

A Comparative Study of the Relative Effectiveness
of Computer Assisted Instruction, Cooperative Learning
and Teacher Directed Instruction on Improving Math
Performance of Low Achieving Students

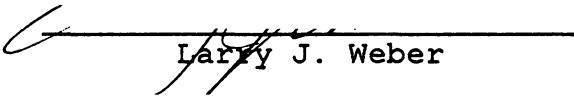
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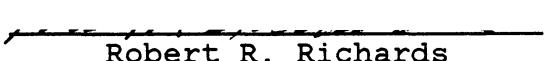
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(ABSTRACT)

This study compared three instructional approaches--computer assisted instruction, cooperative learning, and teacher directed instruction--to determine their relative effectiveness in improving math performance of low achieving students. Additional information was collected on student time on task behavior to determine the relative impact of these treatments on this variable.

An experimental research design was used. Ninety-nine rising sixth grade students were randomly assigned to one of the three instructional delivery groups for a five week summer remediation program. Classroom teachers self selected the treatment approach they used based on interest and personal experience. Additional training in the use of these strategies was provided prior to the beginning of summer school. Fourth grade students' scores on the math subtest of the Iowa Test of Basic Skills (ITBS) served as the

baseline data for assigning students to one of the treatment groups. A subsequent ITBS math score was obtained on the same students as fifth graders with the latter score serving as the pretest measure. At the end of the summer program the ITBS math subtest was readministered to students to obtain posttest dependent measures on math concepts, math problems, math computations and math total. These data were analyzed with an ANCOVA with the fifth grade ITBS math total score serving as the covariate.

While substantial academic growth was reported for all groups on the math total measure, it was found that no significant difference existed between the three groups on improving student performance on math concepts, math problems, math computations, or math total. On the time on task measure, students off task behavior observed was minimal and differences reported were not found to be significant.

DEDICATION

This dissertation is dedicated to my wife for the unselfish sacrifice and willingness to support me throughout the various stages of this work. From frequently changed plans to no vacations, and from many hours away from home to a constant preoccupation with what had to be done next, she continued to support me. Without her presence in my life, this study would not have been completed.

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CHAPTER 1

INTRODUCTION

In 1986 Governor Baliles convened a blue ribbon task force, the Governor's Commission on Excellence in Education, to develop a blueprint for making Virginia's public school system one of the best in the country. In reviewing the status of public education in the Commonwealth, the committee concluded that several changes needed to occur for public schools to be elevated to the level of excellence. Of the many recommendations made, two stood out as being significant for students and local school divisions. One of the committee's recommendations called for the establishment of a Literacy Passport Program at the middle school level. Beginning at grade 6, this program would require that all students pass literacy tests in reading, writing and math in order to be promoted to high school. The commission suggested that school divisions be held accountable for remediating students who failed these tests in grade 6 as well as students who scored in the lower quartile on standardized tests.

On June 19, 1987, the State Board of Education adopted the new Standards for Accrediting Public Schools in Virginia, which included, almost verbatim, the Literacy Passport and remediation recommendations of the Governor's

task force. Beginning in 1990, sixth graders will be required to pass literacy tests in reading, writing, and mathematics as part of the Virginia State Assessment Program (VSAP). In addition, the State Department of Education developed a Literacy Predictor Test Program which could be administered to fourth graders and used to identify students in jeopardy of failing one of the literacy tests. The new standards also required school divisions to develop a remediation program which could possibly include summer school.

Prior to the adoption of the new accreditation standards, the Hampton school division's remediation program included Chapter I services at grades 3-5 (math and reading), a city funded reading program 1-12, and a variety of strategies evolving from the innovativeness of building principals and teachers. Assessment of student mastery of basic skills in reading, writing and math was determined solely by teacher judgement at all grades, except 4, and 6 through 11, where standardized tests were also given. A careful review of past student performance suggested that a comprehensive remediation plan was needed. This plan would require the use of standardized test data to provide an early diagnosis of student academic weaknesses and include appropriate strategies and resources to address them. Realizing this need, the division developed a comprehensive remediation plan during the 1987-88 school year.

In designing a comprehensive remediation plan, it became apparent to the division that previous instructional interventions had been only marginally effective in responding to the academic needs of low achieving students. The efficacy of past efforts to remediate became suspect, due partially to inadequate procedures for identifying students needing remediation and the absence of a systematic evaluation of interventions used. To address these concerns, Hampton students were given standardized tests in grades one through eleven to identify their skill mastery in identified areas beginning in the 1987-88 school year. Additionally, the Literacy Predictor Tests in reading, writing and math were administered to fourth grade students. An analysis of the Literacy Predictor Test scores for the target population suggested that a large number of students were in need of remediation.

In order to maximize the benefits to students, a decision was made to systematically assess the efficacy of selected intervention programs designed to remediate observed deficiencies.

Statement of the Problem

The performance of students on the State Literacy Tests has been of paramount concern to the Hampton City Schools.

With the newly adopted Literacy Passport Program, the school division was confronted with several important questions.

- How would students perform on the literacy tests?
- Which students should receive remediation?
- What should be the logistical considerations for providing remedial instruction to students? and
- What teaching strategies appear to most improve student achievement?

These questions prescribed the parameters and context for the development of appropriate remediation programs. Instructional and administrative decisions regarding the implementation of a remediation program would depend on the accuracy of information used to identify students for such programs. The Degrees of Reading Power Test (DRP) was used to predict student reading performance, while a State Department of Education developed writing prompt provided predictive data about student performance on the writing portion of the literacy tests. The student's Iowa Tests of Basic Skills (ITBS) math sub-test score became the sole predictor of performance on the state developed literacy math test.

In estimating which students would need remediation, the school division based its decision on two underlying assumptions. The first assumption was that the predictor tests in reading and writing--DRP and the State Department writing prompt--were accurate and valid indicators of future student performance on those sections of the literacy tests. The

second assumption held that students predicted to fail the literacy math test would also score in the lower quartile on the ITBS. The State Department of Education purported this to be a valid assumption and consequently instructed school divisions to use the twenty-fifth percentile and lower as the benchmark for determining the need for remediation in math.

The initial stages of program development required the Hampton School System to address the questions of when and under what conditions remediation programs should be delivered. The allocation of state funds to local school divisions to develop and implement remedial programs provided the opportunity for creative instructional programming, but also generated ambivalence about what delivery format would be most appropriate. The Hampton City Schools chose to take a proactive position by planning to remediate identified students before they took the literacy tests rather than the reactive position of remediating only after students had failed them. Plans were developed to conduct a five week summer school and a year long regular term program. Confronted with limited funds budgeted for summer school, a decision had to be made that would maximize resources and benefits to students. To accomplish these goals the division decided to focus on skills which could be more precisely defined and interventions that could be developed to best meet the needs of students during a short period of time. Considering these factors the division selected the area of math

performance as the area of concentration for the summer program.

Given the magnitude of programmatic questions confronting Hampton's key instructional decision makers, there became an obvious need to evaluate administrative and instructional decisions associated with the division's comprehensive remediation plan. After the decision had been made to provide remedial programming through summer and regular term components, questions surfaced about which instructional approaches should be used and the relative effectiveness of those approaches in improving student achievement. While a variety of approaches existed, the division limited its attention to strategies which were purported to have some research base supporting effectiveness in teaching math to low achievers. Using this criterion, the Hampton City Schools selected computer assisted instruction, cooperative learning, and teacher directed instruction as the teaching strategies to be used in the summer program.

Purpose

The purpose of this study was to evaluate delivery techniques used in the five week summer instructional math remediation program and to inform administrators and instructional decision makers about how to remediate and maxi-

mize benefits to students. Specifically, the study was designed to address the following research question:

1. What is the relative effectiveness of computer assisted instruction, cooperative learning, and teacher directed instruction in improving math performance of low achieving students?

Significance of the Study

The Hampton City Schools have implemented a variety of remedial approaches over the years. However, little systematic evaluation of these efforts has been conducted which could be used in making decisions about the efficacy of certain instructional approaches to improve student performance.

This study is designed to address the questions of effectiveness of three interventions--computer assisted instruction, cooperative learning, and teacher directed instruction--in improving student achievement. The information obtained will be useful in making administrative decisions about how to remediate low achieving students in the Hampton City Schools.

Definitions

The following terms were used in this study:

1. Cooperative Learning was defined as an instructional approach which assigned students to small groups and required that they meet two specific criteria: (1) to learn the assigned material individually, and (2) to help each member of the group to learn assigned material.
2. Computer Assisted Instruction involved the teacher using microcomputers as an instructional tool. The computer programs assisted students in learning math concepts, computations, and problem solving.
3. Teacher Directed Instruction required that the primary responsibility for delivery of instruction rest with the teacher. Students were taught primarily as a whole group and individuals were solely responsible for their own learning.

Organization of the Study

Chapter one has included an introduction, a statement of the program, purpose, significance and definition of terms.

The remainder of the study is organized into four chapters. Chapter two includes a review of the literature.

Chapter three describes the methodology and chapter four includes a reporting and analysis of the data. The study culminates with chapter five which includes a summary of findings, conclusions, recommendations and reflections.

CHAPTER 2

REVIEW OF LITERATURE

Context

In response to the national reform movement in education, many states have embarked on education initiatives to address a variety of issues expressed in these reports. Of particular interest has been the concern about declining student achievement. To reverse this trend, Virginia's governor convened a task force in 1986 who's charge was to provide a blueprint for making Virginia's public school system one of the best in the country. This task force made many recommendations, one of which included the requirement that students at the middle school level demonstrate minimum mastery of basic skills before entering high school by passing literacy tests in reading, writing and math. The General Assembly adopted this recommendation and subsequently included it in the Standards of Quality (SOQ) for Public Schools in Virginia. This SOQ mandate also required that local school divisions provide remedial programs for students who scored in the lower quartile of the Virginia State Assessment Program (VASP) and for those who failed the literacy tests administered in the sixth grade.

During the fall of 1987, Hampton City Schools' superintendent organized a steering committee to develop and implement a comprehensive remediation plan. While efforts had been made in the division to respond to the instructional needs of low achieving students, he indicated the school division needed to reexamine those efforts in light of the newly adopted accreditation standards. Additionally, he cited the keen interest and support of School Board and City Council members in implementing programs that would create, enhance and promote an "invitation to learn" for all students in the division.

Having received this charge from the superintendent, the committee began by agreeing on a definition of remediation. All members concluded that remedial programming in the Hampton City Schools would be defined as (a) educational programming for any student who performed below grade level and/or developmental age expectancies in reading and/or math, and (b) educational programming for any student who did not pass any component of the Literacy Passport Testing Program. With regard to the organizational delivery of remedial interventions, the committee concluded that such activities must supplement rather than supplant services normally provided to all students during the regular school program. With a definition of remediation, the committee then concluded a comprehensive needs assessment which was used to answer important programmatic questions:

What programs or activities were in place which addressed the needs of students needing remediation?

What programs or activities were perceived to be successful?

What programs, strategies, or activities should be included in Hampton's comprehensive K-12 remediation proposal? and

What modifications to the regular term structure should be made to accommodate these recommendations?

As a result of this committee's work, the Hampton City Schools developed a comprehensive, K-12, remediation program which had both regular and summer term components. This program was presented to the School Board in February of 1988 and subsequently approved for implementation.

In April of 1988, Dr. S. John Davis, State Superintendent of Public Instruction, distributed a resource document (Virginia Department of Education, 1988) to assist local divisions in developing a remediation program. This State Department of Education document described several critical elements of an effective remediation program, one of which was to include alternative teaching strategies when instructing students, if regular approaches were not successful in helping them to learn. Three of these alternative strategies cited in the resource guide were (a) computer assisted instruction, (b) cooperative learning and (c) teacher directed instruction. Having adopted the Hunter based directed teaching model several years earlier, the division's in-

structional services department concluded that other instructional strategies needed to be explored to improve academic performance of low achieving students. Computer assisted instruction became appealing primarily because it generated high student interest. Cooperative learning, however, was selected for its appeal to teachers as a way to provide greater assistance to students in the learning process. Together these approaches served as the instructional foundation for delivery of instruction during the summer remediation program in 1989.

* Computer Assisted Instruction

A review of studies on computer assisted instructional models has revealed that many variables related to the use of computers have been examined. However, of these studies, none have gained as much interest as those which have focused on student achievement. A review of one hundred sixty-nine studies by the National Task Force on Educational Technology (1986) has reported computers to be effective in teaching students. Magidson (1978) suggested that one could anticipate CAI to be effective in motivating and stimulating students to learn. Together these reports have provided practitioners with the theoretical and empirical basis for exploring CAI as a viable alternative to traditional approaches to teaching students.

Computer assisted instruction (CAI) research over the past three decades has supported its use in the classroom. However many of these studies have generated as many questions as they have answers about CAIs effectiveness.

1. Is CAI significantly more effective than traditional approaches to improving student achievement? and
2. How do CAI instructed students compare on achievement measures to students taught in other non-traditional ways?

Studies to date have covered different disciplines and student ability levels in attempts to answer these important questions. This literature review focuses on studies which report CAI's impact on the achievement of students who have performed poorly in math. Also attention is being given to studies which suggest the need for further controlled investigation to increase the validity of conclusions about the effectiveness of this approach in helping students to become higher achievers.

Data collected from surveys have provided researchers with clues about the effectiveness of computer assisted instruction in remediating math performance of low achieving students. A national report on the use of computers in education reported that teachers perceived computers to be particularly effective with low achievers and in math (Education Turnkey Systems, 1985). Henry Becker (1987) gathered data from over eight thousand teachers and administrators on their

perceptions of the impact that computers had on students. He reported that educators believed that computers increased opportunities for low achieving students to improve basic math skills. Becker further reported that forty percent of the respondents also believed computers positively influenced students' attitudes toward math.

Several formal research studies have reported computer assisted instruction to be more effective than traditional instruction in improving math achievement of low functioning students. Most research to date has assessed the impact of four C.A.I. delivery modes--drill and practice, problem solving, tutorial and simulation (Edwards, Norton, Taylor, Weiss, & Dusseldorf, 1975). While each mode has a specific function, Edwards, et al. (1975) have not determined any one to be more effective than others. The use of drill and practice appears to pervade studies involving math instruction (Edwards, et al., 1975; Burns & Bozeman, 1981; Hotard & Cortez, 1983; Hasselbring, 1984; and Becker, 1987). Students enrolled in a Title I Program in two elementary schools in Lafayette Parish, Louisiana, received daily C.A.I. drill for mathematics along with standard math instruction during the 1980-81 school year. Students were randomly assigned to either C.A.I. or non-C.A.I. groups. Gain scores were detected to be higher for the C.A.I. instructed group over the non C.A.I. group (Hotard & Cortez, 1983). Suppes and Welles (1974) in a review studies of elementary students concluded

that C.A.I. as a supplement to traditional instruction was more effective than normal instruction alone. Similar findings were reported by Morgan (1978), and Hawley, Fletcher, and Piele (1986). In an analysis of several studies involving approximately ten thousand elementary students, Vinsonhaler and Bass (1972) observed higher gains in achievement in groups of students who had received drill and practice instruction. Subsequent reviews of the Vinsonhaler and Bass work by Edwards, et al. (1975) supported earlier findings which concluded that low ability students demonstrated greater gains than higher functioning students.

Even with what might be viewed as convincing evidence, C.A.I. research findings are far from being conclusive. The best claim that most formal studies can make about C.A.I. is that it either improves learning or produces no difference when compared to traditional instruction. Edwards, et al. (1975, p. 148) reported that of twenty studies reviewed, 40% showed little or no difference in achievement results when C.A.I. served as a substitute for or compliment to traditional instruction. Serious flaws in research design have contributed to confounding problems that make some conclusions untenable. Richard Clark (1985) reviewed twenty-eight studies included in a meta analysis performed by Kulik, et al. and found instructional methods, curriculum content, and novelty inadequately controlled. Clark hypothesized that "teachers compete with computers which mask the effectiveness

of computer based education on student achievement" (p. 250). Research by Grayson (1970) and Vinsonhaler and Bass (1972) offered similar caveats. Other concerns about research design included teacher methodology and random assignment. Magidson (1978) suggested it is difficult to compare C.A.I. to traditional instruction because C.A.I. complements traditional instruction and therefore makes comparisons difficult. Clark advised that only "the fixed criteria or defining attributes of the media can be allowed in the comparison" (Clark, p. 250). While the greatest control of delivery lies in using the same teacher, meta analyses conducted by Clark (1985) did not find significantly different effects when the teacher used C.A.I. and traditional delivery approaches with different students. Becker (1987) attempted to conduct a best evidence synthesis of the effects of C.A.I. on student achievement and found only one study out of 51 to have employed true random assignment. He concluded therefore that the findings reported in previous studies may be a result of variables other than exposure to computer instruction.

Given the three reported concerns about C.A.I. research, sufficient research evidence still exists to warrant further study. Burns and Bozeman (1981) indicated, "while no ultimate final answers related to C.A.I.'s effectiveness or guarantees of success can be presented, the analysis and synthesis of many studies do point to a significant enhance-

ment of learning in instructional environments supplemented by C.A.I., at least in one curricula area--mathematics" (p. 37). Some researchers have concluded that C.A.I.'s effectiveness is partially attributed to its ability to stimulate student interest and attitudes toward learning (Magidson, 1978; and Hasselbring, 1984). In searching for a more definitive explanation of C.A.I.'s influence on math achievement of educationally disadvantaged students, a more carefully controlled research design must be employed.

Cooperative Learning

There exists an expanding body of research which postulates that how students perform in their learning environment is greatly influenced by the goal structures present within the classroom. Educational theorists have broadly categorized these goal structures as being cooperative, competitive, individualistic or non-structural in design (Johnson & Johnson, 1974). Cooperative goal structures require a team approach which implies a "one for all and all for one" philosophy. Students' individual and collective successes become the responsibilities of both the individual and the group. Competitive goal structures however are generally described as embracing a "winners and losers" mentality. Student effort is recognized and rewarded based on maximum output which results in some receiving maximum rewards and

others receiving minimum rewards. When applied to the traditional classroom, this structure assumes that there will always exist some learning casualties more commonly referred to as remedial students. The individualistic goal structure, unlike the previous two reward systems, recognizes student effort independently of other efforts. A student's work is evaluated on its own merit thereby making it possible for students to progress at different rates and be rewarded accordingly. Each of these structures subliminally communicates value laden expectations of student performance and interaction within the classroom.

Of these four structures, the cooperative goal structure approach appears to be most effective in the classroom (Johnson, Maryuama, Johnson & Nelson, 1981). Ames and Ames (1978) have suggested that how student effort is reinforced may influence their reaction to success or failure. The traditional classroom tends to create an atmosphere of competition which communicates to students present that there must be "a" winner. The prevailing learning experience therefore for most students becomes repeated failure instead of success. However, with cooperative learning approaches, students are encouraged to become active participants in helping to create successful learning experiences for each other. Simply defined, cooperative learning is a strategy which requires students to work in groups toward a common goal. Inherent in the approach is the attention and ac-

countability of group members to ensuring successful attainment of this goal by each group member. The underlying assumption here is that students can benefit from teaching and being taught by each other. Bucholdt and Wodarski (1978) indicate that this form of instruction enhances student learning by:

1. improving problem solving skills,
2. stimulating student motivation, and
3. providing more individual attention and immediate feedback on performance.

Many researchers (Edwards & DeVries, 1972; Johnson & Johnson, 1974) have reported that students preferred cooperatively structured learning assignments over competitively structured ones. These findings appeared to provide the theoretical and conceptual framework for addressing several important questions. How can the traditional classroom be structured to become motivating and success oriented for students? and How can the traditional classroom incorporate the use of cooperative teaching and learning strategies to improve student achievement?

Cooperative learning strategies over the past twenty years have attempted to respond to the educational practitioner's search for effective alternative approaches to improve student achievement. Slavin (1987) reported that

thirty-three of thirty-eight studies which lasted at least four weeks, showed significant gains in achievement for students taught using cooperative learning versus traditional approaches. While several generic models appear in the literature, the Johns Hopkins Student Team Learning Model appears to have been the most successful in consistently reporting gains in achievement across different performance levels and in several content areas, in particular math (Edward, & DeVries, 1972; Slavin, 1982). Two of these Learning Team interventions--Student Teams Achievement Divisions (STAD) and Teams Games Tournaments (TGT)--have demonstrated the most positive influence for low achieving elementary and middle school students (Slavin, 1982). These approaches attempt to improve student mastery of basic skills through a highly structured instructional format characterized by direct teacher instruction, student practice of skills in groups, and individual accountability for learning skills. In STAD students are assigned to four or five member heterogeneous teams. Students are taught new material and practice solving math problems within their group. The group is instructed to help every member to complete assigned work successfully. Following team practice, each member is given a quiz to assess his/her individual understanding of mastery of math skills. During this phase students must work independently. The TGT method employs a similar instructional format to STAD, except that individual quizzes are replaced

by weekly tournaments. In addition to influencing student achievement, both methods have been believed to be effective in improving time on task (DeVries & Slavin, 1975; Slavin, 1978). However, less formally structured cooperative learning interventions appear to be less successful in positively improving student achievement (Slavin, 1982).

The use of cooperative learning methods have attracted the attention of school administrators and classroom teachers because best evidence research on improving achievement of weak math students have included several important components:

1. studies have been conducted in public schools;
2. most cooperative learning methods were implemented by classroom teachers;
3. all classes were randomly assigned to treatment groups; and
4. all classes were given the same curriculum objectives and materials.

While research to date supports certain cooperative learning practices as consistently more effective in improving math achievement of students, there still exists several important unanswered questions:

1. How critical to cooperative learning's effectiveness is heterogeneity of student abilities within member groups? and
2. Will less formally structured cooperative approaches be as effective as traditional and non-traditional teaching methods in improving student's performance in math?

Research designs which attempt to respond to these questions will provide classroom teachers and administrators with useful information with which to make better instructional decisions about who will benefit most from cooperative learning.

Teacher Directed

Teacher directed instruction, also referred to in the literature as explicit teaching, has a theoretical base which supports it as being effective in improving student achievement. Researchers have observed that students tend to learn through either inductive or deductive instructional approaches (Cotton & Savard, 1982). Students taught with inductive strategies were presented general information and encouraged to discover specific knowledge on skills to be learned. Learning which results from this approach is commonly identified as "discovery learning." On the other hand, deductive approaches require specific skills to be taught to

students in some systematic way. The description of this step by step delivery of instruction was characterized by Rosenshine (1986, p. 60) to include the following:

1. begin a lesson with a short statement of goals;
2. begin a lesson with a short review of previous prerequisite learning;
3. present new material in small steps, with student practice after each step;
4. give clear and detailed instructions and explanations;
5. provide active practice for all students;
6. ask many questions, check for student understanding, and obtain responses from all students,
7. guide students during initial practice;
8. provide systematic feedback and corrections;
9. provide explicit instruction and monitor students during seatwork;
10. continue practice until students are independent and confident.

These attributes were similarly described, though slightly modified, by Gage (1978), Good and Grouws (1979), and Russell and Hunter (1981). The underlying premise of this teaching model was its contention that for specific knowledge or skills to be learned, explicit and systematic instructions had to be delivered to students.

A literature review of studies on teacher directed instruction reveal it to be quite effective in improving basic skills achievement of elementary disadvantaged students (Cotton & Savard, 1982). Rosenshine reported this approach to teaching students to be most appropriate for "young learners, slow learners, and for all learners when the material is new, difficult, or hierarchical" (Rosenshine, 1986, p. 62). Much research on teacher directed instruction examined the effect of Distar (Direct Instructional System for Teaching and Remediation) type programs on reading and math achievement of primary and upper elementary students. The most significant body of research on these programs emanated from the Follow Through Planned Variation Study conducted in the late 1960s by the United States Office of Education. This study was initially conceived to explore the possibility of extending early intervention programs into the upper elementary grades to improve achievement of students whose academic performance lagged behind their age appropriate peers. Over one hundred seventy different research projects used more than twenty different teaching models to assess the comparative effectiveness of these models in improving the reading and math achievement of low achieving students. Longitudinal achievement data collected over a three year period revealed that students taught through explicit teaching techniques showed greater gains in math and reading than students taught with other delivery methods (Kennedy, 1978).

Becker and Gerstein's (1979) follow up of fifteen studies included in the Follow Through Study reported significant effects for directed instruction models in reading, math problem solving, math concepts and math computations.

With the impetus of the back to basics movement of the 1970s, additional studies beyond the Follow Through Project were initiated to test previous research claims about teacher directed practices. Anderson, et al. (1980) observed twenty-nine math teachers to determine their effectiveness in teaching math to junior high students. Their observations revealed that student achievement was highest in classrooms where teachers used approaches similar to those described in many studies on explicit teaching. These findings were consistent with those discovered by Good and Grouws (1979) analysis of math achievement of upper elementary grade students. Brophy's (1979) examination of correlational studies also found direct instruction to be effective. Rosenshine's (1986) review of studies on directed teaching since 1974 further added to the body of evidence that supported explicit teaching as being very effective in teaching well defined content--i.e., mathematical procedures and computations--to slow learners.

The acceptance of findings associated with the directed teaching paradigm, like previously cited models, labors under potential confounding difficulties resulting from methodological flaws in design. Kennedy (1978) reported that

the Follow Through studies did not include comparable comparison groups. House, Glass, McLean and Walker (1978) raised similar concerns which generated concern about the confidence one could place in the findings of some explicit teaching research. Slavin's (1989) analysis of the research on the Hunter based model found claims of this model's effectiveness to be unsupported when the standards of best evidence synthesis was applied to research designs in these studies. Given these design problems, additional research appeared to be needed to assess more accurately the impact that teacher directed instruction has on improving math achievement of low achieving students.

CHAPTER 3

METHODOLOGY

Introduction

This chapter describes the procedures and methods used in this study. The purpose of the study was to determine the relative effectiveness of cooperative learning, computer assisted instruction, and teacher directed instruction in remediating math achievement of low performing sixth grade students. Included are descriptions of the research methodology, population and sample selection, instrumentation, program, data collection, and analysis procedures.

Research Methodology

This study used an experimental design to compare the effectiveness of cooperative learning, computer assisted instruction and teacher directed instruction in improving math achievement of low performing students. Students scheduled to enter the sixth grade in the fall of 1989 were randomly assigned to one of three instructional delivery groups--computer assisted instruction (CAI), cooperative learning, or traditional (teacher directed) instruction--for a five

week summer remediation program. Classroom teachers received comparable training in the use of these strategies to teach students math prior to the beginning of summer school. In the spring of 1988 fourth grade students' scores on the math subtest of the ITBS were obtained which served as baseline data for assigning students to one of the treatment groups. A subsequent ITBS math score was obtained in the spring of 1989 on the same students as fifth graders with the latter score serving as a pretreatment measure of student math achievement. At the end of the summer program in 1989 the ITBS math subtest was readministered to students to assess the impact of the treatment interventions on student math achievement.

Population and Sample

In estimating which students needed remediation, the division based its decision on two underlying assumptions. The first assumption supported the predictor tests in reading and writing as accurate and valid indicators of future student performance. The use of equivalent forms of the DRP to determine prediction and failure rates in reading under the Literacy Testing Program was accepted by the researcher as being adequate for the purpose of this study. While the writing assessment could not meet the statistical test of equivalency, the process used for identifying prompts and

evaluating writing was consistent for both writing sections of the predictor and literacy tests. Therefore, the researcher concluded that the predictors for reading and writing appeared to have sufficient face validity upon which to make tentative instructional decisions about the need for remedial programs. The second assumption suggested that students predicted to fail the literacy math test would also score in the lower quartile on the ITBS. During the spring of 1988, students in grade 6 took a sample literacy test in math as well as reading and writing. One would have assumed a high correlation to have existed between the ITBS math predictor and actual literacy failures. However, a review of the data (see Appendix A) revealed the ITBS to be a gross underestimator of the number of students predicted to fail; and therefore made math predictor scores spurious.

The State Department of Education instructed school divisions to use the twenty-fifth percentile and lower as the benchmark for determining the need for remediation in math. The application of this benchmark to identify students who were in need of remediation appeared to be inadequate, given school division data, and therefore suggested that more students were in need of remediation than had been identified using the State Department guideline. The allocation of state funds to local school divisions to develop and implement remedial programs provided the Hampton division with expanded opportunities to address student's academic needs.

However, these funds were limited and therefore required the school division to determine which alternative programs would be made available to students. It was decided by the Superintendent's staff that local funds would be used primarily to provide regular term remediation services to all students, while the costs associated with the summer school program would be supported by funds from the state. To determine students that would be eligible for the summer program the following criteria were established:

1. Regular summer programming would be provided for students whose math total percentile score ranged from the fifteenth to thirty-fifth percentile. The upper limit (thirty-fifth percentile) was selected to attempt to control for test score variance associated with the standard error of measurement.
2. Chapter I summer programming would be provided to students who scored below the fifteenth percentile. These percentile parameters were chosen to meet federal and state guidelines and available monies for such a program.

The population included 234 rising sixth grade students whose fourth grade ITBS scores fell between the fifteenth and thirty-fifth percentile. All students in the population were students enrolled in the Hampton City Schools, in Hampton, Virginia.

Sample selection was determined by a letter (see Appendix B) and follow up telephone call to parents which invited students in the target population to participate in a summer school remediation program. Forty-two percent of the parents whose children were eligible responded with an interest in

having their child enrolled in the summer program. Only those students whose parents responded yes to the invitation were included in the sample (see Appendix C). Students in the sample were ranked by their "Math total" score from highest to lowest on the ITBS. Scores were grouped and identified as either high, average, or low. Students from each of these groups were randomly assigned to one of three treatments--computer assisted instruction, cooperative learning, or teacher directed instruction. A total of eight classes were included in the study (see Appendix D). Two classes were taught using computer assisted instruction, three classes were taught using cooperative learning, and three classes were taught using teacher directed instructional methodology.

Instrumentation

Math scores on the Iowa Test of Basic Skills subtests were used to assess student achievement and progress toward meeting specific behavioral objectives in math. This measurement instrument was selected for two reasons:

1. the ITBS is mandated by the State Department of Education under the Virginia State Assessment Program (VSAP), and
2. the ITBS is a criterion and/or objective based measure which can be used to:

- a. group students based on their individual strengths and weaknesses on specific behavioral objectives,
- b. diagnose group strengths and weaknesses against some criterion measure,
- c. determine the relative effectiveness of different instructional delivery methods, and
- d. assess the effects of different instructional methods on student achievement.

Form G, Level 10 of the ITBS was used to obtain a baseline measure of each student's fourth grade performance in math. An equivalent form (Form H, Level 11) provided a second measure of math performance during the fifth grade (1989) for each student in the sample prior to the start of the summer school remediation program. Test norms were computed on data gathered during the spring of 1985 on a national sample which was stratified across geographic region, district size, ethnicity, and socio-economic status. Math skills tested on the ITBS were found to correlate highly with Virginia's state mandated standards of learning for this discipline.

Program

Curriculum Development

The fourth grade ITBS math subtest was reviewed and skills were identified which would be tested under the Lit-

eracy Passport Testing Program. The Virginia State Standards of Learning (SOL) for math and Hampton's SOLs were correlated to ensure that these skills were addressed in the curriculum development model (see Appendix E).

Teachers, under the supervision of the division's curriculum specialists, developed strategies and related activities for delivering math instruction to students through cooperative learning, and teacher directed instruction. Previous teacher experiences, i.e., attendance at workshops or seminars related to one of the strategies; teacher use of the strategy in the classroom; or teacher interest in a particular strategy were factors teachers were instructed to use in selecting the strategy with which they would work in the development process. By having teachers select the strategy with which they had some prior training and felt most comfortable using, the researcher attempted to control for differences in instructional materials and strategies which might have made interpretation of treatment effects spurious.

Four interdisciplinary thematic units--Teen Banking, Teen Fitness, Teen Fashion, and Teen Mystery--were developed which focused on specific skills in math computation, concepts, and word problems. Included in these units were teacher daily lesson plans and scheduled field trips to a bank, a fitness center, and a shopping mall. To encourage students to maintain good attendance and to demonstrate successful work habits during the five week summer program, a

teen store was established. This store was stocked with items which could be purchased by students with bonus bucks earned for good attendance, following teacher instructions and getting along with others.

Research based criteria for identifying cooperative learning approaches were used to ensure that planned teaching pedagogy and related activities were appropriate. Instructional staff well versed in computer assisted instruction reviewed materials to assure that strategies developed and software used were congruent with effective computer assisted teaching methods. Teacher directed instructional strategies and activities were reviewed by central office instructional personnel for evidence of compliance with the critical elements of this approach.

Staff Selection

Teachers selected to participate in the study were carefully screened (see Appendix F) and required to meet three criteria:

1. Evidence of success in teaching low achieving middle school students,
2. Participation in the development of interdisciplinary units for the summer remediation program, and
3. Interest and/or experience in using one of the treatment interventions.

The cooperative learning and teacher directed staff met all three criteria. However, teachers in the C.A.I. group did not. Those teachers who participated in the curriculum development process were unable to teach in the summer program due to circumstances beyond their control. Therefore two other teachers who met the remaining selection criteria were chosen to participate in the study.

Staff Training

Workshops and staff inservice training was provided for teachers who selected a given delivery approach. Efforts were made to ensure that teachers in each treatment group received comparable training, resources, and staff support so as to control for a possible Hawthorne effect. For more specific information relative to staff development activities see Appendix G.

Classroom Procedures

All teachers using a given delivery approach used common lesson plans. Weekly observations were made by trained observers to validate the presence of critical attributes associated with each treatment.

Computer assisted instruction groups combined the use of computers with teacher directed instruction. Teachers

started class with students being given a few minutes to practice computational skills. Computers would then be turned off and teachers would provide instructional input using similar approaches used by teachers in the directed teaching group. Students were questioned to determine their understanding of information presented by the teacher. Practice problems were assigned and student mastery of specific skills were determined by the teacher prior to students being assigned independent work on the computer.

In the cooperative learning groups, teachers divided their classes into four or five member teams. They started the day with a word or logic problem for each team to solve. Cooperative learning skills were emphasized such as how to get along in a group and the role responsibilities of group members. Teacher instruction of identified mathematics skills and concepts was delivered to the entire class. Examples and modeling were used to aid instruction while team and individual questions were asked by the teacher to check for student understanding. Student practice of the skill or concept was done as a team activity with team members helping each other to successfully complete assigned problems.

Teachers using directed instruction used a highly structured model of lesson delivery. Teacher input was given to the whole group on a new skill or concept with the use of the chalkboard, posters, bulletin boards, manipulatives, or pictures. Following the initial presentation of input, the

teacher provided students with appropriate models or examples for the skill being taught. Prior to the assignment of math problems for independent practice, teachers engaged students in guided practice activities and provided specific teacher feedback to them on their efforts to demonstrate skill mastery.

Data Collection

Student math subtest percentile scores were collected from the sample's 1987 fourth grade ITBS test results, Form G, Level 10. A subsequent fifth grade pretest measure on the ITBS, Form H, Level 11 was obtained from the targeted population during the spring of 1988 in accordance with the school division's testing program. Teachers from each treatment group administered the math subtest of the ITBS, Form H, Level 11, to their students at the end of the summer program to obtain posttreatment scores. Representatives of the Riverside Publishing Company indicated that the use of Form H, Level 11, would be an appropriate instrument for obtaining the dependent measure (final achievement score) given the five month interval (March-August) between test administrations.

Over the five week program within each treatment group, ancillary information was collected to assess student off task behavior. Observers trained in the Jane Stallings cod-

ing techniques gathered data once weekly through classroom visitations. During each visit, the observer made visual sweeps of the classroom every two minutes followed by a one minute break and recorded each student who was off task during a thirty minute period. Off task behaviors were considered to be defined as follows:

C = Chatting--Low talking or whispering, passing notes between students which pulls them off task.

D = Disruptive--Bothering a number of students, e.g., loud talking, throwing things, pushing or fighting.

P = Personal Needs--Sharpening pencils, going to the toilet, getting a drink, getting papers or books.

W = Waiting--Waiting with hand up for teacher's attention, waiting for materials to be passed.

Z = Sleeping--Resting head on desk or having head tilted downward with eyes closed, not visibly participating or attempting to learn tasks.

Also important to each sweep was the activity that was occurring at the time of the off task behavior. The activity codes used were as follows:

I = Instruction--Listening to the teacher's explanation of content or subject matter.

O = Organizing--Listening to the teacher make assignments or organizing; getting paper and books out.

R = Reading--Student is reading aloud.

S = Seatwork--Student is working at seat on silent reading or written assignment.

Q = Question/Answer--Teacher poses question to students, includes students writing math problems on the board.

G = Games--Playing academic games.

Therefore, when the observer did a sweep of the class and found a student off task, the observer recorded a code which reflected the classroom activity going on when the student was off task. All eight classes were observed weekly using the off task instrument (see Appendix H). Ten sweeps, lasting two minutes each, were made during a thirty minute class segment. A one minute nonrecording period occurred between each two minute sweep. A copy of the off task seating chart and summary were provided each teacher after the observation.

Analysis of Data

In order to compare scores obtained at the end of the summer remediation program, an Analysis of Covariance (ANCOVA) technique was used. This statistical procedure was chosen to reduce the effects of the pretreatment score differences in groups which might have influenced posttreatment measures obtained. Four one way ANCOVAs were used to analyze posttreatment score data for significant treatment effects. The independent variables, instructional methods, consisted of three treatments--cooperative learning, computer assisted

instruction, and teacher directed instruction. The dependent measures were student's summer school posttreatment scores on concepts, computations, and word problems, and math total from Form H of the ITBS math subtest. Raw score data was used in the analysis of dependent measures with fifth grade stanine scores across the three groups serving as the covariates. The purpose of the research was to compare math scores obtained at the end of the summer program to determine the relative effectiveness of instruction received through cooperative learning, computer assisted instruction or teacher directed instruction.

Data obtained on time on task behavior were analyzed using a one-way Analysis of Variance (ANOVA) to determine if significant differences in student off task behavior occurred across treatment groups. This statistical technique was selected because of its appropriateness in determining differences in scores from these groups of sample sizes as large as the one in this study.

The .05 level of significance was chosen to analyze all data collected in this study to determine if observed changes in student scores were statistically significant.

Summary

The procedures and methods described in this chapter were selected to increase the power of the statistical anal-

ysis of treatment results. The design also provided ancillary data on students time on task behavior which may have been influenced by the instructional treatment.

CHAPTER 4

RESULTS

This study was designed to provide key instructional decision makers with information about the relative effectiveness of different instructional delivery techniques to remediating math performance of low achieving students. While a variety of approaches exists, three were selected for this study--computer assisted instruction, cooperative learning, and teacher directed instruction. These methods were chosen because they had strong research base which purported them to be effective in improving math achievement of educationally disadvantaged students. During a five week summer program, students were taught math through one of these approaches, and tested at the end of the program to determine if any of the three methods were more effective in improving achievement than others.

Improvement was measured by student performance on the Iowa Test of Basic Skills Math subtests. These tests were administered to determine if score gains occurred from pretest to posttest with each treatment group. To determine if certain strategies were more effective than others in producing gains, four one-way ANCOVAs were performed on posttreatment score data across the three groups. Findings

from these analyses were used to determine the relative effectiveness of these strategies in improving math achievement over the five week period.

Student time on task information was also collected once weekly across the three instructional groups. These data were reviewed to examine the relative impact of the delivery interventions in reducing students' off task behaviors.

This chapter is organized to report the data collected relative to the research question posited. A special section is included to report information regarding student time on task behavior.

Description of Population

Ninety-nine rising sixth graders from the Hampton City Schools participated in the study. Students in the sample were selected based on their Iowa Test of Basic Skills (ITBS) math total score which fell between the fifteenth and thirty-fifth percentiles on the 1988 spring administration of the ITBS. These scores served as the sole basis for making random assignments of students to one of the three treatment groups--computer assisted instruction, cooperative learning, or teacher directed instruction--for the summer program. Students were tested again with the ITBS as fifth graders in compliance with the division's regular testing program. This second math subtest score served as a baseline pretest meas-

ure. Posttest scores were obtained by readministering the ITBS math subtest at the end of the summer program.

Research Question

The following research question was stated in this study: "What is the relative effectiveness of computer assisted instruction, cooperative learning, and teacher directed instruction on student math performance of low achieving students?"

The independent variables consisted of three instructional delivery treatments--computer assisted instruction, cooperative learning and teacher directed instruction. Fourth grade ITBS math data were collected in 1988 on students in each of the treatment groups. Percentiles were used by the school division in reporting student performance during the regular term, which made these data readily more accessible to the researcher for the purpose of making random assignment of students to instructional groups (see Appendix D). Table 1 provides data on fourth grade math total percentile scores for each treatment group. Group score differences observed after random assignment of students to treatment groups were not found to be significant at the .05 level ($F=2.947$, $p>.05$).

During the spring of 1989, the sample population was readministered the Iowa Test of Basic Skills (ITBS) as part

Table 1. Fourth Grade Total Math Scores, Mean Percentiles and Standard Deviations by Treatment Group

Grade 4 - Math Total Percentile			
Treatment Group	N	$\bar{X}/\text{%ile}$	SD
Computer Assisted	24	*26.000	6.318
Cooperative Learning	38	*23.842	5.778
Teacher Directed	37	*26.189	5.915

*p > .05.

of the school divisions' regular testing program. While these scores were a more current indicator of student performance, these data were not available to the researcher prior to the beginning of summer school. It became necessary to determine if the treatment group's fifth grade scores were significantly different, and therefore likely to have influenced differences observed at the end of the treatment period. To conduct this analysis, a measurement scale which represented interval type data, i.e., raw scores or stanines, was needed. Raw score data were unavailable, therefore student stanine scores were computed from the percentile data which were available. Group means and standard deviations reported in Table 2 for computer assisted groups of $\bar{X}=4.042$, $SD=1.083$; cooperative learning groups, $\bar{X}=3.447$, $SD=1.329$; and teacher directed groups, $\bar{X}=3.784$, $SD=1.182$ were found not to be significantly different, $F=1.387$, $p>.10$.

This study looked at the relative effects of three treatments on achievement. Fundamental to this inquiry was the assumption that student score gains occurred across all three groups during the treatment period. Again, stanine scores were selected for reasons previously cited to determine if academic growth actually occurred. A comparison of math scores--pretreatment to posttreatment--within each group showed growth during the five week period (see Table 3).

Table 2. A Summary of Fifth-Grade Pretreatment Stanine Score Means and Standard Deviations by Treatment Groups

Treatment Groups	Math Totals		
	N	\bar{X}	SD
Computer Assisted Instruction	24	*4.042	1.083
Cooperative Learning	38	*3.447	1.329
Teacher Directed	37	*3.784	1.182

*p > .10.

Table 3. A Summary of Pretreatment and Posttreatment Stanine Score Means by Treatment Group

Treatment Group	N	Pretest	Posttest
		(Stanine Scores)	(Stanine Scores)
Computer Assisted Instruction	24	4.042	4.667
Cooperative Learning	38	3.447	3.895
Teacher Directed	37	3.784	4.459

Analyses were then directed to the primary research question of relative effectiveness of the three teaching methods. To answer this question, raw score data were obtained at the end of the summer program in August of 1989 on the four posttest measures--math concepts, math problems, math computations and math total. These data are summarized in Table 4.

Four one-way ANCOVAs were used to determine the relative effectiveness of the treatment interventions on improving math achievement at the end of the five week summer program. Each group's fifth grade stanine scores were used as the covariate. How treatment group means were affected by the covariate is summarized in Table 5. While group score differences were noted, none were found to be significant on math concepts, math problems, math computations and math total, as noted in Table 6.

Time on Task

A one-way ANOVA was performed on the percentage of off task behavior observed across groups during the summer program. During the weekly thirty minute observation period, the percentage of group off task behavior was found to be low as reported in Table 7. Group differences in off task behavior as reported in Table 8 were not significant, $p>.05$.

Table 4. A Summary of Pretreatment Raw Score Means and Standard Deviations on Math Concepts, Math Problems, Math Computations and Math Total by Treatment Group

Treatment Group	Math Concept			Math Problems			Math Computations			Math Total		
	N	\bar{X}	SD	N	\bar{X}	SD	N	\bar{X}	SD	N	\bar{X}	SD
Computer Assisted Instruction	24	20.917	4.149	24	13.583	4.021	24	27.250	6.923	24	20.456	4.165
Cooperative Learning	38	18.658	5.278	38	12.5	4.079	38	23.026	7.582	38	18.061	4.631
Teacher Directed Learning	37	20.919	3.578	37	12.324	4.17	37	26.324	5.826	37	20.189	2.921

Table 5. A Summary of Pretreatment Raw Score and Adjusted Means on Math Concepts, Math Problems, Math Computations, and Math Total by Treatment Groups

Treatment Groups	N	\bar{X}	*Adjusted \bar{X}
<u>Math Concepts</u>			
Computer Assisted	24	20.917	20.343
Cooperative Learning	38	18.658	19.135
Teacher Directed	37	20.919	20.801
<u>Math Problems</u>			
Computer Assisted	24	13.583	13.1112
Cooperative Learning	38	12.500	12.8926
Teacher Directed	37	13.324	13.2274
<u>Math Computations</u>			
Computer Assisted	24	27.250	26.8839
Cooperative Learning	38	23.026	23.3307
Teacher Directed	37	26.324	26.2492
<u>Math Totals</u>			
Computer Assisted	24	24.456	20.0310
Cooperative Learning	38	18.061	18.4426
Teacher Directed	37	20.189	20.0929

*Mean differences not significant, $p>.05$.

Table 6. A Summary of Four One-Way ANCOVAs on Math Subtests Raw Score Data

Source	df	SS	MS	F-Ratio	Prob>F
ANCOVA - Math Concepts					
Covariate	1	446.1423	446.1423	29.41	0.0000
Treatment Groups					
Error (Between)	2	53.550679	26.75339	1.76	0.1770
Error (Within)	95	1441	15.16843		
Total	98	2006.747	15.16843		
ANCOVA - Math Problems					
Covariate	1	301.9206	301.9206	21.87	0.0000
Treatment Groups					
Error (Between)	2	2.1108	1.0554	.08	0.9265...
Error (Within)	95	1311.521	13.8055		
Total	98	1634.505			
ANCOVA - Math Computations					
Covariate	1	181.5125	181.5125	4.04	0.0473
Treatment Groups					
Error (Between)	2	232.6797	116.3398	2.59	0.0804
Error (Within)	95	4270.069	44.9481		
Total	98	4778.08			
ANCOVA - Math Total					
Covariate	1	297.8822	297.8822	23.51	0.0000
Treatment Groups					
Error (Between)	2	60.13686	30.0684	2.37	0.0987
Error (Within)	95	1203.688	12.6704		
Total	98	1622.444	12.6704		

Table 7. A Summary of Group Mean Percentages and Standard Deviations of Student Off Task Behavior by Treatment Groups

Treatment Group	N	Percentage of Student Off Task Behavior	
		\bar{X}	SD
Computer Assisted Instruction	24	2.2	2.023
Cooperative Learning	38	1.96	1.501
Teacher Directed	37	2.61	1.845

Table 8. A Summary of One-Way ANOVA on the Percentage of Student Off Task Behavior Across Treatment Groups

Source	df	SS	MS	F-Test
Treatment Groups				
Between	2	2.516	1.258	.402
Within	29	90.856	3.33	p>.25
Total	31	93.372		

Summary

While gains in student achievement scores were found to exist within each of the three treatment groups, the research findings did not reveal any one of the instructional treatment approaches to be more effective than others in improving student math performance during the five week summer program.

The percentage of time students demonstrated off task behavior was reported to be minimal for students in each of the instructional groups. Differences observed were not found to be significant across computer assisted, cooperative learning, teacher directed groups.

CHAPTER 5

SUMMARY, CONCLUSION, RECOMMENDATIONS AND REFLECTIONS

The purpose of this study was to determine the relative effectiveness of three instructional delivery approaches--computer assisted instruction, cooperative learning, and teacher directed instruction--used to remediate students during a five week summer program.

Sample

The target population included two-hundred thirty-four rising sixth grade students whose fourth grade math total percentile scores fell on or between the fifteenth and thirty-fifth percentiles. Letters were sent to parents of these students asking their permission to enroll their son or daughter in the summer program. Forty-two percent of the parents responded positively to the invitation.

Students in the sample were then randomly assigned to one of three instructional treatment groups--computer assisted instruction, cooperative learning, or teacher directed instruction based upon their fourth grade (1988) ITBS scores (math total). Eight classes were formed with two classes being taught through computer assisted instruction, three

classes being taught through cooperative learning and three classes being taught through teacher directed methodology.

Teachers self selected the strategy they would use during the summer program. Additionally, these teachers who taught during the summer program--with the exception of the CAI group--participated in the development of an interdisciplinary curriculum which was used during the summer to teach math content. Teachers who developed the CAI curriculum were unable to teach during the summer, however teachers selected for their replacement used prepared materials and lesson plans.

Data Collected

The Iowa Test of Basic Skills math subtest was used to gather data on each treatment group's math achievement during grade 4, grade 5 and at the end of summer school. Fourth grade data were used to randomly assign students to one of three treatment groups while fifth grade scores served as a pretest covariate. At the end of the five week summer program the ITBS was readministered to students to obtain posttest raw score measures on math concept, math problems, math computations and math total.

Time on task data was also collected once weekly by teachers trained in using the Jane Stallings model of coding off task behavior. Weekly observations were made for a

thirty minute period in each of the classrooms and recorded on a form designated for that purpose.

Data Analysis

Four one way ANCOVAs were used to analyze data collected at the end of the summer program on student's math achievement across treatment groups. Posttest raw scores on math concepts, math problems, math computations and math total were compared, using their fifth grade pretest stanine scores as the covariate, to determine the relative effectiveness of the three treatments. The .05 level was chosen as the determinant of significance.

An ANOVA was used to analyze the mean percent of student off task behavior between groups to determine if any of the three treatments was significantly more effective than the others in keeping students engaged in appropriate learning tasks. The data collected were organized to respond to the research question and related question which follow:

Research Question: What is the relative effectiveness of computer assisted instruction, cooperative learning, and teacher directed instruction on improving math performance in low achieving students?

The analysis of posttest scores across the three treatment groups revealed no one strategy to be significantly more

effective than another in improving student's achievement in math over a five week period. Students tended to score highest across the three treatment groups on the computation portion of the test and lowest on solving word problems.

Research Question: What is the relative effectiveness of the three instructional approaches on student on task behavior during the five week summer program?

Observers found students in each of the treatment groups to experience a high rate of involvement in appropriate learning tasks during the observation period. The average percent of student off task behavior for each of the three treatment groups were found to not be significantly different between groups.

* Conclusion

None of the instructional approaches compared were found to be significantly more effective in improving student's math achievement during the summer program. Instead, groups taught through computer assisted instruction, cooperative learning, and teacher directed instruction demonstrated similar score gains after the five week treatment period. These findings may have been more attributed to the conceptual design of the summer remediation program than attributed to the comparative efficacy of the three instructional approaches.

The incorporation of an interdisciplinary curriculum centered around the teaching of math skills through interesting and relevant themes; the inclusion of instructionally related field trips; and the inclusion of weekly visits to the teen store to reward successful work behaviors together may have served as significant motivators which possibly masked or weakened differences in treatment effects which may have existed. One could conclude that the conceptual design of the summer program, coupled with a very competent and highly motivated staff, would produce comparable gains in student achievement irrespective of the instructional approach used.

The length of the treatment period may also have helped to explain math score gains associated with each treatment. Achievement differences of the magnitude needed to determine the relative effectiveness of CAI, cooperative learning and teacher directed instruction may have required a longer treatment period than five weeks while many CAI studies have reported equal or better student achievement in less time than traditionally taught students (Hasselbring, 1984). The claims of effectiveness purported by less formally structured cooperative learning strategies and teacher directed research have been made based on studies conducted over extended periods of time (Johnson, 1984; Kennedy, 1978). Therefore a reasonable conclusion might be that the significant differences in treatment effects anticipated would not have been observed in a five week period due to the protracted treat-

ment period needed to assess the relative effectiveness of these instructional approaches.

The types of treatment interventions compared may have also influenced reported findings. Limited research has been conducted to compare non-traditional approaches--like computer assisted instruction and cooperative learning--to determine which is more effective in improving math achievement. Although differences existed between the elements associated with these strategies, both included critical attributes common to teacher directed instruction. Magidson (1978) and Clark (1985) both concluded that comparisons between CAI and traditional instruction experienced confounding problems because the strategies were not significantly different from each other. This observation would appear to apply to the cooperatively learning treatment as well. Given these treatment conditions and the length of the treatment period one might expect achievement gains to be similar for students taught through computer assisted instruction, cooperative learning or teacher directed strategies. Therefore a finding in this study of no difference in treatment effects appeared to support this conclusion.

While efforts were made to create comparable groups through random assignment, this research approach may not have adequately controlled for variances in student learning styles. Many researchers have reported findings that indicated achievement is either facilitated or inhibited by the

congruency between instructional approaches and student preferred learning styles. How students learn best may have been a more pertinent factor for teachers using cooperative learning. Student achievement in these groups were more directly influenced by the cooperative and effective functioning of group members than students taught in CAI or teacher directed classrooms. One might conclude that the effectiveness of this approach was in part contingent upon what Wheeler (1977) described as a student preference or predisposition for working in groups. Without prior information about how students functioned in groups, more teacher time and attention had to be given to teaching students how to perform as effective group members. Teachers who used this strategy during the summer program expressed more concerns about not having enough instructional time to teach than did teachers from any of the other treatment groups. Student math scores for the cooperative learning groups were consistently lower on each of the dependent measures than scores of their counterparts in the other treatment groups. This observation implied that these findings were a direct result of lost instructional time attributed to time required to teach cooperative group skills. The researcher concluded that the absence of significant treatment effects may have been the result of the degree to which treatment--learning style fits existed and teacher-student interactions were focused on subject matter content.

The findings and subsequent conclusion drawn in this study should be generalized only to sample populations examined under similar conditions. The researcher concluded that neither computer assisted instruction, cooperative learning or teacher directed instruction were found to be significantly more effective than the other in remediating math achievement of rising sixth grade students during a five week summer program. However, several caveats should be considered when attempting to offer an explanation for these findings--the conceptual design of the summer program, the duration of the treatment period, the similarities in treatment interventions, and the possible influence of student learning styles. While this study has not conclusively identified a best way to improve student math achievement it may have provided the practitioner with additional information and insights about how the achievement of low functioning students can be positively influenced by different instructional strategies.

Recommendations

To produce more conclusive findings about the relative effectiveness of the three interventions the following recommendations might be considered:

1. Conduct the study over a longer period of time.

2. Consider learning styles of students when assigning students to treatment groups.
3. Attempt to isolate more effectively the critical attributes of each treatment to provide stronger group comparisons.
4. Consider randomly assigning students to treatment groups based on more specific skill measures like math concepts, math problems or math computations.
5. Create treatment groups which reflect a wider range of achievement levels.

Further research is recommended in the following areas:

1. Determine how critical learning style preferences are to the effectiveness of cooperative learning approaches for different achievement groups.
2. Determine the relative effectiveness of non-traditional instructional approaches in addressing specific math skill deficiencies, i.e., solving word problems in math, improving computational skills, etc.

Reflections

Reflecting back on this study has caused me to realize the importance of asking good questions before identifying what are perceived to be good answers. While much rhetoric

has been expressed about the primary role of administrators as instructional leaders, the litmus test used by many to judge their effectiveness is how well do they solve problems or produce "good" answers. The prospect that large numbers of Hampton's students might fail the newly adopted literacy tests under the Literacy Passport Testing Program (LPTP) created the need for an answer to a big problem--hence the development of this study.

Reflecting back on this study has caused me to develop a greater appreciation for the importance of asking good questions before identifying what is perceived to be good answers. In preparing to conduct this study, several important questions emerged--(1) How could we teach students differently in order to facilitate higher degrees of academic success and (2) could one expect greater student academic gains when using certain nontraditional teaching strategies? While the selection of computer assisted instruction, cooperative learning and teacher directed instruction as treatment options was based on extant research, those findings provided information which was more descriptive than prescriptive about the effectiveness of the three strategies. Computer assisted instruction studies did not include sufficient detail to determine how computers were used so that similar aspects of CAI implementation could be replicated to determine their relative impact on achievement. Best evidence research on cooperative learning described the compo-

sition of cooperative groups, how the strategy was performed, and materials used by the teacher. While inferences were made about the importance of these cooperative learning components, these variables have not been sufficiently studied to determine if these variables or others are the necessary determinants for producing purported student gains associated with cooperative learning. Of the three treatment approaches, only teacher directed instruction research identified the critical attributes of this methodology. In retrospect I have come to realize that more indepth research is needed to determine the fixed, critical attributes of the methodology if previously reported findings are to be replicated. The decision to use the three treatments selected in this study did not provide answers to the problems previously cited as much as it helped to identify more subtle but equally important questions that need to be answered.

During the five week summer program, I learned the importance of considering the context within which learning was to take place. In listening to teachers, and reviewing the literature there was a need to develop a summer program that created an optimum learning environment for all students when examining the effects of the treatment approaches. So often in school based research, a built in bias is presented by giving more attention to the treatment and less attention to the classroom environment in which instruction takes place. Observing students, teachers and parents reactions to thema-

tic units, field trips, and the teen store helped me to realize the importance of addressing the context within which teaching and learning must occur. As one student said to a teacher "this is fun . . . we don't have the same old boring books and stuff."

Through this study I have developed a greater understanding and appreciation for what research is and the planning needed to increase its usefulness at the classroom level. While time was given to the development of appropriate instructional materials, more was needed to provide for more indepth review and field testing in classrooms. Not having allocated time to pilot instructional materials and activities may have confounded achievement gains thought to be associated with the instructional treatments.

If we are to make a difference in student academic performance, instructional leaders must increasingly focus on asking better questions. As a result of this study, research has taken on new meaning for me. To be an instructional leader and make a difference, I must first seek to ask better questions if I can expect to discover better answers.

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APPENDIX A. COMPARATIVE DATA

Comparative Data

ITBS vs. Sample Literacy Passport Test (SLPT)

Grade 6, 1988

ITBS - Number students scoring in bottom

quartile on math subtest 223

SLPT - Number students failing math 509

Number students scoring <25%tile 269

Number students scoring >25%tile 223

APPENDIX B. LETTERS: SUMMER SCHOOL INVITATION



Hampton City Schools Administrative Center

Director of Secondary Instruction

TO: Elementary Principals

FROM:

DATE: March 5, 1989

Attached is the list of students from your school who meet established criteria for being served in the Middle School summer remediation program. This program will focus on improving student's performance in math while reinforcing specific reading and writing skills. The initial contact with parents should be personal, positive and stress the importance of their son or daughter receiving additional assistance. A special orientation activity for all identified students and their parents is being planned for later this spring. Additionally, information regarding this activity will be forthcoming.

Please conduct your initial communication with the parent of students listed by April 21. and will be following up with you personally regarding your initial contacts with parents.

For those of you who are interested in planning parent coffees, please call me if I can be of any assistance to you.

BKC/c

cc:



Hampton City Schools Administrative Center

1819 Nickerson Boulevard
Hampton, Virginia 23663

Billy K. Cannaday, Jr.
Director of Secondary Instruction

June 26, 1989

Dear Parents:

We are pleased that your child is participating in our Summer Passport Program being held July 10 - August 10 from 9:00 a.m. to 11:30 a.m. The teachers have done a tremendous job of creating exciting, fun-filled, and learning experiences for the children. It is extremely important that your child attend every day.

As you know, we are providing transportation pick-up at your door for your child. We do not have a definite time that the bus will be there at your home the first day, but it should be between 8:00 a.m. and 8:30 a.m. If there are any changes in this, we will let you know.

All the children who signed up for this program received a small blue passport to be filled out and returned the first day of school. By returning this, they will receive a free gift from the teen store. In case the passport has been misplaced, another one is enclosed. Be sure to remind your child to bring it with him/her on July 10.

We are looking forward to working with your child this summer. His/her teacher will be contacting you before school starts.

If there are any concerns or questions, you can contact Billy Cannaday or Peggy Brooks at the School Administrative Center.

Thank you again for your child's participation.

Sincerely,

Billy K. Cannaday

Peggy Brooks

BC/PB/c

APPENDIX C. SAMPLE PARENT/STUDENT CONTRACT



PASSPORT TO SUCCESS PART I - (Student)

I, _____ agree to participate in the Summer Passport Program. As a student concerned about school success, I will do the following:

- come to school everyday
- come to school prepared to do my best
- come to school prepared to follow the instructions of my teacher
- come to school prepared to get along with my classmates.

Signature of Student

PART II (Parent)

I, _____ permit my child to attend the Summer Passport Program. As a parent concerned about my child's success in school, I will do the following:

- see that my child attends school everyday
- encourage my child to put forth his/her best effort in school
- encourage my child to listen to his/her teacher
- encourage my child to get along with his/her classmates
- show an interest in my child's work during the Summer Passport Program

I give permission for _____ to participate in the following activities during the Summer Passport Program:

- to attend field trips to a bank, a health and fitness center, and a shopping center
- to participate in interviews and testing to help determine the effects of the summer program on my child.

Signature of Parent

PART III (School)

The Hampton City Schools agree to provide the Summer Passport Program for your child. We believe all students can learn and therefore we will provide learning experiences and activities designed to accomplish this goal. The Hampton City Schools are committed to providing school experiences which focus on student success.....because we care.

Signature of Superintendent

APPENDIX D. CLASS DATA: SUMMER SCHOOL

Computer Assisted Instruction

(Teacher 1)

Math Total

Percentage Score

<u>S</u>	<u>4th Grade ITBS</u>
1	31
2	31
3	15
4	34
5	18
6	28
7	21
8	18
9	28
10	21
11	18
12	28
13	34
n=13	

Computer Assisted Instruction

(Teacher 2)

Math Total

Percentile Score

S 4th Grade ITBS

1	34
2	24
3	34
4	34
5	24
6	24
7	18
8	34
9	24
10	21
11	28
n=11	

Cooperative Learning

(Teacher 1)

Math Total

Percentile Score

<u>S</u>	<u>4th Grade ITBS</u>
1	21
2	28
3	21
4	28
5	18
6	18
7	21
8	34
9	28
10	15
11	28
12	28

n=12

Cooperative Learning

(Teacher 2)

Math Total

Percentile Score

<u>S</u>	<u>4th Grade ITBS</u>
1	15
2	21
3	18
4	21
5	31
6	24
7	24
8	18
9	31
10	28
11	21
12	18
13	24

n=13

Cooperative Learning

(Teacher 3)

Math Total

Percentile Score

<u>S</u>	<u>4th Grade ITBS</u>
1	28
2	24
3	15
4	31
5	24
6	31
7	34
8	31
9	18
10	24
11	31
12	18
13	15
n=13	

Teacher Directed

(Teacher 1)

Math Total

Percentile Score

<u>S</u>	<u>4th Grade ITBS</u>
1	15
2	24
3	34
4	28
5	24
6	24
7	28
8	28
9	34
10	24
11	21
12	31
13	18

n=13

Teacher Directed

(Teacher 2)

Math Total

Percentile Score

S

4th Grade ITBS

1	18
2	34
3	34
4	31
5	12
6	34
7	24
8	34
9	24
10	24
11	28
12	24

n=12

Teacher Directed

(Teacher 3)

Math Total

Percentile Score

<u>S</u>	<u>4th Grade ITBS</u>
1	31
2	34
3	31
4	31
5	28
6	24
7	24
8	24
9	21
10	28
11	24
12	15

n=12

APPENDIX E. SAMPLE: MATH SKILLS INCLUDED IN CURRICULUM MODEL

THEME: TEEN DOLLARS

OBJECTIVES			STRATEGIES
State SOL	Hampton Numeration and Numbers (20%)		
4.01	4001	Identify place value for each digit in 6-digit numeral; in 7-digit numeral; in 9-digit numeral.	Prepare cards with nine digit numbers in which two will have the same digit in the hundred place. Students will pair up using matches. These will later be read. Checks will be written using amounts such as \$1,238,854, etc. Place value chart and/or transparency will be displayed.
4.03 5.02 6.02	4002	Round numbers, 99 or less, to the nearest ten. Round a whole number 9,999 or less to nearest ten, hundred, or thousand. Round a whole number 99,999 or less to nearest ten, hundred, thousand, or ten thousand	Round numbers found as answers to task cards such as: how many depositors, how much money monthly, etc.
4.04	3008	Estimate whole numbers sums and differences.	Use answers from task cards such as if there are _____ depositors and about _____ is deposited each month, estimate the average amount deposited each month.
5.03	5010	Estimate whole number sums, differences, products, and quotients.	Estimate sums on deposit slips. Use menus, tell students they have given amount of money and can buy 4 items. What would they pick, etc. Worksheet.

THEME: TEEN DOLLARS

OBJECTIVES			STRATEGIES
State SOL	Hampton	Computation of Whole Numbers (20%)	
4.11	4016	Read and write decimals expressed as tenths.	Read and write amounts on checks such as \$22.19.
5.08		Read and write decimals through hundredths.	Decimal concepts MECC No A-206 (Maze Runner) Read odometer at beginning and end of a trip. Decimal place value chart (see addendum).
		Computation of Decimals 10%	
4.05	4004	Add with whole numbers.	Use whole numbers amounts on deposit slips.
5.04			
6.04			
4.12	4004	Add with decimals expressed as tenths.	Conquering Decimals MECC No. A-207 Addition
5.10	4017	Add with decimals through hundredths with regrouping	
6.09	6004	Add decimal fractions through thousandths.	Find total amount of dollars, deposit slip involving whole amounts and cents.
4.06	4017	Subtract with whole numbers	Super-market shopping (Cooperative Learning). Ordering from a menu Set up a classroom store.
5.05			
6.05			
4.13	4017	Subtract with decimals expressed as tenths	Make withdrawals (write checks) - both whole dollars and dollars and cents.
5.11		Subtract with decimals through hundredths	MECC (as above) Subtraction

THEME: TEEN DOLLARS

STATE SOL	OBJECTIVES	STRATEGIES
Hampton		
6.10 6004	Subtract with decimals through thousandths	Figuring correct change for order (whole dollars and cents). Subtract mileage on odometer to find distance.
4.07 3009	Find product of two whole numbers basic facts through 9x9.	Multiplication chart
4.08 4009	Find product of 2 whole numbers one factor 999 or less and second factor 9 or less	Menu with multiple items of same price (See Teacher Directed) Shopping list (See Cooperative Learning). Find the cost of multiple items in the classroom store.
4.10 5.07 6.07	Find quotient of 2 whole numbers and the remainder	Leftovers (See Cooperative Learning)
5.09	Compare numerical values of two decimals through hundredths (cents) using $>$, $<$, $=$.	Determine whether there is enough money to make purchases and/or items from a menu.

TIME: TEEN DOLLARS

OBJECTIVES		STRATEGIES
State SOLS	Hampton Measurement and Geometry (20%)	
4.18	Determine value fo a collection money which has total value \$1.00.	worksheets # , # in "teacher directed" packet. Determine from given set coins which can be used to make 43¢, 79¢, \$1.00, etc. MECC Money Works A - 195
4.19	3024 Tell time to the nearest minute Application (20%)	Ask students what time they will be leaving for the bank, what time it is now and how many minutes from now until we will be leaving, etc. MECC Clock Works A-168
4.22	4010 Solve one step problems involving addition, subtraction and multiplication of whole numbers.	Cooperative Learning strips "What's the Question" "Hidden Questions," "Estimating Answers," "Does the Answer Make Sense," "Find the Error?"
5.20	Create a problem based on information from a given problem situation.	
5.21	5009 Solve word problems +, -, x, ÷ whole numbers.	Teacher directed "Beastly Banking"
6.19		Create and share problems using information collected at the bank.
6.21	4025 6020 Determine if a given problem includes sufficient data to solve the problem or contains unnecessary information for solving the problem.	MECC Problem-Solving Strategies A-784

THEME: TEEN DOLLARS

		OBJECTIVES	STRATEGIES
State SOLS	Hampton		
4.24	4023	Solve nonroutine problems	Magic squares Money squares
5.22	5030	Solve nonroutine problems	Unscrambling words
6.22	6019	Solve nonroutine problems	"Wordles" using bank terms.

APPENDIX F. LETTERS: TEACHER SELECTION PROCESS



Hampton City Schools Administrative Center

Superintendent of Schools

TO: Elementary Principals
Middle School Principals

FROM:

DATE: September 8, 1988

SUBJECT: MIDDLE SCHOOL REMEDIATION PROGRAM DEVELOPMENT-STAFF SELECTION

As a school division this year we will continue to address as a major priority the development of a comprehensive remediation program at the middle school level. Two major initiatives will be (1) the development of a summer school remediation program for rising 6th grade students (Summer 1989), and (2) the development of a regular term remediation program for 6th grade students (Fall 1989).

We would appreciate your assistance in the selection of staff to assist us in the development of these programs by asking interested persons to complete the attached application. This application should be returned to you no later than September 16.

Principals are asked to review these applications and forward to Mr. Cannaday only the applications of those individuals you feel meet the criteria stated on the application. These applications will be reviewed by a central committee. On site observations will be a component of the final selection process.

The division's commitment to remediation is rooted in the belief that all children can learn. The identification of strong teachers to assist us in these efforts will make this belief a reality.

c

cc:

Better... Because We Care

**Call for Teachers Interested in Developing
Innovative Remediation Curricula, Grade 6**

SELECTION WILL BE BASED ON THREE PRIMARY CRITERIA:

Skill as a teacher

Ability to write curriculum for low achievers

Willingness to assist with staff development

Applicants may or may not be available to teach in the Summer/Regular School Remediation Program.

WHO IS ELIGIBLE TO APPLY?

Teachers, grades 4-8, who have worked successfully in helping low achievers learn, who believe they can make a special contribution to the Remediation Program, Grade 6, and who have skill in curriculum development. See "Characteristics Desired in Applicants" (attached).

WHAT IS THE TASK?

Between November and April, selected teachers will develop the remediation curriculum (summer and regular) using strategies that are innovative, interdisciplinary, and process-oriented (learning by doing).

They will plan and write curriculum in a combination of workshop sessions and independent follow-up activities.

PAYMENT

Since curriculum writing will occur in part during release time and in part independently, those persons participating will receive payment (to be determined) when the curriculum guide is completed.

Interested teachers should complete the attached application form and submit to their principals by Friday, September 16.

HAMPTON CITY SCHOOLS

**Application Form for Curriculum Development
Remediation Program, Grade 6**

Name _____ School _____

Current Assignment _____

Professional Experience

Other grades taught _____

Cite briefly your experience in teaching low achievers (regular school, summer school, special programs).

List curriculum writing projects in which you have participated.

Explain what contribution you believe you would make to curriculum development for low achieving students.

Deadline for applications: By Friday, September 16, submit to your principal.

**Characteristics Desired in Applicants for Remediation
Curriculum Development Program**

Ability to make students feel good about themselves

Successful teaching of students of varied abilities

Belief that these students can learn

Enthusiasm for learning

Creative, innovated approaches to learning; a willingness to approach learning in different ways

Knowledge of the ways students learn

Interactive skills needed for effective teamwork

Receptivity to cooperative learning

Receptivity to the uses of new technology

Skill in interdisciplinary studies

Analytical skills and the ability to evaluate one's own progress

Skill in planning and the ability to carry out tasks once direction has been set

APPENDIX G. SAMPLE: STAFF DEVELOPMENT ACTIVITIES

MIDDLE SCHOOL SUMMER INSERVICES
(General Guidelines)

- WHEN?** June 12, 13, 14, 15 - (8:30 a.m. - 4:30 p.m.)
- WHO?** All sixth grade teachers who might be teaching students needing remediation.
- WHERE?** Spratley Middle School
- WHAT?** Develop exciting ways of teaching math and writing.
- INCENTIVES?**
- . Opportunity to learn exciting approaches to teaching students who need remediation.
 - . 3 hours non-college credit (tuition paid)
 - . \$100.00 paid to each teacher.
 - . Computer check-out policy for the summer.

(Structure)

What	How	By Whom	When
Overview of Summer School Experience	Grade level meeting	Steering Committee and Selected Teachers	
Cooperative Learning		Staff Development/ Selected Teachers	June 12
*Teacher Directed Instr.		Staff Development/ Selected Teachers	June 13 (am)
Computer Assisted Instr.		CBM/Selected Teachers	June 13 (pm)
Computer Assisted Instr.		CBM/Selected Teachers	June 14
Computer Assisted Instr.		CBM/Selected Teachers	June 15 (am)
Teacher Develop Unit		Summer Schoool Participants	June 15 (pm)

*This strategy has been formally adopted by the division and is the foundation of staff development activities associated with the Hampton Instructional Improvement Model.

The Mid-Atlantic Association for Cooperation in Education (MAACIE)
presents...

COOPERATIVE LEARNING AND MATHEMATICS

with

Neil Davidson is an Associate Professor of Mathematics at the University of Maryland. He has twenty years of experience using cooperative learning methods and has authored two texts, a handbook, and many articles in this field. At this time he is editing a handbook for teachers on cooperative learning and mathematics which will be published later this year. In addition, he is president of MAACIE and a board member of IASCE.

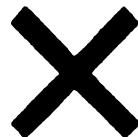
Thursday
March 2, 1989

8:30 - 3:30

This experiential workshop will introduce small group cooperative learning in mathematics by looking at topics such as roles of students and teachers, group formation, instructional materials, and evaluation issues. Participants will experience a variety of cooperative learning strategies as related to mathematics, ranging from simple to complex. Come and start a network of practitioners on cooperative learning in math.

Designed for math practitioners grades 6 - College

WM. PACA STAFF DEVELOPMENT CENTER
Located in P.G. County near the Beltway and Rt. 202.
Easy access!



WORKSHOP REGISTRATION — Deadline February 16, 1989

Workshop fee includes continental breakfast and lunch.

First MI Last
Teacher - Lindsay Middle School
Position School/Office County (if MD)

MAACIE Member \$25.00
Non-Member \$35.00 \$35.00

MAACIE Membership
(through 6/30/89) \$15.00

Limited enrollment on a first come basis.
Mail registration to be received by February 16 to:

Confirmation and directions will be
sent upon receipt of registration.

Registration must be accompanied by payment. No phone registrations, please!
Make checks payable to MAACIE. We regret that we cannot accept purchase orders.
Non-members may join now for \$15.00 and be eligible for membership rates.
(See expiration date on mailing label.)

APPENDIX H. SAMPLE: OFF TASK INSTRUMENT

Figure 1

(Sample)
STUDENTS OFF-TASK SEATING CHART

Teacher Name: Jane Smith Time: 9:00
Date: 9/12/84 Number of Sweeps: 10

Mrs. Smith (front of classroom)

Flora	Mark	Betty	Joe
Jeff U/I ① U/S ② U/S ③ U/Q ④	Susan	Robert	Dona
Ursula C/O ④ C/S ⑦	Daniel	Ellen	Bill U/I ① U/S ② U/S ④ U/S ③
Sharon C/O ③ C/S ⑦	Jack	Les U/I ① C/S ② C/S ⑥ C/S ⑦	Mary

Students' Off-Task Codes Time Sweep Activity Codes

C = CHATTING ① ② ③ ④ I = INSTRUCTION
D = DISRUPTIVE ⑤ ⑥ ⑦ O = ORGANIZING
P = PERSONAL NEEDS ⑧ ⑨ ⑩ R = READING
U = UNINVOLVED S = SEAT WORK
W = WAITING Q = QUESTION/ANSWER
Z = SLEEPING W = WRITTEN WORK
G = GAMES

Source: Stallings Teaching and Learning Institute

STUDENTS OFF-TASK SEATING CHART

Teacher Observed: _____ Date: _____

Observer: _____ Period: _____

- Directions:
1. Have the teacher to be observed draw students' desks as they are in the classroom and label each with the student's name. Return chart to the observer.
 2. Use the codes at the bottom of this page to record students off-task behavior.

USE LARGER SHEET IF NECESSARY

Students' Off-Task
Codes

C = CHATTING
D = DISRUPTIVE
P = PERSONAL NEEDS
U = UNINVOLVED
W = WAITING
Z = SLEEPING

Time Sweep


Activity Codes
I = INSTRUCTION
O = ORGANIZING
R = READING
S = SEAT WORK
Q = QUESTION/ANSWER
W = WRITTEN WORK

SUMMARIZING OFF TASK SEATING CHART

Who was off task the most?

Where were they sitting?

What was the most off task behavior?

- Chatting
- Disruptive
- Personal Needs
- Uninvolved
- Waiting

What might be the cause?

In what activity were students most off task?

- Seatwork
- Organizing
- Instruction
- Oral Reading
- Question/Answer
- Waiting

What might be the cause?

In what sweep were most off task?

<input type="checkbox"/>	1	<input type="checkbox"/>	6
<input type="checkbox"/>	2	<input type="checkbox"/>	7
<input type="checkbox"/>	3	<input type="checkbox"/>	8
<input type="checkbox"/>	4	<input type="checkbox"/>	9
<input type="checkbox"/>	5	<input type="checkbox"/>	10

What might be the cause?

OFF TASK BEHAVIOR

C → CHATTING

D → DISRUPTIVE

P → PERSONAL NEEDS

U → UNINVOLVED

W → WAITING

Z → SLEEPING

SWEET NUMBERS



Scallings Observation System

ACTIVITIES

I → INSTRUCTION

O → ORGANIZING

R → READING

S → SEATWORK

Q → QUESTION/ANSWER

G → GAMES

W → WRITTEN WORK

Stallings Observation System

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