learner. All of these components must be present in a lesson and must be relevant to the objective. A teacher is not tied inflexibly to his objective. He has the option to leave his objective but must be aware that he is leaving the specific learning.

The second instructional skill is to teach at the correct level of difficulty. This is determined by use of a task analysis, which is a listing of enabling sub-learnings which are essential to the terminal objective. The procedure for forming a task analysis is:

1. State the terminal objective
2. List all the essential learnings which are en route objectives to the terminal objective
3. Impeach the list for essential learnings
4. Sequence the essential learnings if there is a dependency
5. State the learnings in the form of diagnostic questions.

By diagnostically analyzing each learner, the teacher has the mechanism by which to select objectives which are at the correct level of difficulty for each learner.

The third instructional skill is to monitor the progress of the learner and to adjust the lesson by selecting alternative techniques, activities, or objectives if necessary. The teacher must be constantly aware of the learners and where they are in reference to accomplishing the objective. The task analysis is the gross diagnosis. Monitoring and adjusting is the refined diagnosis. A study of Bloom's (1956) taxonomy is included in the course to give the teacher added alternatives in adjustment. The teacher can increase or decrease the level of difficulty or the level of complexity. Bloom's levels of complexity are knowledge, comprehension, application, analysis, synthesis, and evaluation. Emphasis on the taxonomy directs attention not only to the levels of complexity of the teacher's

questions but also to the level of complexity of the learner's responses.

The final instructional skill is the use without abuse of the principles of learning.

A principle of learning is any of the variables that are in the classroom whether they are intended to be there or not. They include such things as the intercom, noise, lights, etc.

It is the total environment in which the learning occurs. Most of the variables in a classroom are uncontrollable by the teacher. P.E.T. only deals with the eight principles of learning that can be controlled by the teacher. These are: set, closure, covert behavior, overt behavior, motivation, reinforcement, retention, and transfer. (Vaught, 1979, p. 19)

Theoretical Background

Madeline Hunter (1974) has viewed teaching as a decision-making process. She has attempted to establish for teachers and administrators an understanding of the scientific principles of learning. The incorporation of these principles, she believes, will enable the art of teaching to emerge. She concedes that the complex nature of the psychological and environmental human variables makes the social sciences less exacting than the physical

sciences. However, there is knowledge that generating certain behaviors in teachers increases the probability of generating desirable learning in students and minimizing undesirable learnings.

The three basic categories of the teaching-learning process are: (1) content, (2) learner behaviors, and (3) teacher behaviors. The process must begin with the selection of the content; only after this selection can appropriate behaviors in the other elements begin. The next professional decision concerns what the learner will do to accomplish the objective. This decision is made after considering what behavior will lead to accomplishing the intended learning as well as what behavior will be effective for the particular learner. Effectiveness of a certain behavior for a given individual depends upon the behavior that will be most productive for the learner at this stage of his learning. The decision cannot be made intuitively but rather by critical analysis of the learner's previous behavior in learning and through thorough and persistent monitoring of his current performance. The teacher and learner must be prepared to adjust or modify behavior based on the most current data. Only after the objective and learner behaviors have been established can the decision on teacher behaviors be made. A teacher's actions must also be the most productive behaviors possible

in achieving the learning. At this time a thorough understanding of the principles of learning is necessary.

(Hunter, 1974)

Next, an examination of the cause-effect relationships in the teaching-learning process must be made. Hunter states two generalizations. (1) Learning is incremental and proceeds in sequence. The sequence can be either dependent or independent in nature. (2) Certain principles of learning, validated by research, have been identified which contribute significantly to achieving learnings in the teaching-learning process. Hunter states that understanding and incorporating these principles is critical to the teaching-learning process. They affect the rate and degree of achievement. Understanding of these cause-effect relationships helps explain, predict, and produce successful learning.

The science of human learning, according to Hunter (1974), has developed to the extent that educators can control and manipulate the environment. Hunter (1974) states:

In order to assume this responsibility, the teacher must make a clearly defined sequence of decisions which will enable him to deliberately assist learning. Scientific analysis has recently led to identification

of eleven sequential decisions which generate professional action. Rather than restricting artistry and innovation, they enable a teacher to direct his creativity and artistry to areas where they make the greatest difference, rather than dissipating energy at attempting to innovate where science has already defined a productive path. These eleven items are listed as teacher decisions because the teacher can never delegate his responsibility for a student's successful learning. Nevertheless, the student himself should make as many of these decisions as he can make productively. These eleven decision areas developed elsewhere will merely be listed here:

1. Deliberate and scientific separation of genuine educational constraints from the typical ethnic, financial, intellectual, or emotional excuses which constitute fashionable (and unfortunately, acceptable) "cop-outs."
2. Determination of what the student has already achieved and what he is ready to learn in terms of degree of difficulty (sequence) and complexity (affective,

cognitive, or psychomotor domain).

3. Identification of productive behavior for this particular learner to achieve the learning task.
4. Determination of an instructional objective with specific content and perceivable learner behavior.
5. Identification of principles of learning relevant to the accomplishment of this instructional objective.
6. Adaptation of those principles to the particular situation and to each learner.
7. Use of the teacher's own personality and competence in the specific learning area to enhance the learner's probability of successful accomplishment. Except for "knowing oneself," this is the only decision area about which science has little to offer at present. Here is the place for the highly operational but inarticulate knowledge of intuition: the art of teaching. Because such knowledge remains, at this time, inarticulate, it is not systematically transmittable to all teachers.

8. Synthesis of the first seven decisions into a deliberate design for a learning opportunity. To maximize successful learning, all of the first eight decisions must be consciously made before the teacher-learner interaction.
9. The actual teaching-learning process begins. As the lesson begins, the teacher's observations of the learner augment or correct the decision-making process. This instantaneous use of current data characterizes the true professional.
10. Evaluation is an integral and continuous part of the process, not merely a terminal function. Constant monitoring of the learner's progress yields essential information which may modify the teaching-learning process.
11. On the basis of these evaluative data collected during the teaching-learning process, the determination is made to (a) reteach, (b) practice and extend, (c) move on, or (d) "abandon ship" because for some reason the objective is not attainable by the learner at this time. (pp. 350-351)

Hunter (1976) indicates that there are four essential steps in implementing a program to improve instructional skills. The first step is to develop a cadre of supervisors (principals or professors) who become sophisticated in the analysis of teaching. These persons must be able to: (a) comprehend the generalizations of the "what" and "how" of teaching, (b) identify principles of learning in teaching situations, (c) make and analyze anecdotal records, (d) evaluate a lesson, and (e) conduct a teacher conference. The second step is to develop the instructional skills in teachers through staff development programs. In the third step, the supervisor observes the teacher in the classroom to see whether the teacher has been able to translate the instructional skills into the teacher's own classroom teaching. The observation adds incentive for the teacher to practice and to transfer the skills to the classroom. In the fourth step, the supervisor conducts a conference with the teacher, commending the teacher for strengths and remediating and reteaching areas of weakness. "A teacher-preparing institution, an individual school or a total district wishing to increase the effectiveness of instruction needs to accomplish all four basic steps." (Hunter, 1976, p. 169)

Problem

Purpose of the Study

The purpose of this study was to determine the effect of the Program for Effective Teaching on teacher performance and on student achievement. Each group which completed P.E.T. was asked to evaluate the program and its usefulness. Teacher's evaluations were overwhelmingly positive in terms of the teacher's perception of how P.E.T. affected the teacher's classroom instruction. Evaluations of P.E.T. by principals and assistant principals have been extremely positive in terms of its effect on teacher performance. Since 1976, the Newport News Public School System has witnessed a significant increase in standardized test scores and criterion-referenced test scores and levels. Many variables affected these increases. What portion can be attributed to the Program for Effective Teaching is difficult to assess.

Statement of the Problem

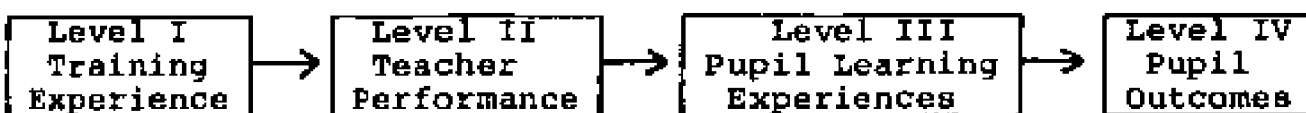
The problem central to this study was to develop empirical data with which to evaluate objectively the effectiveness of the Program for Effective Teaching. Answers were sought to the following questions:

1. What effect does the Program for Effective Teaching have on teacher performance when the teacher returns to his classroom?

2. What effect does the Program for Effective Teaching have on student achievement?
3. Do students of teachers who have greatest proficiency in instructional skills achieve more than students of teachers who have less proficiency in instructional skills?

Hypotheses

The Newport News Public Schools' Program for Effective Teaching is based on the specific teacher competencies determined by Madeline Hunter. Using Hunter's teaching-learning process as a theory base, this study was designed to research the degree of teacher growth in those specific competencies; to measure the degree of pupil progress in attaining specific educational objectives; and to determine the relationship between teacher performance and the attainment of student progress. Medley, Soar, and Soar (1975) developed a paradigm which described four levels to assess teacher effectiveness.



Level I refers to assessments which deal with the training experiences that a teacher has had including courses the teacher has taken as well as other instruction the teacher has experienced.

Level II refers to assessments of teacher behaviors while the teacher is instructing.

Level III refers to assessments of pupil behavior while the teacher is instructing. This includes activities the students are asked to perform as well as the amount of involvement and practice pupils perform.

Level IV refers to assessments of pupil outcomes of instruction which include measurable changes in student behavior.

At the teacher performance level, Hunter (1976) indicates that instructional skills of teachers can be improved if teachers are prepared through in-service to make and to implement rational teacher decisions. This in-service must include observations in the teacher's classroom for critical analysis of the teacher's application of these skills. With the training, teaching skills can be learned. This leads to the following hypotheses.

Hypothesis I

Teachers who have completed the Program for Effective Teaching (experimental group) will rate significantly higher in the teacher performances as measured by the Teacher Appraisal Instructional Improvement Instrument (TA Triple I) after completing the program than they did prior to participation in the program.

Hunter (1974) indicates that teachers who are trained to make rational teaching decisions will be more effective and efficient teachers than teachers who teach by intuition. The trained teacher will be applying the science of teaching while the untrained will at best be a competent technician of the teaching act. Thus, the trained teacher will implement the skills of instruction in a more consistent and rational manner.

Hypothesis II

Teachers who have completed the Program for Effective Teaching (experimental group) will rate significantly higher on the teacher performances as measured by the Teacher Appraisal, Instructional Improvement Instrument (TA Triple I) than teachers who have not had the program (control group).

By examining pupil outcomes, Level IV of the Medley, Soar, and Soar model, one can see whether the program can improve student attainment of specific educational objectives. "The professional competence of the teacher . . . is the critical ingredient to increasing the probability of successful learning." (Hunter, 1976, p. 169)

Hypothesis III

Students of mathematics teachers who have completed the Program for Effective Teaching (experimental group) will score significantly higher on the Basic Mathematics

Skills Test than students of mathematics teachers who have not participated in the program controlling for pre-test scores and SRA STEA (Scientific Research Associates' Short Test of Educational Ability) scores.

To examine further the relationship between the level of teacher performance and the degree of pupil progress in attaining specific educational objectives, it follows that teachers who are most successful in applying the instructional skills will have students making the greatest progress in achievement.

Hypothesis IV

Students of mathematics teachers who are rated in the highest quartile on teacher performances as measured by the Teacher Appraisal, Instructional Improvement Instrument (TA Triple I) will show greater achievement in the Basic Mathematics Skills Test than students of mathematics teachers who are rated in the lowest quartile.

Definition of Terms

For the purpose of this study, three basic terms need to be defined: learning, teaching, and the teaching-learning process. The following definitions, as defined by Hunter (1974), are applied in this study:

Learning is any change of behavior that is not motivational or due to a temporary condition of the organism.

Teaching is a process of deliberate decision-making and action which makes learning more probable and more predictably successful than it would be without that teaching.

The teaching-learning process is the dynamic interaction between teacher and learner. (pp. 346-347)

Limitations

This study has certain limitations. They are as follows.

All teachers in this study were secondary teachers. The Program for Effective Teaching is in its third year in the Newport News School System. All teachers of grades one through five who were in the system during 1976-1977 had completed the program. Therefore, any experimental group of teachers in these grades would have had to be composed of teachers new to the system. In addition, the skills and vocabulary of the program had become so much a part of the elementary school it would have been difficult to have a control group that was not being influenced by the Program for Effective Teaching.

The study was limited to teachers of English, social studies, mathematics, and science. This limitation had been determined because these were the priority areas of

the school system. Teachers in other content areas will be taking the Program for Effective Teaching in subsequent years.

Student achievement was limited to measurement in the area of mathematics. Specifically, the general mathematics students were taught the state minimum competency objectives. Mathematics had been selected because the objectives in mathematics were more specifically defined than those of other specified fields and because an instrument had been developed to measure achievement of them.

Teacher behavior could have been influenced by the knowledge that the raters for this study were elementary P.E.T. instructors. Although the secondary P.E.T. course was conducted by an entirely different group of instructors from the elementary program and was housed in a different building from the elementary program, some secondary teachers in the study may have recognized an association of their raters with a P.E.T. course. This may have limited or modified some secondary teachers' behaviors.

Overview of the Remainder of the Study

Chapter 2 contains a review of the literature and research related to the problem. The methodology of the present study including the research design, instrumentation, and statistical treatment of data will be discussed

in Chapter 3. A presentation of the findings and results of the study is found in Chapter 4. Chapter 5 of this dissertation presents the conclusions and implications for further research.

Chapter 2

Review of Related Literature and Research

A review of literature and research related to the problem of the study is presented in this chapter. The review is divided into five sections: (1) the teaching and the learning processes; (2) teacher behaviors and student achievement; (3) measurement of teacher effectiveness; (4) effects of in-service programs on teacher behavior, and (5) the Long Beach (California) Unified Public Schools' Professional Development Center Model.

The Teaching Process and the Learning Process

The review of literature begins with an examination of the teaching process and the learning process as theorized by Hunter (1971). These processes and the teaching decisions inherent in them are the basis for the content of the Program for Effective Teaching.

The Teaching Process

The teaching process as explained by Hunter (1971) is based on the following assumptions:

1. Teaching and learning are interwoven and are separated only for focus, study, or prescriptive action.

2. Teaching is the process of professional decision-making and the transforming of these decisions into behaviors which lead to learning becoming more probable, efficient, predictable and economical.
3. Constraints within the teacher or the teacher's environment can be decreased by appropriate teaching decisions.
4. Teaching decisions and actions are within the direct control of the teacher; learning is not within the direct control of the teacher.
5. Teaching is a learned skill. The individual's personality can help or hinder his professional skills.
6. Teacher behavior can be grouped as (1) those related to the learning, (2) those related to the learner's behavior, and (3) those related to the teacher's behavior.
7. A body of knowledge has been developed to help the teacher make appropriate decisions in each area. Many studies have been done to ascertain the characteristics of a good teacher.

In the teaching process, the first decision a teacher must make is to determine the learning objective. To determine the objective the teacher must be knowledgeable in the content area. He must also know what the learner has already learned in the content area. In most content

areas, a continuum of skills or knowledges exists which make certain skills prerequisites to more complex or difficult skills. Determining the appropriate objective is prerequisite to any decision about methodology for successful teaching. The teacher carefully chooses objectives that are not too difficult and therefore not attainable regardless of how well the teacher teaches or how hard the learner tries. In a similar manner the teacher must not choose objectives that the student has already mastered. In either situation little learning will occur. Choosing objectives at the appropriate level of difficulty is essential to successful teaching. Proceeding at a level which is too difficult or too easy or at a rate which is too fast or too slow wastes time. Such a negative experience hinders future learning (Hunter, 1971).

Another skill of the successful teacher is the ability to adjust the degree of intellectual complexity at any level of difficulty. In cognitive complexity, the Taxonomy of the Cognitive Domain (Bloom, 1956) has been developed as a guide for teachers to classify learnings. Taxonomies have also been developed in the affective domain (Krathwohl, 1964) and the psychomotor domain (Simpson, 1966). In any domain, the teacher must choose objectives at an appropriate level of difficulty and complexity which implies that the teacher knows how far a student has progressed

within a given domain. It is the teacher who must monitor the appropriateness and attainability of the learning objective (Hunter, 1971).

A teacher's second decision in the teaching process is to determine what the learner must do to accomplish the objective. Learning implies that the learner must "do" something. This "doing" must be relevant to the objective and appropriate for that particular learner. Many problems in learning are a result of imprecise decisions about the behavior of the learner. The product of the teaching process up to this point is the behavioral objective of the teaching act. The teacher must determine the learning as well as what the learner must do to accomplish it. The objective describes the content as well as the behavior of the learner. "The efficiency of teaching is increased so markedly by specifying objectives in behavior and developing this skill in teaching behavior." (Hunter, 1971, p. 151) A behavioral objective written precisely provides a teacher the opportunity to evaluate student achievement. On the basis of current data, the teacher can make rational decisions of whether to (1) reteach the lesson, (2) abandon the lesson, (3) practice, (4) extend the learning, or (5) move on to a new learning. This process is on-going throughout the lesson (Hunter, 1971).

The third decision a teacher must make is to determine the methodology or strategy to be used in accomplishing the objectives. Strategy decisions are appropriate only after the behavioral objective has been established. "Validity of method is established only in relation to its effectiveness in accomplishing a specified learning objective." (Hunter, 1971, p. 151) There are basic principles of learning that underlie methodology. These principles tend to be valid for all subjects and all age groups. The application of these principles of learning into the classroom tends to make successful teaching. The way these principles are applied will depend upon the teacher's personality, subject area, learner's age, interests and capabilities (Hunter, 1971).

An important principle of learning is motivation. Motivation must be maintained at an optimal level throughout the teaching-learning process, not just at the beginning. Many out-of-school factors affect motivation. The teacher has little control of most of these external factors. In-school factors within the teacher's influence are:

1. The degree of the student's concern about the learning
2. The type of feeling tone involved in the learning
3. The degree of the student's interest in the learning
4. The degree of the student's success in the learning

5. The precision of the knowledge of results available to students
6. The relationship of the learning activity to the goal desired by the student (Hunter, 1967 a).

Previously, the amount of time available for teaching was considered to be an important factor in the amount of learning accomplished. Current research in teaching is focused on variables that affect learning within existing time constraints.

Factors related to the material to be learned are:

1. Order
2. Length and complexity
3. Meaning
4. Whole versus part
5. Vividness

Factors related to the learning act are:

1. Motivation
2. Reinforcement
3. Feeling tone
4. Active participation by the learner
5. Degree of guidance
6. Knowledge of results
7. Level of aspiration
8. Schedule of practice
9. Positive and negative transfer (Hunter, 1967 b).

Another principle of learning is retention. According to Hunter, retention of material is related to:

1. The degree of original learning
2. The meaningfulness of the material
3. The presence of feeling tone
4. The presence of positive or negative transfer
5. The schedule of practice (Hunter, 1967d).

By focusing on the factors that affect transfer, another principle of learning, it is possible to increase desirable transfer and decrease undesirable transfer which might impede future learning. Factors which affect transfer are:

1. Similarity of two situations
2. Association of two learnings
3. Degree of original learning
4. Identification of the critical attributes of the learning (Hunter, 1970).

Another aspect of the teaching process is the teacher's "use of self." This is the human aspect of the process, where the teacher uses his own personality and skills in conjunction with his teaching skills. "It is this 'use of self' which differentiates the artist from the competent technologist in the profession." (Hunter, 1971, p. 153) A teacher who is sensitive to individual learners will vary the amount and type of support, reinforcement, stimulation or demands placed upon individuals at different

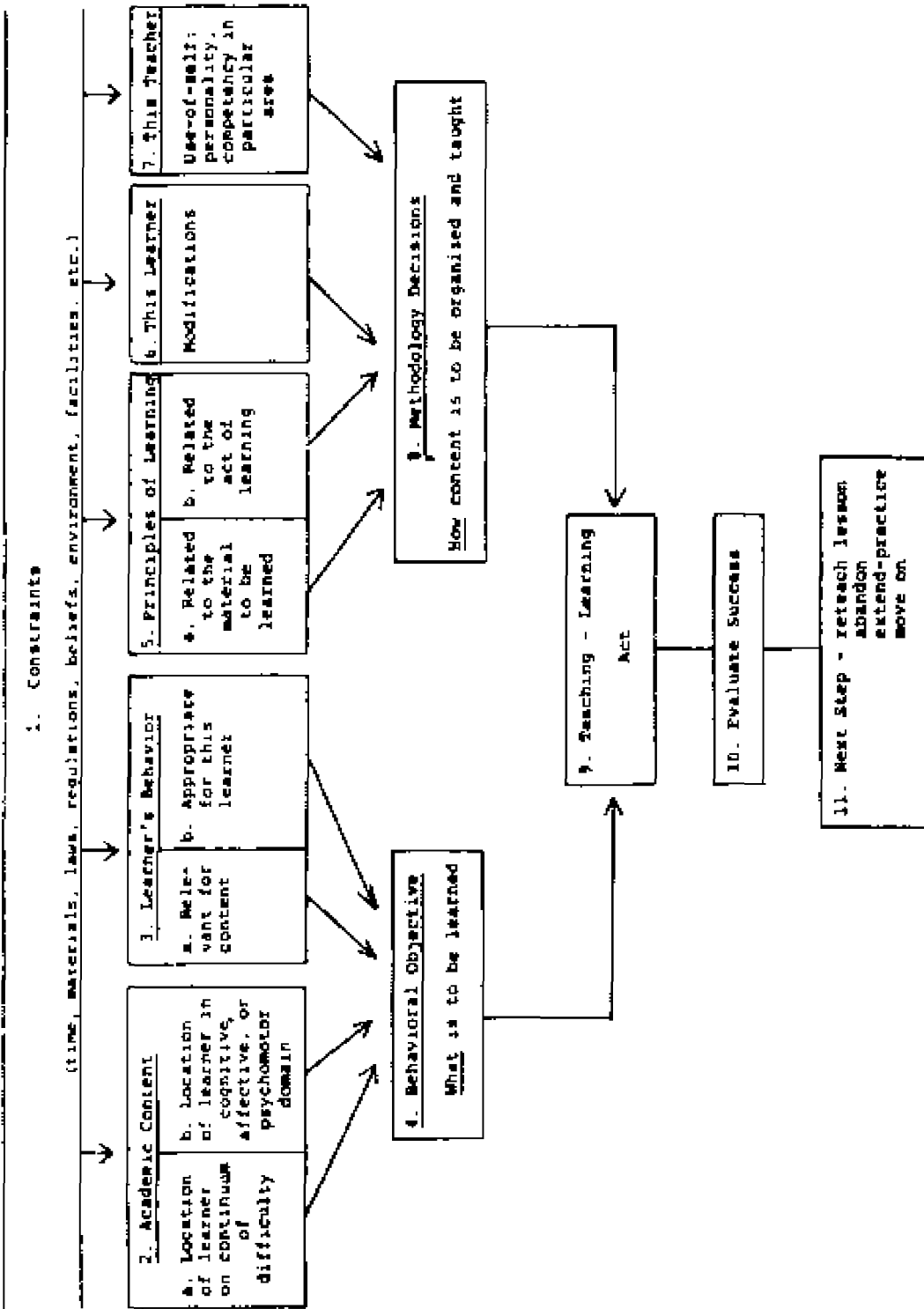
times. "This quality of human sensitivity in the process of teaching is not easily identified or described and consequently is not easily transmittable." (Hunter, 1971, p. 153)

One such quality is the degree to which a teacher is supportive or demands that his student be independent. According to Hunter, the competent teacher is flexible, is sensitive to student needs, and is aware of his own teaching patterns. He also makes adjustments in the degree to which he is supportive or independent (Hunter, 1971). Another variable that a competent teacher manipulates is the degree of predictability versus the degree of ambiguity maintained in the learning environment. A third variable trait is the size of the learning increments the teacher takes. Some teachers teach in small incremental steps, while others move much faster. As in other teaching decisions, the teacher must base the pace on the behavioral clues generated by the learners (Hunter, 1971).

The personality of any teacher is an asset for some learners and a liability for others. The competent teacher accentuates or modifies his style to enhance the decision-making in the teaching process.

Figure 1 is a model of the successful teaching process. It is the theory-based response to the following questions which becomes performance behavior:

Figure 1



SOURCE: Hunter, M. The Teaching Process and the Learning Process. In E. Seifman and D. Allens (Eds.) Handbook for Teachers. Glenview, Illinois: Scott Foresman and Company, 1971, p. 155.

1. Which constraints exist that must be taken into account?
2. What learning task is appropriate for the student at this particular stage of his learning?
 - a. The degree of difficulty in ascending increments
 - b. The degree of cognitive complexity (cognitive domain) or internalization (affective domain) or automation (psychomotor domain)
3. What learner behavior is--
 - a. Relevant for the task?
 - b. Appropriate for the characteristics of this learner?
4. What is the primary behavioral objective for this lesson?
5. Which principles of learning must be incorporated that are related to:
 - a. The material to be learned?
 - b. The act of learning?
6. What modifications need to be made for this particular student?
7. How can the teacher use his particular competencies and personality to enhance

the translation of his teaching decisions into effective action, i.e., teaching behavior which incorporates funded knowledge with the "best of me"?

8. What is the best methodology to accomplish the learning objective?
9. How can all these decisions (1-5) be best synthesized in the teaching-learning act?
10. How successful was the teaching-learning act?
11. What should be the next step in the professional decision-making process?

(Hunter, 1971, pp. 154-156)

The Learning Process

Hunter (1971) sees the learning process as having four major premises. Learning is incremental. Simple learning components lead to more complex learnings. Therefore, learnings can be built on previous learnings, step by step. This implies that analytic techniques are necessary to make learning more efficient and effective. This closely parallels the first decision in Hunter's teaching process.

Learning is predictable. The teacher needs to facilitate the learning that is to be accomplished by using principles of learning (Hunter, 1971).

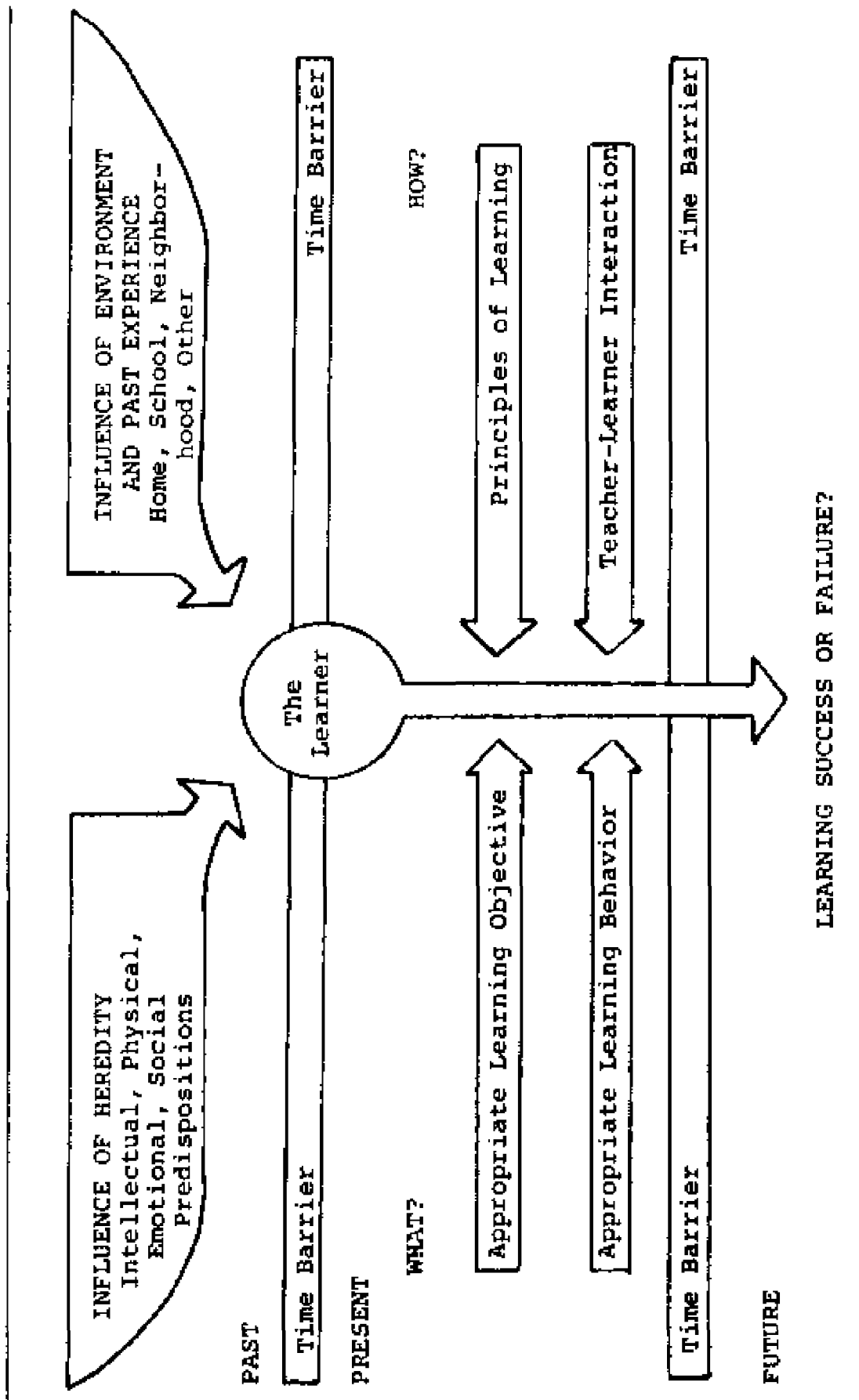
Factors that occurred in the past neither guarantee nor disallow successful learning happening at the present. Neither genetic nor environmental factors make learning impossible. These factors can help or hinder learning; a teacher, however, should attempt to build on those experiences which will aid learning. This premise emphasizes that appropriate learning is possible for everyone. Time is a barrier that is an obstacle for a teacher. A teacher can make changes only in the present (Hunter, 1971).

In the learning process a teacher acts as facilitator to identify the areas where the learner needs to direct his efforts and to incorporate principles of learning in the process to achieve the learning more efficiently and effectively. Figure 2 is a model of the learning process indicating what a teacher can do in the present to facilitate learning (Hunter, 1971).

Teacher Behaviors and Student Achievement

Examination of research of teacher behaviors which promote learning is appropriate to this study because it is the teacher's behavior during instruction that determines to a large extent the pupil learning. The competent teacher knowingly identifies, articulates, and applies principles of learning in his teaching. If the teacher is competent in his teaching skills and applying principles

Figure 2



SOURCE: Hunter, M. The Teaching Process and the Learning Process. In E. Seifman and D. Allen (Eds.) Handbook for Teachers. Glenview, Illinois: Scott Foresman and Company, 1971, p. 114.

of learning, the probability of successful student learning is increased (Hunter, 1971).

Research shows that attempts have been made to link teacher behaviors to achievement of students and to classroom environment. Ryans (1961) found a relationship between elementary school teachers who are understanding, friendly, organized, businesslike, stimulating, child-centered, and imaginative with elementary school pupils who are alert, participating, confident, responsible, and exhibit self-control. At the secondary school level, significant relationships existed between imaginative and stimulating teachers and student achievement.

Anderson and Walberg (1968) and Fortune (1967) found that organization of the lesson by the teacher correlated significantly with student achievement. In other studies, however, Walberg (1969) and Belgard, Rosenshine and Gage (1968) found no significant results.

A study dealing with student teachers linked student achievement with the teacher behaviors of showing approval by praising and repeating students' ideas and frequently integrating student responses into the lesson. The correlation was positive although not significant (Fortune, 1967). Studies by Ryans (1960) and Torrance and Parent (1966) showed significant relationships between the trait of teacher warmth and student behavior. Other studies,

however, showed no significant relationship between these variables (Flanders, 1970; Perkins, 1965; and Wallen, 1966).

Several studies showed that teachers who are business-like rather than simply interested in students enjoying themselves produced students who showed greater gains in achievement (Conners and Eisenberg, 1966; Torrance and Parent, 1966; Chall and Feldman, 1966; Wallen, 1966; and Fortune, 1967).

Studies by Fortune (1967), Belgard, Rosenshine, and Gage (1968), and Anderson and Walberg (1968) showed a relationship between clarity of explanation of concepts by the teacher and achievement of students. According to a study done by Rosenshine and Furst (1971), teacher behaviors which promoted student performance were: clearness of the explanation, variety during the instruction, enthusiasm, achievement-orientation and businesslike manner, and provision of frequent opportunities for students to practice the task.

Several researchers studied the relationship between student achievement and the teacher's knowledge of content and of pedagogy. Millman (1973) wrote that important abilities of a teacher are to change pupils' knowledge, skills and attitudes in a pre-specified way, to determine specific objectives, to organize for instruction, and to be knowledgeable in subject matter and in educational philosophies.

McNeil (1967) studied the effect on pupil performance of teachers who used specific behavioral objectives as compared to teachers who did not. He found that there was significantly higher student performance by teachers who used specific behavioral objectives. Baker (1967), however, found no significant differences in pupil achievement between a group of teachers using behavioral objectives and a group which did not. The reason given for this finding was that teachers did not understand the objectives since they could not identify items on tests which measured the given objectives; therefore, knowing an objective did not help. Popham (1967) tried to differentiate teachers from non-teachers by having both groups teach students as many objectives as possible in four hours. The results showed no significant difference between the two groups in terms of student achievement.

Levine (1972) conducted a study of the effect on student performance by teachers who were able to state objectives in behavioral terms, determine pupil's level of attainment of objectives by a pre-assessment, develop activities which are relevant to the objective, and evaluate student mastery of objectives. These competencies were used in a criterion-referenced programmed package. Students of teachers competent in these skills did significantly better on a unit test than did students of teachers

who were not competent in these skills. Tucker (1969) conducted a similar study but did not find the same effects. He concluded that exposing teachers to the skills did not change the teachers' teaching behaviors.

Flanders (1960) found that teachers who were able to provide flexible influence styles, shifting from the direct to the indirect depending upon the situation, were better able to create climates in which students achieved. Several studies found significant correlations between variation in teacher behavior and achievement by students (Connors and Eisenberg, 1966, Walberg, 1969, and Lea, 1964).

Hamachek (1968) found that teachers who are knowledgeable in their subject matter, warm, flexible and responsive, and equally concerned with relationship variables as with cognitive variables make good teachers. These teachers view teaching as more than presentation of facts but rather view teaching as guiding students to their potential for understanding.

Medley (1977) found a correlation between teachers with high student achievement gains and teachers who produced students with better self-concepts and interest in school. Effective teachers spent a greater percentage of class time on activities that were task-oriented, with most of their students' time spent in structured activities with little unoccupied time. Questions tended to be at a

lower level of complexity rather than at the analysis, synthesis, or evaluative levels. This was particularly true with students of lower socio-economic levels. Medley also found effective teachers have orderly classrooms. Effective teachers are more apt to individualize assignments and spend more time actively involved with small groups of students. Teachers who assign a greater amount of independent work were found to produce students who like school but actually learn less. Medley discovered that techniques that are effective with high socio-economic level students are not always effective with low socio-economic level students. For example, giving much individual attention produces high achievement gain with low socio-economic students, but is not as effective with high socio-economic level students.

Soar and Soar (1973) found that a neutral emotional range of classroom climate produced the most student achievement; a negative classroom climate is more destructive of achievement gains of low socio-economic level students. They found a variety of levels of complexity of cognitive skills was effective. In another study, Soar and Soar (1968) found that a variety of sound teaching techniques and behaviors was optimal in student achievement. Achievement was tied to the degree that teachers structured learning activities at different levels; the higher the cognitive level the less structure required. Some degree of structure

and direction is necessary, though, at even the highest levels.

McDonald and Elias (1976) found that a pattern of teaching techniques rather than a single teaching method discriminated the effective teacher from the ineffective one. Effective patterns differed with grade level and subject because of the needed amount of explanation or direction the area or level required. For example, the effective second grade teacher used a wide variety of types of reading materials and worked frequently with individual students. The teacher initiated questions and explanations. By contrast, the effective fifth grade teacher used longer periods of direct student-teacher interaction and made less use of different materials. The difference in the approaches was attributed by the researchers to be due mainly to the differences in the kinds of reading skills the teachers were trying to accomplish.

Measurement of Teacher Effectiveness

One problem of educational administrators has been to determine how best to measure teacher effectiveness. Barr (1955) indicated that the concept of teacher effectiveness is not uniform, that understanding of analysis of data varies, and that levels of professional sophistication differ. He concluded that little was known about how to judge teacher effectiveness. Robinowitz and Travers

(1953) stated that effective teachers contribute to the growth of pupils. Since the 1950's, researchers have attempted to find a definition of teaching competencies and to find a quantitative process to measure these competencies (Owens, 1971).

Rosner (1973) indicated that teacher effectiveness should be measured through observation of teacher behavior in the classroom, using instruments which categorize teacher behavior in both the affective and cognitive domains. In addition, student behavior should be measured in both the affective and cognitive domains. Medley (1973), Mitzel (1960), Popham (1973), and Millman (1973) agree with this method. Popham suggested that teacher performance tests based on the ability of the teacher to achieve certain stated instructional objectives could discriminate weak from strong teachers.

Stevens (1960) stated that measures of teacher effectiveness should be based on (1) relevance of the instrument to the teacher behavior being measured, (2) reliability of the instrument, (3) freedom from bias, (4) flexibility for different teaching strategies, and (5) practicality in terms of time constraints and ease in use. Popham's (1973) approach was based on a teaching performance test which gave a teacher an objective to teach as well as sample test items and directions to plan a fifteen-minute

lesson designed to have the learners master the objective and to be interesting to the learners. The teacher planned the lesson and presented the lesson to a small group of learners. A post-test was administered to the learners. Learners rated the lesson in terms of interest. A measurement in the cognitive domain was based on the post-test scores and in the affective domain by the learner's ratings.

Millman (1973) discussed the objections to the teaching performance test for measuring teacher competence. One criticism was that only those skills which are observable and objectively defined could be learnings. Therefore, the focus was on trivial outcomes. Another criticism was that teaching performance tests measure the growth of small groups of students for short periods of time on enrichment-type materials when the goal was to determine how well a teacher could do with thirty students for a full year. Millman answered the first objection by stating that there was nothing about the format of the teaching competency measure that required teaching trivia, that the teacher could deal with any learning outcome. To the second objection, he answered that efforts could be made for long-term studies. A teacher, however, who performed poorly on several short-term performance tests was not likely to perform differently over a longer period of time.

Medley (1973) stated that the present trend in the measurement of teacher evaluation is toward the measuring of process as well as product. Process implies what the teacher says and does while providing instruction as well as teacher-pupil interaction. Product implies pupil achievement as a result of instruction. The Hunter Teacher Appraisal Instructional Improvement Instrument was designed to measure the process (Hunter, 1976).

Effect of Staff Development Programs
on Teacher Behavior

Programs of staff development have been developed and implemented with little, if any, evaluation of their effects. Rosenshine (1971), however, stated the major concern is whether in-service programs relate to teacher behavior in the classroom. In addition, Popham (1973) felt that teachers should be "skilled goal achievers." He did not feel that most staff development programs attempt to do this. Teachers want to impart the content and maintain good classroom discipline. Popham suggested that teachers need to develop clear and specific instructional objectives and develop instructional strategies to accomplish them. As suggested by the Medley, Soar, and Soar (1975) model developed earlier, the ultimate objective is the effect on student achievement. That objective can be reached only through the intermediate objective of changes in teacher behavior.

Rosner (1973) indicated that there are three requirements of a valid in-service program. First, the program must demonstrate teacher growth based on specific competencies. Second, there must be evidence of pupil achievement based on specific objectives. Third, a research design must be developed to study the relationship between teacher growth and pupil achievement. Without any one of these steps, a program could not be validated. Teaching is a form of problem-solving behavior and these problem-solving skills are learned by training and practice.

Medley (1973) stated that a model in-service program specifies its objectives in behavioral terms, maintains the proper environment for teachers to learn these behaviors, and evaluates the quality of the teacher behavior in quantitative terms. Rosenshine and Furst (1971) found that in-service programs which focused on specific behaviors were more effective than traditional methods courses in changing teacher behavior. A study by Levine (1973) using student teachers concurred with the conclusions of Rosenshine and Furst.

Lawrence (1977) directed a research study to determine the current status of procedures for changing teacher performance through staff development programs. The investigation summarized the findings of ninety-seven studies which reported results of in-service programs. Several trends were found that are pertinent to the present

study. First, in-service programs situated on college campuses were found to be as effective in changing teacher behavior as those conducted in school system buildings. School-based programs were more effective in changing complex teacher behaviors and in changing teacher attitudes. Second, school-based staff development programs planned or conducted by school system administrators or supervisors tended to be more effective than those programs involving college or other outside personnel. Third, in-service education which attempts to change teacher concepts or to increase the teacher's reservoir of information has a high degree of success. Those programs which try to change teacher behavior are less successful; while those attempting to change teacher attitudes are the least successful. Realization of objectives is significantly higher when the goal is directed to a change in teacher behavior rather than student behavior. Fourth, staff development is more likely to achieve success when teachers must demonstrate the expected behavior and receive feedback on their performance than when teachers are asked to store the information for future use. Last, in-service is more likely to be beneficial if the program is a part of the general plan and goal of an entire school district rather than an isolated effort.

The Long Beach (California) Unified
School District's Professional
Development Center Model

The Newport News Public Schools' Program for Effective Teaching has its antecedent, the Long Beach (California) Unified School District's Professional Development Center. Although P.E.T. differs in format, both programs have the same theory base.

The emphasis of the Professional Development Center Program was the strengthening of classroom instructional techniques in reading and mathematics in kindergarten through grade 6 by involving school personnel from selected schools in an intensive training program. Besides attempting to improve reading and mathematics achievement, the in-service program is aimed at decreasing teacher turnover in central city schools.

The format of the Long Beach Professional Development Center program has varied considerably over the years but the content has remained constant. The program has four major components:

1. Teaching to reading and mathematics objectives
2. Developing diagnostic and prescriptive skills needed to individualize instruction in reading and mathematics
3. Assessing instruction through clinical supervision

4. Maintaining and refining instructional skills through follow-up.

In the eight years of the program, 866 individuals working in the targeted schools have participated in the program. Findings from a five-year analysis of the standardized test scores of pupils taught by teachers who participated in the program indicate that the program has aided in improving student achievement in both reading and mathematics. Gains were noted with the third year of the program. For the five years during which comparisons were made, in seventy-four percent of the fifty comparison points, pupils whose teachers participated in the training made greater test score gains than pupils of teachers who had not received the training (see Table 1).

Summary

This chapter attempted to examine the literature for those studies relating to this investigation. In summary, the following observations can be made.

Hunter's Teaching and Learning Process is the basis for the Program for Effective Teaching. Hunter explains effective teaching as an eleven-step decision-making process.

The literature indicates many teacher traits, behaviors, and competencies have been identified which promote learning in pupils. Among these are: the ability to explain clearly, organize instruction, be flexible, be enthusiastic, be

Table 1
8-Year Record of PDC Operations in the Long Beach
Unified School District: Pupil Test Results
1969-70 to 1976-77

School Year	Difference in Median Months Gained ^a Between Pupils Taught by PDC Participants and Pupils Taught by Non-PDC Participants									
	Mathematics					Reading				
	Grade					Grade				
	2	3	4	5	6	2	3	4	5	6
1969-70		Not Available					Not Available			
1970-71		Not Available					Not Available			
1971-72		Not Available					Not Available			
1972-73	(+1)	(+5)	(+6)	(+5)	(+7)	-2	0	(+4)	0	(+4)
1973-74	(+2)	(+1)	(+5)	(+5)	(+3)	(+1)	0	(+1)	0	(+2)
1974-75	(+8)	-1	(+7)	(+3)	(+2)	(+5)	(+1)	(+5)	(+3)	-3
1975-76	(+2)	(+1)	(+1)	(+2)	(+1)	(+1)	(+1)	(+3)	(+5)	-5
1976-77	(+1)	-1	(+2)	0	-1	0	-1	(+2)	(+2)	(+2)
Total 1969- 1977	○ = PDC Trained Teachers' Pupils Showing Greater Median Gains Than Non-PDC Trained Teachers' Pupils									

^aAll of the differences listed (preceded by plus, minus, or zero signs) refer to the median scores of pupils of PDC trained teachers compared to the median scores of pupils of non-trained teachers. Negative scores and zero scores simply indicate those cases in which the pupils of PDC trained teachers gained fewer or the same number of months as the pupils of non-trained teachers.

businesslike, and be warm. The teacher should be knowledgeable of content and of educational philosophies, employ behavioral objectives, assess learning, and develop meaningful learning activities. There has been a variety of results in terms of finding significant cause and effect relationships between teachers' behaviors and pupil achievement. These studies showed no teaching strategies or methods which worked best with all children. In addition to the age of the learner and the subject area content to be taught, the complexity of the learning task and the socio-economic status of the learners must be considered.

According to Lawrence's review, staff development programs that appear to be effective are those that attempt to involve school-based administrators and supervisors in planning and conducting the program. In addition, in-service programs which try to change teacher behavior rather than student behavior are more likely to succeed. Programs which are related to the general priorities of the school district tend to benefit teachers more than single-effort programs. Programs are more likely to accomplish their aims when teachers are able to demonstrate the learnings and to receive feedback on their attempts.

This concludes the review of literature related to this study. Chapter 3 states the methodology used in conducting this study.

Chapter 3

Methodology

This study involved the measurement of changes in teacher behavior based on the objectives of the Program for Effective Teaching and achievement of students of teachers who completed the Program for Effective Teaching. Chapter 3 presents a description of the methodology used in this study. The chapter includes a discussion of (a) sample selection, (b) description of the instrumentation, (c) procedures, and (d) data analysis.

Sample Selection

The subjects used for examining teacher performance (Hypotheses I and II) in this study were forty-eight Newport News secondary teachers of English, science, social studies, or mathematics. Each of the eight secondary school principals submitted eight names of teachers, two from each of the departments mentioned above, whom the principal would recommend for the first Program for Effective Teaching class for secondary teachers. All sixty-four teachers were informed that they might be observed for the purpose of evaluating the Program for Effective Teaching. From each school, three teachers

were randomly selected to be in the experimental group and three to be in the control group. The composition of the experimental and control groups is described in Table 2. The twenty-four teachers in the experimental group participated in the Program for Effective Teaching during September and October, 1978. Teachers in the control group were not enrolled in the Program for Effective Teaching in 1978.

The subjects used for examining student achievement (Hypotheses III and IV) were students selected from the general mathematics classes of mathematics teachers who were randomly selected to be either in the pool of teachers for the experimental group or the pool of teachers for the control group. Teachers who were selected by the principals to be in a fall 1978 Program for Effective Teaching class, who were in the pool of teachers for the experimental group, and who taught at least one general mathematics class comprised the experimental group for this study. Each teachers in the experimental group was assigned a grade level for the purpose of this study based upon the grade level of the majority of general mathematics students that teacher instructed. Thus, each experimental group teacher was assigned a grade level of eight, nine or ten depending upon whether that teacher taught mainly General Math 1,2 (Grade 8), General Math 3,4 (Grade 9) or General Math 5,6 (Grade 10).

Table 2
 Composition of Subjects Used in Evaluation
 Teacher Performance

	Experimental		Control	
	Intermediate School	High School	Intermediate School	High School
English	0	3	4	4
Science	5	3	2	3
Social Studies	3	1	3	2
Mathematics	<u>4</u>	<u>5</u>	<u>3</u>	<u>3</u>
Total	12	12	12	12

Each experimental group teacher was paired with a teacher from the pool of teachers for the control group. The paired control group teacher was randomly selected from among the teachers in the pool of teachers in the control group who taught the same grade-level general mathematics class in the same school as the paired teacher in the experimental group. In two instances no teacher in the pool of control group teachers was available who taught the same grade-level general mathematics in the same school as the experimental group teacher. Therefore, a teacher from the pool of teachers for the control group was randomly selected from another school who taught the same level general mathematics as the experimental group teacher. In all, the experimental group consisted of twelve teachers paired with twelve teachers in the control group. Each group consisted of three grade eight, five grade nine, and four grade ten general mathematics teachers.

All students (n=564) with both a pre-test and post-test score enrolled in the appropriate grade-level general mathematics class of each teacher were included in determining the level of student achievement for that teacher. The area of mathematics was selected for measurement of student achievement because the objectives were clearly defined and an instrument had been developed locally which measures them.

Description of Instrumentation

Two instruments were used in this study. To measure teacher performance the Teacher Appraisal, Instructional Improvement Instrument (TA Triple I) developed by Hunter was used. To measure student achievement the Basic Mathematics Skills Test, Form 5, developed by the Newport News Public Schools was used.

Teacher Appraisal, Instructional Improvement Instrument

Hunter (1976) developed the Teacher Appraisal Instrument (TAI) to focus on overt classroom behavior that answers the following questions:

1. Are teaching-learning time and energy focused on the intended objective?
2. Is that objective at the appropriate level of difficulty?
3. Are there constant monitoring and adjusting?
4. Which principles of learning are being used productively?
5. Which principles of learning are being abused or ignored? (p. 168)

The original purpose of the TAI was to identify and state the elements of successful teaching. The TAI was found to be applicable to all content areas, all age groups or all

ability levels, and all sizes of instructional groups or various classroom organizations. The TAI was renamed the Teacher Appraisal, Instructional Improvement Instrument (TA Triple I) because it was found to be helpful in improving instruction.

The TA Triple I can be used to improve instruction by helping a teacher know whether teacher-learner energy is focused on the intended learning or is being dissipated, which learning principles are being used appropriately to further student learning, which additional principles could be used to accelerate that learning and which principles, if any, are being ignored or abused, thereby interfering with intended learning. An extremely important contribution of this instrument is the articulated information of what a teacher is doing well and why it is successful. Often the teacher is unaware of or has automated productive teaching behaviors. As a result of becoming aware of them, he or she can deliberately transfer those decisions and behaviors to new situations where they are appropriate.

(Hunter, 1976, p. 168)

The use of the TA Triple I requires professional competencies, judgment, and ability to analyze (Hunter, 1976). A copy of the TA Triple I can be found in Appendix A.

Each of the forty-eight teachers in the experimental and control groups for Hypothesis I and Hypothesis II were observed and rated on the Hunter TA Triple I by a pair of judges who are experts in observing and rating lessons for the components of the Program for Effective Teaching. The judges were the four instructors for the elementary Program for Effective Teaching.

To determine the inter-judge reliability of these observers using this instrument, six videotapes were made of teachers instructing classes. The four P.E.T. instructors as well as this researcher observed and rated these lessons using the TA Triple I. The ratings were analyzed using the procedure for measuring inter-judge reliability as defined in Kerlinger (1973). Table 3 demonstrates high degree of reliability between judges. Correlations of reliability ranged from 0.95 to 0.99. All six ratings were significant at the 0.5 percent level. The reliability was acceptable for this study.

Basic Mathematics Skills

Test, Form 5

The Newport News Public Schools developed a test to measure achievement of students on the Virginia State

Table 3

Inter-Judge Reliability of Observers Using
the Teacher Appraisal Instructional
Improvement Instrument

Source of Variation	Sum of Squares	Degrees of Freedom	F	p	r_{tt}
1. Teaching to an Objective					
Items	0.2	5			
Individuals	57.2	4	75.53	.005	0.99
Residuals	3.8	20			
Total	61.2	29			
2. Correct Level of Difficulty					
Items	1.8	5			
Individuals	30.7	4	15.35	.005	0.95
Residuals	7.0	20			
Total	39.5	29			
3. Monitoring and Adjusting					
Items	1.2	5			
Individuals	54.2	4	75.28	.005	0.99
Residuals	3.6	20			
Total	59.0	29			
4. Facilitating Use of Principles of Learning					
Items	0.8	5			
Individuals	55.0	4	91.67	.005	0.99
Residuals	3.0	20			
Total	58.8	29			
5. Interfering Abuse of Principles of Learning					
Items	1.0	5			
Individuals	46.7	4	32.20	.005	0.97
Residuals	7.0	20			
Total	54.7	29			
6. General Impression					
Items	0.2	5			
Individuals	63.4	4	176.11	.005	0.99
Residuals	1.8	20			
Total	65.4	29			

Minimum Competencies as defined by Virginia State Board of Education, 1978. A list of these objectives can be found in Appendix B. The test was developed by Robert G. Johnson, Assistant Principal, Menchville High School; Nancy Makela, Mathematics Department Chairman, Menchville High School and this researcher. The test contains three items for each of the thirty-three identified competencies for a total of ninety-nine items. All items are multiple choice in nature with four item responses for each item step. Appendix C is a copy of this test.

Validity

Gronlund (1971) indicates that the state of the art for the determination of criterion-related validity of achievement tests is not fully developed. "A major problem is that of obtaining a satisfactory criterion of success." (p. 89) He suggests that "procedures of logical analysis" should be employed to determine test validity.

To assess content and criterion-related validity of the Basic Mathematics Skills Test, Form 5, a table of specifications was developed. Table 4 summarizes the test items in terms of content and level of complexity. In addition, to check the validity of this instrument, a panel of experts composed of Tidewater Virginia Supervisors of Mathematics and Mathematics Department Chairmen concurred

Table 4
 Table of Specifications for
 Basic Mathematics Skills Test, Form 5

	Computation			Comprehension	Application	Analysis	Total
	Knowledge of Specific Facts	Knowledge of Terminology	Ability to Perform Algorithms				
Numeration	3	3					6
Whole Number Computation			12				12
Decimal Number Computation			9				9
Fractional Number Computation			6				6
Percent Computation			6				6
Geometry		6					6
Measurement		3		12			15
Graphs				9			9
Consumer Applications		3	6	15	6		30
Total	3	15	39	36	6		99

Table adapted from Bloom, Hastings, and Madaus, 1971.

that the test in fact measured the corresponding competencies as defined by the Virginia State Board of Education.

Concurrent validity was established by correlating the Newport News Public Schools Basic Mathematics Skills Test with the Virginia State Mathematics Minimum Competency Test administered November 3 and 4, 1978. Eighty-seven tenth-grade Newport News Public Schools students who had taken both tests in the fall of 1978 were randomly selected and their scores on each test were correlated by using Pearson Product Moment Coefficient of Correlation Formula. The coefficient of correlation was--

$$r = 0.89$$

$$n = 87$$

$$p < .01$$

Table 5 summarizes the descriptive statistics of this validity check.

Reliability

To obtain a measure of reliability on the test, a test-retest procedure was used. A group of forty-five students who took the test retok the test three weeks later. The results were correlated using the Pearson Product Moment Coefficient of Correlation Formula. The reliability coefficient was--

$$r = .97$$

$$n = 45$$

$$p < .01$$

Table 5
 Correlation of the Newport News Public Schools
 Basic Mathematics Skills Test with the
 Virginia State Minimum Competency Test

(n = 87)		
	Newport News Basic Skills Mathematics Test	Virginia State Minimum Competency Test
Mean	65.63	79.52
V_x	24.95	18.02
Standard Deviation	16.38	14.33
x_i	5710	6918
Sum of Squares	397,824	567,756
S_{xy}		208.09
$x_i y_i$		471,939
Coefficient of Correlation		0.89

A summary of the descriptive statistics of the reliability check is found in Table 6. The reliability coefficient was acceptable for this study.

Procedures

Data Collection for Teacher Performance

The following describes the collection of data for Hypotheses I and II, which dealt with teacher performance.

A meeting was held with the secondary principals to explain the purpose and procedures of this study.

Principals were asked to submit names of eight teachers from which the experimental and control groups were randomly selected. Principals informed these teachers that they would be observed as part of this study.

Two judges observed each of the forty-eight teachers of the experimental and control groups of this study. The observers were unaware of the group to which the teacher was assigned. Each teacher was rated by each judge on the Teacher Appraisal Instructional Improvement Instrument (Appendix A). The results were averaged. These scores were used as the pre-test for teacher performance.

The experimental group participated in the Program for Effective Teaching during September and October, 1978.

After the program was completed, the judges observed and rated the same teachers they had observed earlier. Again, the judges were not aware to which group the

Table 6
 Reliability of the Newport News Public Schools
 Basic Mathematics Skills Test

(n = 45)		
	October Testing	November Testing
Mean	69.20	71.87
V_x	18.13	21.82
Standard Deviation	12.55	15.68
x_i	3114	3234
x_i^2	222,418	243,234
S_{xy}		190.46
Coefficient of Reliability		.97

teachers were assigned. The results of the ratings were averaged. These scores were used as the post-test for teacher performance.

Data Collection for Student Achievement

The following describes the collection of data for Hypotheses III and IV, which dealt with student achievement.

All mathematics teachers were given the State of Virginia Minimum Competency Objectives (Appendix B). The teachers were instructed to make these competencies the basic objectives for their general mathematics classes.

All general mathematics students were administered the Newport News Basic Mathematics Skills Test, Form 5 (Appendix C). These scores were used as a pre-test to measure student achievement.

Experimental group teachers participated in the Program for Effective Teaching during the fall of 1978.

Experimental group teachers were rated on the Teacher Appraisal Instructional Improvement Instrument (Appendix A).

Periodically after the experimental group teachers completed the Program for Effective Teaching, they were observed during the course. Observations and subsequent conferences helped to maintain skills developed during the course.

In the spring of 1979, all general mathematics students were administered the Newport News Basic Mathematics Skills Test, Form 5. Their scores were used as a post-test to measure student achievement.

Data Analysis

To test empirically the hypotheses of this study, several data analysis techniques as outlined in Statistical Package for the Social Sciences (Nie, Hull, Jenkins, Steinbrenner, and Brent, 1975) were employed. The specific analysis used to test each hypothesis is discussed.

Data Analysis for Teacher Performance

Hypothesis I, using the six criteria defined on the Hunter TA Triple I, compared the performances of teachers who participated in the Program for Effective Teaching before and after the training program. The data were analyzed by using a t-test for paired observations. The t-test was used to determine if there was a significant difference from the pre-observation to the post-observation on any of the six criteria.

Hypothesis II, using the six criteria defined on the Hunter TA Triple I, compared performance of the experimental and control groups of teachers. The data were analyzed by use of analysis of covariance. The groups were compared using ratings of observations upon completion of the training program covarying statistically for the effects of ratings

before the instruction. F-ratios were obtained to see whether there was a statistically significant amount of variability between the groups. In addition, eta values were found to determine the amount of variance explained by the Program for Effective Teaching. An eta value is the correlation ratio defined as the square root of the quotient of the between-groups sum of squares and the total sum of squares for a distribution. Eta values are employed when a coefficient of correlation is desired for data known to be related in a non-linear manner (Fried, 1969).

Data Analysis for Student Achievement

Hypothesis III compared mathematics achievement on the Basic Mathematics Skills Test of the students of the experimental and control groups of mathematics teachers. The scores of all of the general mathematics students who took both the pre- and post-tests were used to determine a mean pre-test score and mean post-test score for each teacher in the study. Analysis of covariance was employed on the means of the spring testing scores on the Basic Mathematics Skills Test controlling for the mean scores obtained at the beginning of the year. An F-ratio was determined to see if there was a statistically significant amount of variability between the groups.

Hypothesis IV compared the mean student achievement on the Basic Mathematics Skills Test of students of the

mathematics teachers in the first quartile to those of the mathematics teachers in the fourth quartile, the quartiles relating to the ratings on the Hunter TA Triple I total score. The data were analyzed by use of analysis of covariance. The groups were compared covarying for the mean scores obtained on the Basic Mathematics Skills Test administered in September, 1978.

This chapter has presented the methodology used in this study. The next chapter presents a discussion of the findings of this study.

Chapter 4

Findings

The results of the analysis of the data of this study will be presented in Chapter 4. Each hypothesis stated in Chapter 1 will be examined in each of the following sections.

Hypothesis I

Hypothesis I predicted that teacher participants in the Program for Effective Teaching would learn the instructional skills of the program and would have significantly higher ratings measured on the Hunter TA Triple I on the post-observation than on the pre-observation in each of the six criteria. The group of twenty-four teachers in the experiment improved their ratings in all six criteria: teaching to an objective, selecting objectives at the correct level of difficulty, monitoring the progress of learners and making appropriate adjustments, using principles of learning, not abusing principles of learning, and creating of a general overall impression of effective teaching. All six criteria improved significantly from pre- to post-observation ($p < .01$). T-values ranged from

a 3.24 with 23 degrees of freedom for teaching to an objective to a 7.37 with 23 degrees of freedom for using principles of learning. The results of Hypothesis I are summarized for each criterion in Table 7. The results implied that teachers can learn the instructional skills of the Program for Effective Teaching and are able to implement them in their teaching. Therefore, Hypothesis I was accepted for each of the six criteria.

Hypothesis II

Hypothesis II predicted that teachers who had completed the Program for Effective Teaching would improve their ratings on the six areas of instructional skills measured in the Hunter TA Triple I significantly more than teachers who had not participated in the program. Post-observation scores were compared to observation ratings made prior to participation in the class. Four of the six skill areas produced F-ratios on the main effect of the analysis of covariance that were significant at the five percent level of confidence. These areas were: selecting objectives at the correct level of difficulty, monitoring the progress of the learners and adjusting when necessary, not abusing the principles of learning and creating a general overall impression of effective teaching. One area, monitoring the progress of learners and adjusting when necessary, was significant at the one percent level of confidence.

Table 7

T-Test (Paired Observations)

	Mean	Standard Deviation	Standard Error	(Difference) Mean	Standard Deviation	Standard Error	T Value	Degrees of Freedom	2-Tail Prob.
Teaching to an Objective									
Pre-	3.3542	0.853	0.174	0.5417	0.820	0.167	3.24	23	0.004
Post-	3.8958	0.944	0.193						
Selecting Correct Level of Difficulty									
Pre-	3.3750	0.576	0.118	0.3542	0.521	0.106	3.33	23	0.003
Post-	3.7292	0.589	0.120						
Monitoring Achievement and Adjusting									
Pre-	3.1458	0.759	0.155	0.6042	0.859	0.175	3.44	23	0.002
Post-	3.7500	0.872	0.178						
Facilitating Use Principles of Learning									
Pre-	3.0833	0.584	0.119	0.6458	0.429	0.088	7.37	23	0.001
Post-	3.7292	0.675	0.138						
Not Abusing Principles of Learning									
Pre-	3.3750	0.495	0.101	0.3958	0.571	0.116	3.40	23	0.002
Post-	3.7708	0.510	0.104						
General Impression									
Pre-	3.1667	0.686	0.140	0.6250	0.630	0.129	4.86	23	0.001
Post-	3.7917	0.846	0.173						

Although not significant, the area of using the principles of learning produced an F-ratio of 4.003 with 2 and 45 degrees of freedom.

Although the analysis of covariance produced several significant F-ratios, the eta values ranged from 0.18 for teaching to an objective to 0.42 for monitoring and adjusting. The F-ratios suggest that teacher participants demonstrated significantly greater understanding and application in four instructional skills. There still exists, however, a large amount of unexplained variance between and within the teacher groups. The low eta values would also indicate that the covariant of a pre-observation rating would have low success in predicting the degree of improvement a participant might make by enrolling in the Program for Effective Teaching. Tables 8 through 13 summarize the results of each instructional skill for Hypothesis II.

On the basis of data obtained for this study, Hypothesis II was accepted for four instructional skills areas: selecting an objective at the correct level of difficulty, monitoring and adjusting, not abusing the principles of learning and creating the general overall impression of effective teaching. Hypothesis II was rejected for the skills: teaching to an objective and using the principles of learning.

Table 8

Analysis of Covariance: Teaching to an Objective

	Experimental Group Mean	Experimental Group Standard Dev.	Control Group Mean	Control Group Standard Dev.	
Pre-observation	3.35	0.85	3.31	0.78	
Post-observation	3.98	0.94	3.60	0.63	
Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F Ratio	Prob.
Covariate Pre-observation	12.084	1	12.084	30.949	.001
Main Effect	0.847	1	0.847	2.168	.148
Residual	17.570	45	0.390		
Total	30.500	47	0.649		

Beta = .17; Eta = .18; multiple r^2 = .424

Table 9

Analysis of Covariance: Selecting Objectives at the

Correct Level of Difficulty

	Experimental Group		Control Group		
	Mean	Standard Dev.	Mean	Standard Dev.	
Pre-observation	3.38	0.58	3.33	0.67	
Post-observation	3.73	0.59	3.40	0.53	
Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F Ratio	Prob.
Covariate					
Pre-observation	3.287	1	3.287	13.056	.001
Main Effect	1.196	1	1.196	4.750	.035
Residual	11.329	45	0.252		
Total	15.812	47	0.336		
Beta = .28; Eta = .29; multiple r^2 squared = .284					

Table 10

Analysis of Covariance: Monitoring Achievement and Adjusting

	Experimental Group Mean	Experimental Group Standard Dev.	Control Group Mean	Control Group Standard Dev.
Pre-observation	3.15	0.76	3.06	0.74
Post-observation	3.75	0.87	3.02	0.73

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F Ratio	Prob.
Covariate Pre-observation	6.578	1	6.578	12.409	.001
Main Effect	5.686	1	5.686	10.725	.002
Residual	23.855	45	0.530		
Total	36.120	47	0.769		

Beta = .40; Eta = .42; multiple r squared = .340
--

Table 11

Analysis of Covariance: Facilitating Use
Principles of Learning

	Experimental Group Mean	Experimental Group Standard Dev.	Control Group Mean	Control Group Standard Dev.	
Pre-observation	3.08	0.58	2.94	0.58	
Post-observation	3.73	0.68	3.29	0.75	
Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F Ratio	Prob.
Covariate Pre-observation	10.725	1	10.725	34.991	.001
Main Effect	1.227	1	1.227	4.003	.051
Residual	13.793	45	0.307		
Total	25.745	47	0.548		

Beta = .22; Eta = .30; multiple r^2 squared = .464

Table 12

Analysis of Covariance:

Not Abusing Principles of Learning

	Experimental Group		Control Group		
	Mean	Standard Dev.	Mean	Standard Dev.	
Pre-observation	3.38	0.49	3.33	0.58	
Post-observation	3.77	0.51	3.38	0.63	
Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F Ratio	Prob.
Covariate					
Pre-observation	3.145	1	3.145	11.643	.001
Main Effect	1.697	1	1.697	6.281	.016
Residual	12.154	45	0.270		
Total	16.995	47	0.362		
Beta = .32; Eta = .33; multiple χ squared = .285					

Table 13

Analysis of Covariance: General Impression

	Experimental Group Mean	Experimental Group Standard Dev.	Control Group Mean	Control Group Standard Dev.	
Pre-observation	3.17	0.69	3.06	0.63	
Post-observation	3.79	0.85	3.31	0.70	
Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F Ratio	Prob.
Covariate Pre-observation	14.727	1	14.727	47.152	.001
Main Effect	1.830	1	1.838	5.883	.019
Residual	14.055	45	0.312		
Total	30.620	47	0.651		

Beta = .25; Eta = .30; multiple \bar{r} squared = .541

Hypothesis III

Hypothesis III predicted that students of mathematics teachers who have participated in the Program for Effective Teaching would make greater gains in mathematics achievement than would students of mathematics teachers not exposed to the program. Three hundred fifteen general mathematics students of twelve teachers in the experimental group took both the pre- and post-test and were the subjects used in this study. The control group consisted of the two hundred forty-nine students with pre- and post-test scores taught by the twelve teachers in the control group. The means of pre- and post-test scores were computed for each teacher's students. These means were the measures used in analyzing this hypothesis.

The F-ratio determined by comparing post-test mean scores for students of teachers in the experimental group and students of teachers in the control group covarying for pre-test scores was 3.938. Although this was large, with only 23 degrees of freedom this F was not significant at the 5 percent level of confidence. The findings for Hypothesis III are summarized in Table 14.

Since the F value for Hypothesis III was not significant at the 5 percent level of confidence, Hypothesis III was not confirmed.

Table 14
 Mean Student Achievement of Teacher Participants in
 Program for Effective Teaching vs.
 Teachers Who Were Not Participants

	Experimental Group Mean	Standard Dev.	Control Group Mean	Standard Dev.
Pre-test	55.95	8.49	52.88	8.42
Post-test	72.46	6.08	66.70	6.75

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F Ratio	Prob.
Covariate Pre-test	409.739	1	409.739	14.657	.001
Main Effect	110.073	1	110.073	3.938	.060
Residual	587.051	21	27.955		
Total	1106.864	23	48.124		

Beta = 0.32; Eta = 0.42; multiple r squared = 0.47

Hypothesis IV

Hypothesis IV predicted that students of mathematics teachers who were rated in the highest quartile on teacher performances as measured by the TA Triple I would show greater achievement on the Basic Mathematics Skills Test than students of mathematics teachers who were rated in the lowest quartile. Of the twenty-four mathematics teachers who were rated in the TA Triple I and whose students were pre- and post-tested on the Basic Mathematics Skills Test, the six teachers with the highest total TA Triple I scores were compared with the six teachers with the lowest total TA Triple I scores.

The F-ratio determined by comparing post-test mean scores for students of teachers in the first quartile and students of teachers in the fourth quartile covarying for pre-test scores was 7.645. This F-ratio was significant at the 5 percent level of confidence. The eta value was .33, the beta value was .53, and multiple r squared was 0.689. It is possible that much of this unexplained variance could be attributed to variances in student ability. The findings for Hypothesis IV are summarized in Table 15.

Since the F value for Hypothesis IV was significant at the 5 percent level of confidence, Hypothesis IV was confirmed.

Table 15

Analysis of Covariance: Mean Student Achievement of
 High Rated Teachers vs. Mean Student Achievement
 of Low Rated Teachers

	Experimental Group Mean	Experimental Group Standard Dev.	Control Group Mean	Control Group Standard Dev.	
Pre-test	52.70	6.14	56.80	10.17	
Post-test	72.25	6.61	67.50	8.30	
Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F Ratio	Prob.
Covariate Pre-test	268.170	1	268.170	12.331	.007
Main Effect	166.250	1	166.250	0.022	.022
Residual	195.723	9	21.747		
Total	630.142	11	57.286		
Beta = .53; Eta = .33; multiple \bar{r} squared = .689					

Chapter 4 has summarized the findings of the study. In Chapter 5, conclusions will be drawn based on these results. Implications for educational administrators and for further research will be discussed.

Chapter 5

Conclusions and Implications

This chapter presents: (1) the conclusions of this study; (2) the implications for educational administrators, and (3) the implications for future research.

Conclusions

Studies have been conducted which have attempted to determine the effects of some in-service programs on student achievement. These in-service programs have usually focused on the teaching of behaviors which would promote learning. These studies varied depending upon the teacher behaviors and type of in-service program upon which they focused. The results of these studies were mixed in terms of finding significant cause-effect relationships between different teacher behaviors and student achievement.

The purpose of the present study was to investigate the effectiveness of a specific in-service program, Program for Effective Teaching, in a particular school system, Newport News Public Schools, and its effect on teacher performance and student achievement. The program focused on specific instructional skills explained in Chapter 1.

Hypotheses I and II

The results from the data collected in this study support the findings of the majority of the research claiming that teachers can learn behaviors which promote learning when given the opportunity to learn them. Hypothesis I, teachers who score significantly higher in the Hunter TA Triple I after completing the Program for Effective Teaching than before enrolling, was confirmed. In addition, Hypothesis II, teachers who have had the Program for Effective Teaching would score significantly higher on the Hunter TA Triple I than teachers who have not had the program, was also affirmed. The results of this study tend to support the hypotheses that teachers can be taught instructional skills and can apply learned instructional skills in their classroom.

It was not within the realm of this study to determine whether teachers do apply these skills on a regular basis in their classrooms. Although the teacher subjects in both the experimental and control groups were aware that they would be observed for this study, they did not know when these observations would be made. In addition, building administrators periodically observed the subjects to reinforce effective use of the skills learned in the program.

Almost all teachers in the experimental group showed improvement from the pre- to post-evaluation. Increases,

though, were not equal for all teachers. More variance existed between teachers in the post-observations than in the pre-observations. This variance in high and low rated teacher scores is borne by the low eta values for each of the six criteria for both Hypotheses I and II. These low eta values suggest that an observation rating would not be a good predictor of what amount of improvement a teacher might make by enrolling in the Program for Effective Teaching Achievement level in the instructional skills cannot determine the receptiveness of teachers to accept changes to their instructional patterns. Therefore, much unexplained variance does exist.

Of the six criteria of the Hunter TA Triple I, all were significant at the 5 percent level or close to that level for Hypothesis II except for Teaching to an Objective. Although teachers in the experimental group made significant gains in this skill as confirmed by Hypothesis I, teachers in the control group also made increases in this skill. The results for this skill were contaminated since several schools developed workshops within their building to introduce the content of Teaching to an Objective to their faculties. There is a possibility that the data were affected to the point that the gains of the experimental group were partially counteracted by gains made by the control group of teachers.

Hypotheses III and IV

Although there was a reasonably high F-value, the F was not high enough to confirm Hypothesis III, mean scores of students of teachers who had the Program for Effective Teaching would be significantly higher on the Basic Mathematics Skills post-test than the mean scores of students of teachers who did not have the program. However, Hypothesis IV, that there was a positive relationships between higher teacher performance ratings on the Hunter TA Triple I and student achievement on the Basic Mathematics Skills Test, was confirmed.

For Hypothesis III, almost six hundred students were involved for data collection, but only twenty-four teachers. Since the analysis involved the mean scores for each teacher, only twenty-four scores were used. A larger size experimental group might have altered the result by increasing the number of degrees of freedom. All general mathematics teachers who had completed the Program for Effective Teaching in the first two sessions were used in this study. Other restrictions prevented a larger number from being enrolled in the class. In addition, to be effective the teacher must be proficient in all of the instructional skills. Five to seven months may not be enough time for adequate practice. More favorable findings might occur in subsequent years.

Again, it must be stated that this study was limited to secondary teachers of academic subjects. Thus far no attempt has been made in Newport News Public Schools to train teachers who do not teach English, science, social studies, or mathematics. This study did not attempt to involve elementary school teachers since most elementary teachers in Newport News have already completed the Program for Effective Teaching. The results of this study as it has been conducted cannot be generalized to include them. Also, there cannot be any generalizations of this study made in terms of student achievement beyond general mathematics to other subjects, since this research limited the data collection to that area. No attempt was made to examine variables that were unique to the Newport News Public Schools. No other school system has attempted to implement an in-service program involving instructional skills in the same manner as the Newport News Public Schools. Therefore, it would be difficult to generalize the results of this study for other systems.

Implications for Educational Administrators

The conclusions drawn from interpretation of the findings in this study provide several implications for educational administrators.

This study suggests that instructional skills can be taught to teachers through staff development programs.

It appears that teachers can apply learned behaviors in their classrooms. If an administrator wishes to change teacher performance, it is possible; but the teacher must be taught the desired behavior.

If the teacher completes an in-service program such as the Program for Effective Teaching, the teacher may receive an understanding of skills of the act of instructing which are definable and measurable. The teacher, along with the administrator, could share a common vocabulary of teaching. From this understanding, the administrator could focus himself and his staff on the improvement of instruction.

Although this study did not show improvement in student achievement at the 5 percent level of confidence, there is a trend toward the increase in student performance.

Another implication for the educational administrator is the possible value of the Hunter TA Triple I shown in this study as a discriminator of teachers whose students achieve. The results of Hypothesis IV suggest that competent raters using the TA Triple I might recognize the effective teacher in terms of student achievement through ratings of teacher behaviors. The TA Triple I, therefore, has implications for use by administrators as an instrument for teacher observation. This decision should not be based on this study alone, but rather in conjunction with other studies where the instrument was used. To use the

TA Triple I, the administrator and teacher need to isolate and define with precision those basic skills deemed desirable. In addition, situations in which skills are appropriately used should be described so that both skills and situations can be identified identically by teacher and rater.

Implications for Research

Based on the findings and conclusions of this study, there are implications for further study of the effects of the Program for Effective Teaching.

To assess the effect of the program, in terms of student achievement, a longitudinal study is suggested. Significant gains were not found in the first year of the secondary program although the data leans in that direction. It might also be appropriate to attempt to determine to what degree teachers are implementing the instructional skills of P.E.T. There exists the situation of teachers implementing instructional skills without having attended the program. These skills may have been acquired through other educational experiences or study. A study correlating the degree of implementation of the skills of the Program for Effective Teaching with the increase in student achievement might be a relevant endeavor.

Content areas and grade levels not included in this study should be examined. This study was limited to

English, mathematics, science, and social studies teachers at the secondary level for teacher performance and general mathematics for student achievement. Designs which would examine teacher performance and student achievement in other subjects and for other age groups might be beneficial.

This study has been done entirely within the constraints of the Newport News Public Schools with its unique size, problems, community, goals, and personnel. The implementation and evaluation of the Program for Effective Teaching have been done to aid and assess this single system. Other studies to examine other similar programs designed to improve instructional skills in the Hunter model may have different results. The evaluation of the Newport News program needs to be on-going and revised as these factors change within the system.

APPENDIX

APPENDIX A

APPRAISAL FORM

Date _____

Name _____ Episode # _____

1. TEACHING TO AN OBJECTIVEegg on the wall | buck shot | meandering path | few detours | string of pearls
Evidence:2. CORRECT LEVEL OF DIFFICULTYtoo easy/hard | not right for | right for some, | right for | just right for
for almost all | majority | not for others | majority | almost all
Evidence:3. MONITORING AND ADJUSTINGno adjustment | very little | some adjustment | achievement w/ | much achieve
adjustment | adjustment | adjustment when | w/appropriate
necessary | adjustment
Evidence:4. FACILITATING USE OF PRINCIPLES OF LEARNINGalmost no use | little use | some use | frequent use | constant use
of principles | of principles | of principles | of principles | of principles
Evidence:5. INTERFERING ABUSE OF PRINCIPLES OF LEARNINGconstant abuse | frequent abuse | some abuse | almost no | no abuse
abuse
Evidence:6. GENERAL IMPRESSIONinadequate | below average | average | better than average | excellent
Evidence:

APPENDIX B

VIRGINIA STATE MINIMUM COMPETENCIES FOR MATHEMATICS

Numeration

1. Given numerals naming whole numbers less than ten million, the student will read the numerals.
2. Given numerals naming whole numbers less than ten thousand, the student will write the word name for the number.
3. Given a set of whole numbers, named by numerals of not more than four digits, the student will arrange the numerals in order from smallest numerical value to largest.

Computation - Whole Numbers

4. Given two, three, or four whole numbers named by numerals of not more than four digits, the student will find the sum.
5. Given two whole numbers named by numerals of not more than three digits, the student will find the difference.
6. Given two whole numbers named by numerals of not more than three digits, the student will find the product.
7. Given a dividend named by a numeral of no more than four digits and a divisor named by a numeral of no more than two digits, the student will find the quotient.

Computation - Decimals

8. Given two decimal fractions named by numerals of no more than four digits and having no more than three places to the right of the decimal point, the student will find the sum or difference.
9. Given two decimal fractions, named by numerals of three digits with the decimal point in any position, and the digits of their product, the student will properly place the missing decimal point in the product.
10. Given a dividend of no more than four digits and no more than three decimal places, a divisor of no more than two digits and no more than one decimal place, and the digits of the quotient, the student will properly place the decimal point in the quotient.

Computation - Fractions

11. Given two simple fractions which have denominators of 1, 2, 3, 4, or 5, the student will find the product.
12. Given a common fraction which has a single digit denominator, the student will write the equivalent decimal fraction.

Computation - Percent

13. Given a percent, the student will write the equivalent decimal fraction.
14. Given a number and a percent (from 1-100 inclusive) the student will find the percentage.

Geometry

15. Given a set of figures, the student will identify those which best represent the concept of parallelism.
16. Given an appropriate drawing of a circle, the student will identify the center, a radius, and a diameter.

Measurement

17. Given the dimensions of a rectangular region, the student will find the area of the region.
18. Given the lengths of the sides of a rectangular region, the student will find the perimeter of the region.
19. Given a list of units of measure, the student will identify those indicating length (meter, centimeter, kilometer; foot, inch, mile) mass/weight (kilogram, gram; pound) and capacity (liter, milliliter; pint, quart, gallon), or vice versa.
20. Given a drawing of either a Celsius or Fahrenheit thermometer, the student will write the indicated temperature to the nearest degree.
21. Given two times (to the nearest 1/2-hour designation) within a 12 hour time interval, the student will determine the elapsed time.

Application

22. Given a bar or broken-line graph, the student will estimate and compare quantitative information.
23. Given a circle graph in which each sector is labeled as a percent of the whole, the student will compare quantitative information.
24. Given a bar, broken-line, or circle graph and a statement of inference, the student will state whether the inference is true or false based on information on the graph. (The inference will be a simple statement relative to comparisons of size of frequency and trends of increase, decrease, or constancy.)
25. Given a map and scale, the student will indicate the route of least mileage between two locations.
26. Given a specified situation and a federal or state income tax table, the student will find the correct amount of tax.
27. Given the cost of an item(s) and a sales tax table, the student will find the correct amount of sales tax.
28. Given an amount of money, \$1, \$5, or \$10, and the total amount of purchase, the student will determine the correct change.
29. Given a specified number of hours worked and an hourly rate of pay, the student will compute the wages.
30. Given the gross earnings and the amounts of deduction for social security and federal and state taxes, the student will compute the net earnings.
31. Given the appropriate information, the student will write a check.
32. Given the appropriate information, the student will complete a check stub.
33. Given the prices of similar packaged goods, the student will determine and compare unit prices.
34. Given the regular price of an item and a rate of discount, the student will compute the amount of discount.

BASIC MATHEMATICS SKILLS TEST

Test Area	4
Step	01
Form	5

1. 4,587 can be written as _____.

- a. four thousand, three hundred eighty-seven
- b. four million, three hundred eighty-seven
- c. four hundred, three thousand eighty-seven
- d. none of the above

2. 5,029 can be written as _____.

- a. five million, twenty-nine
- b. five thousand, twenty-nine
- c. five hundred, twenty-nine
- d. none of the above

3. 7,216 can be written as _____.

- a. seven thousand, two hundred sixteen
- b. seven million, two hundred sixteen
- c. seven hundred, two thousand sixteen
- d. none of the above

4. Arrange the set of numbers

{1221, 1121, 1122, 1211}

in order from smallest to largest.

- a. {1221, 1211, 1122, 1121}
- b. {1122, 1121, 1211, 1221}
- c. {1121, 1122, 1211, 1221}
- d. none of the above

5. Arrange the set of numbers

{1021, 1102, 1012, 1120}

in order from smallest to largest.

- a. {1102, 1120, 1012, 1021}
- b. {1012, 1021, 1102, 1120}
- c. {1021, 1012, 1102, 1120}
- d. none of the above

6. Arrange the set of numbers

{132, 123, 213}

in order from smallest to largest.

- a. {213, 123, 132}
- b. {213, 132, 123}
- c. {132, 213, 123}
- d. none of the above

$$\begin{array}{r} 7. \quad 826 \\ \quad 781 \\ + \quad 68 \\ \hline \end{array}$$

- a. 1,665
- b. 1,675
- c. 1,565
- d. none of the above

$$\begin{array}{r} 8. \quad 4,673 \\ + \quad 3,827 \\ \hline \end{array}$$

- a. 7,500
- b. 8,490
- c. 8,500
- d. none of the above

$$\begin{array}{r} 9. \quad 7,265 \\ \quad 450 \\ \quad 269 \\ + \quad 42 \\ \hline \end{array}$$

- a. 8,026
- b. 8,016
- c. 8,025
- d. none of the above

$$\begin{array}{r} 10. \quad 367 \\ - \quad 84 \\ \hline \end{array}$$

- a. 323
- b. 383
- c. 273
- d. none of the above

$$\begin{array}{r} 11. \quad 702 \\ - \quad 354 \\ \hline \end{array}$$

- a. 448
- b. 358
- c. 348
- d. none of the above

$$\begin{array}{r} 12. \quad 800 \\ - \quad 563 \\ \hline \end{array}$$

- a. 363
- b. 237
- c. 337
- d. none of the above

For questions 22-27: Place the decimal in the proper place in the answer of the problem.

13.
$$\begin{array}{r} 567 \\ \times 7 \\ \hline \end{array}$$

a. 3,969
b. 3,929
c. 4,209
d. none of the above

22. $1.57 \times 4.03 = 63271$

14.
$$\begin{array}{r} 320 \\ \times 45 \\ \hline \end{array}$$

a. 13,800
b. 1,328
c. 14,018
d. none of the above

- a. .63271
b. 632.71
c. 6.3271
d. 63.271

15.
$$\begin{array}{r} 609 \\ \times 35 \\ \hline \end{array}$$

a. 15,315
b. 21,315
c. 4,872
d. none of the above

23. $.528 \times 1.23 = 64944$

16. $8 \overline{) 4035}$

a. 54 R3
b. 504 R3
c. 504
d. none of the above

- a. .64944
b. 64.944
c. 649.44
d. 6.4944

24.
$$\begin{array}{r} 3.7 \\ \times .8 \\ \hline 296 \end{array}$$

- a. .296
b. 2.96
c. 29.6
d. 296.

17. $4060 \div 8 =$

a. 67 R4
b. 607
c. 67
d. none of the above

25. $1.75 \div .5 = 35$

- a. 3.5
b. .35
c. 35.
d. none of the above

18. $67 \overline{) 1306}$

a. 19 R33
b. 109 R33
c. 91 R33
d. none of the above

26.
$$3.2 \overline{) 4.000}$$

- a. 125.
b. 12.5
c. 1.25
d. .125

19. $2.07 + 41.09 =$

a. 4.316
b. 43.06
c. 43.16
d. none of the above

27.
$$12 \overline{) 342}$$

- a. 342.
b. 3.42
c. 34.2
d. .342

20. $4.98 - .008 =$

a. .490
b. 4.988
c. 4.972
d. none of the above

21. $28.5 - 13.61 =$

a. 14.89
b. 15.11
c. 14.91
d. none of the above

20. $\frac{3}{5} \times \frac{3}{4} =$ a. $\frac{9}{20}$ b. $\frac{4}{5}$

c. $\frac{9}{20}$ d. none of the above

29. $\frac{7}{3} \times \frac{4}{5} =$ a. $\frac{5}{6}$ b. $\frac{22}{15}$

c. $\frac{8}{15}$ d. none of the above

30. $\frac{1}{4} \times \frac{2}{3} =$ a. $\frac{5}{8}$ b. $\frac{11}{12}$

c. $\frac{1}{6}$ d. none of the above

31. Change $\frac{5}{8}$ to a decimal.
a. 1.6
b. .625
c. 6.25
d. none of the above

32. Change $\frac{5}{8}$ to a decimal.
a. .375
b. 2.67
c. 37.5
d. none of the above

33. Change $\frac{1}{2}$ to a decimal
a. .05
b. 2
c. .5
d. none of the above

34. 6% can be written as $\frac{\quad}{100}$.
a. .006
b. 6
c. .6
d. none of the above

35. 23% can be written as $\frac{\quad}{100}$.
a. 2.3
b. 23
c. .23
d. none of the above

36. 225% can be written as $\frac{\quad}{100}$.
a. .225
b. 22.5
c. 225
d. none of the above

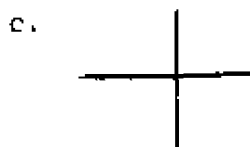
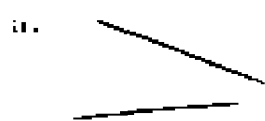
37. Find 75% of 80.
a. 600
b. 6000
c. 6
d. none of the above

38. Find 40% of 400.
a. 160
b. 10
c. 16
d. none of the above

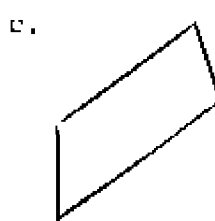
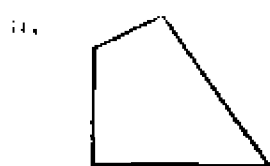
39. Find 5% of \$14.60
a. \$73.00
b. \$.70
c. \$.73
d. none of the above

40. Which of the following pairs of lines are parallel lines?

101

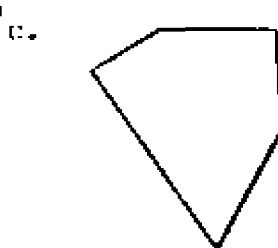
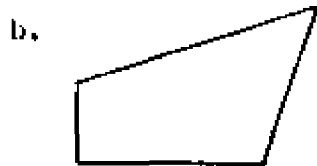


41. Which of the following figures has at least one pair of parallel sides?



d. none of the above

42. Which of the following figures has at least one pair of parallel sides?



d. none of the above

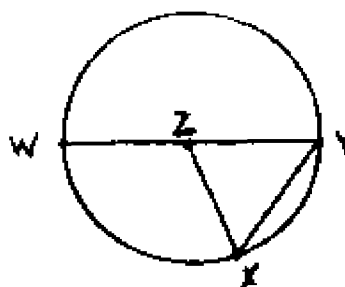
43. Which point is the center of this circle?

a. W

b. X

c. Y

d. Z



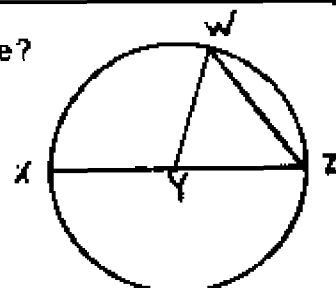
44. Which line segment is probably the radius of this circle?

a. \overline{XZ}

b. \overline{WZ}

c. \overline{WY}

d. none of the above



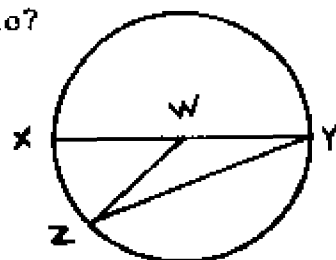
45. Which line segment is probably a diameter of this circle?

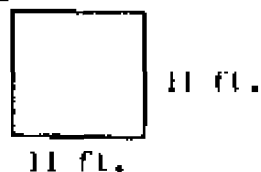
a. \overline{YW}

b. \overline{YZ}

c. \overline{XY}

d. \overline{WZ}



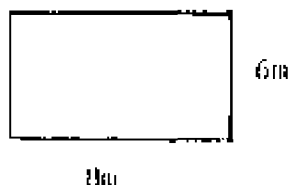
46. Find the area.

a. 121 sq. ft.

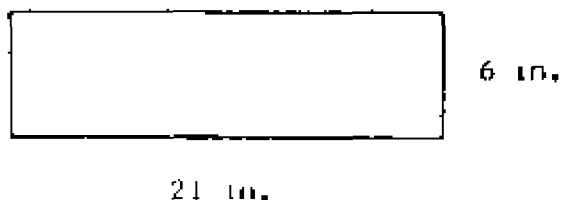
b. 22 sq. ft.

c. 44 sq. ft.

d. none of the above

47. Find the area.a. 20 m^2 b. 28 m^2 c. 48 m^2

d. none of the above

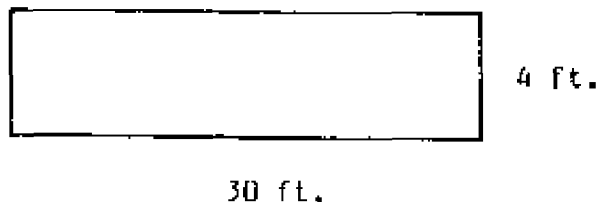
48. Find the area.

a. 54 sq. in.

b. 126 sq. in.

c. 48 sq. in.

d. none of the above

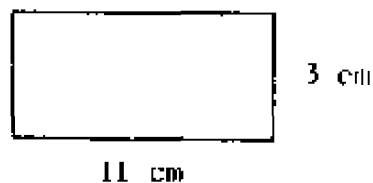
49. Find the perimeter.

a. 64 ft.

b. 128 ft.

c. 38 ft.

d. none of the above

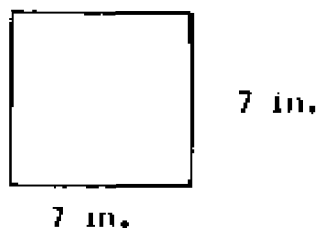
50. Find the perimeter.

a. 33 cm

b. 28 cm

c. 24 cm

d. none of the above

51. Find the perimeter.

a. 28 in.

b. 49 in.

c. 21 in.

d. none of the above

52. Which of the following units of measure would you not use to measure the amount of liquid?

- a. quart b. pint
c. yard d. liter

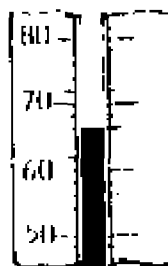
53. Which of the following units of measure would not be used to measure how long something is?

- a. decimeter b. yard
c. foot d. gram

54. Which of the following units of measure would you use to weigh something?

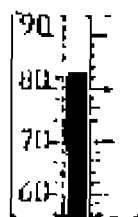
- a. quart b. centimeter
c. kilogram d. gallon

55. According to the thermometer, what is the temperature?



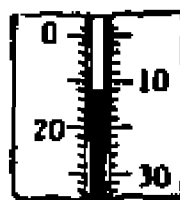
- a. 63°
b. 74°
c. 66°
d. 68°

56. According to the thermometer, what is the temperature?



- a. 83°
b. $81\frac{1}{2}^{\circ}$
c. 97°
d. $86\frac{1}{2}^{\circ}$

57. According to the thermometer, what is the temperature?



- a. 12°
b. -28°
c. 28°
d. -12°

58. An airplane leaves Los Angeles, California, at 10:00 a.m. and arrives in Seattle, Washington, at 3:30 p.m. How long was the flight?

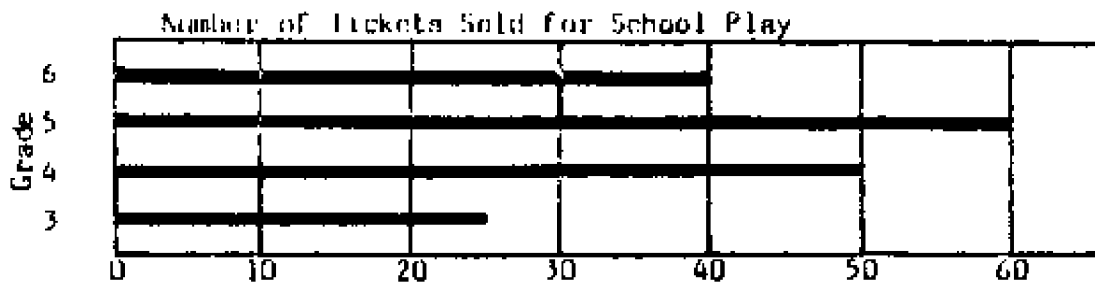
- a. $5\frac{1}{2}$ hours b. $3\frac{1}{2}$ hours c. 5 hours d. none of the above

59. A bus leaves Newark, New Jersey, at 11:50 a.m. and arrives in Butler, New Jersey, at 2:00 p.m. How long is the trip?

- a. 2 hours b. $2\frac{1}{2}$ hours c. $2\frac{1}{2}$ hours d. none of the above

60. Mary began typing her term paper at 5:00 p.m. and finished at 1:30 a.m. How long did it take her to type the paper?

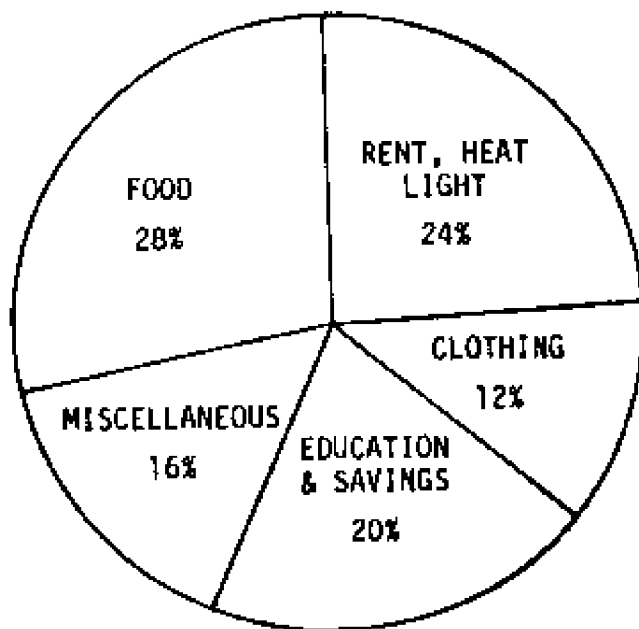
- a. $3\frac{1}{2}$ hours b. $8\frac{1}{2}$ hours c. 4 hours d. none of the above



61. Which grade sold the most tickets?
 a. 3 b. 4 c. 5 d. 6
62. How many tickets were sold all together?
 a. 150 b. 25 c. 170 d. none of the above
63. How many more tickets did the fourth grade sell than the sixth grade?
 a. 10 b. 20 c. 30 d. 40

Questions 64-66 refer to the following circle graph.

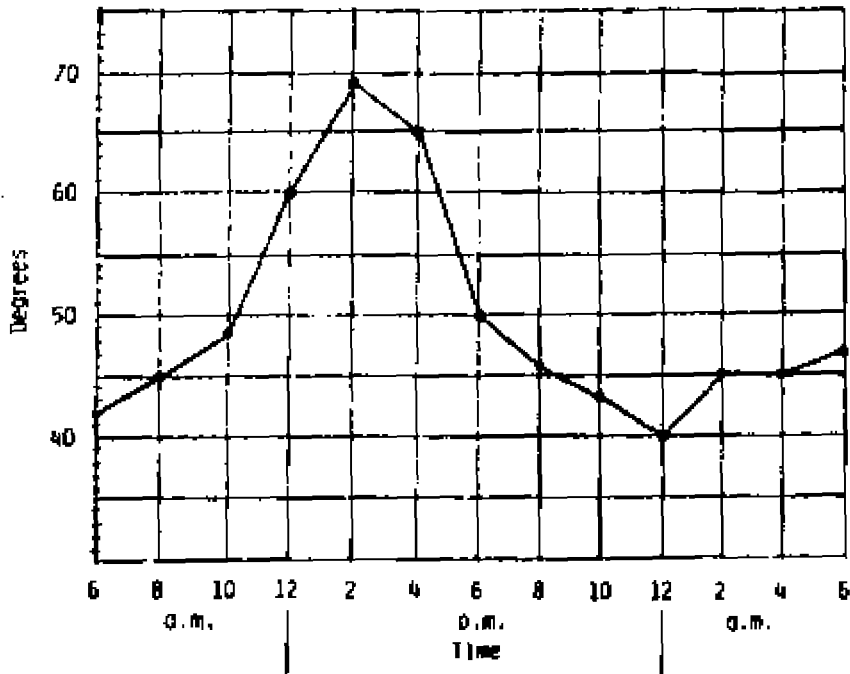
THE JONES FAMILY BUDGET



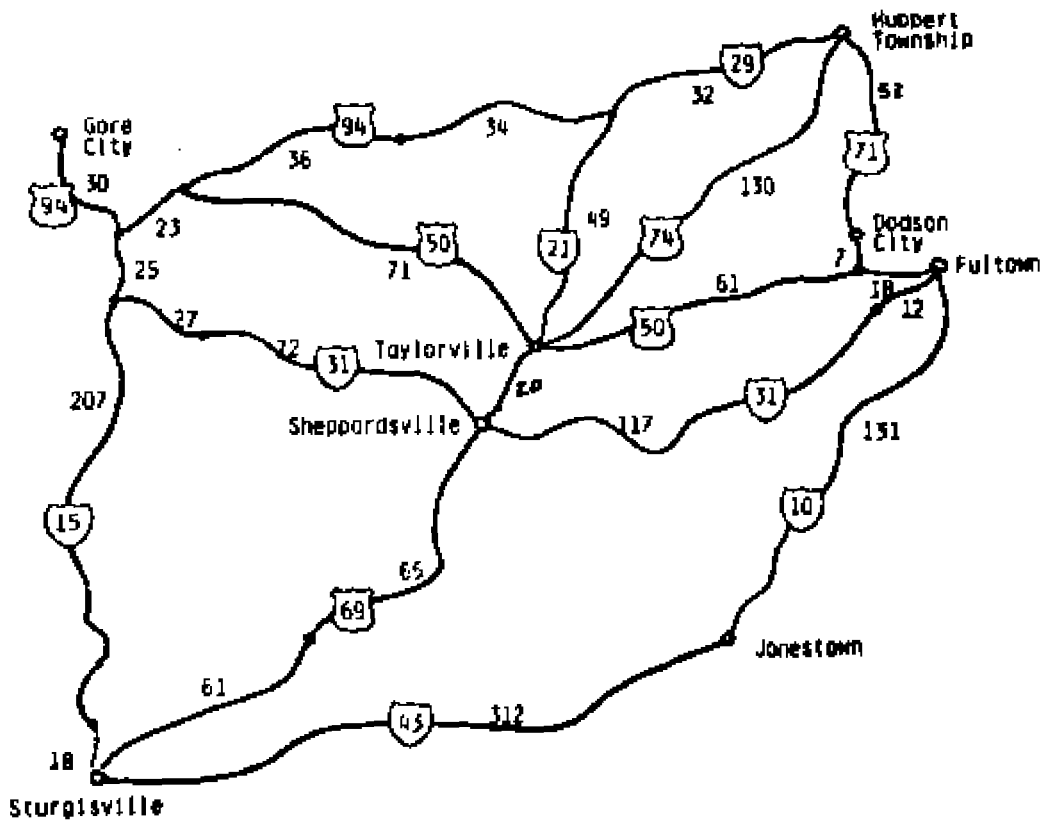
64. Which item accounts for the greatest expense in the Jones family budget?
 a. clothing
 b. food
 c. rent, heat, light
 d. none of the above
65. The amount spent for clothing and miscellaneous together is about the same as that spent on:
 a. education & savings
 b. rent, heat, light
 c. food
 d. none of the above
66. What percent of the Jones family budget is spent on education & savings?
 a. 28%
 b. 20%
 c. 16%
 d. 12%

For questions 67-69, consider the graph. Would the following statements be true or false?

TEMPERATURES IN NEWPORT NEWS, VIRGINIA ON APRIL 17, 1979



- 67. The highest temperature of the day was recorded at 4:00 p.m.
a. true b.
- 68. The greatest increase occurred between 12:00 a.m. and 2:00 p.m.
a. true b. false
- 69. The amount of decrease in the temperature was about the same between 2:00 and 4:00 p.m. as it was between 6:00 and 8:00 p.m.
a. true b. false



70. To travel from Gore City to Huppert Township, the shortest route shown will be to use _____.
- Route 94, Route 50, Route 71
 - Route 94, Route 50, Route 21, Route 29
 - Route 94, Route 29
 - none of the above
71. To go from Jonestown to Gore City, the shortest route shown would be to use _____.
- Route 43, Route 15, Route 94
 - Route 43, Route 69, Route 31, Route 94
 - Route 10, Route 31, Route 94
 - Route 10, Route 50, Route 94
72. To travel from Sturgisville to Huppert Township, the shortest distance you could travel using the roads shown would be _____.
- 286 miles
 - 520 miles
 - 237 miles
 - none of the above

Questions 73-75 refer to the portion of the state income tax table shown below.

Taxable income is at least	But less than	Your tax is	Taxable income is at least	But less than	Your tax is
\$8,410	—	\$284.38	\$9,380	—	\$338.38
8,495	—	286.13	9,395	—	340.13
8,510	—	288.88	9,410	—	340.88
8,525	—	288.83	9,425	—	341.83
8,540	—	287.38	9,440	—	342.38
8,555	—	298.13	9,455	—	343.13
8,570	—	298.88	9,470	—	343.88
8,585	—	299.83	9,485	—	344.63
8,600	—	300.38	9,500	—	345.38
8,615	—	301.13	9,515	—	346.13
8,630	—	301.88	9,530	—	346.88
8,645	—	302.63	9,545	—	347.63

73. What is the tax on a taxable income of \$9,494?
- \$343.88
 - \$299.63
 - \$344.63
 - none of the above
74. What is the tax on a taxable income of \$9,416?
- \$341.63
 - \$295.88
 - \$340.13
 - none of the above
75. What is the tax on a taxable income of \$8,582?
- \$298.88
 - \$343.88
 - \$298.13
 - none of the above

82. Bill is paid \$4.50 an hour. He worked a total of 75 hours during the last 2 weeks. How much did he earn during these 2 weeks?
- \$54.00
 - \$337.00
 - \$337.50
 - none of the above
83. Amy worked 11 hours on Thursday. She earns \$3.15 an hour. How much did she earn?
- \$26.50
 - \$34.65
 - \$33.65
 - none of the above
84. Kevin worked 44 hours last week. He is paid \$2.68 an hour. How much did he earn?
- \$116.82
 - \$128.92
 - \$117.92
 - none of the above
85. Mrs. Simons earned \$441 (gross earnings) for one week. Her employer deducted \$43 for federal tax, \$0 for state tax, and \$25 for social security. How much money did she actually receive (net earnings)?
- \$375
 - \$366
 - \$365
 - none of the above
86. Jane Carter earned \$241 (gross earnings) for one week. Her employer deducted \$39 for federal tax, \$16 for state tax, and \$7 for social security. How much money did she actually receive (net earnings)?
- \$159
 - \$150
 - \$169
 - none of the above
87. Mr. Preston earned \$619 (gross earnings) for one month. How much money will he actually receive (net earnings) after his employer deducts \$119 for federal tax, \$25 for state tax, and \$37 for social security?
- \$437
 - \$800
 - \$428
 - none of the above

Questions 88 - 93 refer to the following information and diagram.

Thomas Marks had \$216.34 in his account. He deposited \$75.42 on July 20, 1978. On July 30, 1978, he wrote a personal check to Food Fair for \$52.06 to purchase groceries.

\$		19		NO. NEWPORT NEWS, VA. 19		12-34 567	
		Newport News Bank Company of Newport News, Virginia					
DEPOSIT	DOLLARS	CENTS	PAY TO THE ORDER OF		89	90	
DEPOSITS	9	1					
	2	2					
TOTAL	9	3					
THIS CHECK			FOR		88		
DEPOSIT						DOLLARS	

88. In the area marked **(88)**, what should be written?
- July 30, 1978
 - Food Fair
 - \$52.06
 - none of the above
89. In the area marked **(89)**, what should be written?
- Thomas Marks
 - Food Fair
 - July 30, 1978
 - none of the above
90. In the area marked **(90)**, what should be written?
- \$75.42
 - \$216.34
 - \$52.06
 - none of the above
91. In the area marked **(91)**, what should be written?
- \$216.34
 - \$75.42
 - \$52.06
 - none of the above
92. In the area marked **(92)**, what should be written?
- \$52.06
 - \$216.34
 - \$75.42
 - none of the above
93. In the area marked **(93)**, what should be written?
- \$164.28
 - \$140.92
 - \$291.76
 - \$268.40

94. A box of 48 tea bags sells for 61¢ and a box of 100 tea bags sells for \$1.29. Which is the better buy?
- a box of 48 tea bags
 - a box of 100 tea bags
 - They are equal
 - none of the above
95. A 12-ounce can of pineapple juice sells for 24¢. A 46-ounce can of pineapple juice sells for 92¢. Which is the better buy?
- 12-ounce can
 - 46-ounce can
 - they are equal
 - none of the above
96. A 27-ounce jar of applesauce can be purchased for \$1.08. What is the cost of each ounce of applesauce (unit price)?
- 5¢
 - 3¢
 - 4¢
 - none of the above
97. George Shaw was able to purchase a hammock listed at \$14.90 at a discount rate of 40%. How much is the amount of the discount?
- \$.60
 - \$5.92
 - \$.59
 - none of the above
98. A desk that regularly sells for \$120 can be bought during a sale at a discount rate of 20%. How much will a buyer save if he purchases it during the sale?
- \$2.40
 - \$96.00
 - \$24.00
 - none of the above
99. A garden umbrella that usually sells for \$29.00 is on sale at a discount rate of 35%. What discount is the purchaser being offered?
- \$10.15
 - \$1.02
 - \$10.10
 - none of the above

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