To the Graduate Council:

I am submitting herewith a dissertation written by Katherine Taggart Blackburn entitled "A Correlational and Multiple Regression Analysis of Seventh Grade Mathematics Students' Attitudes and Their Teachers' Characteristics." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Education.

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A CORRELATIONAL AND MULTIPLE REGRESSION ANALYSIS OF SEVENTH GRADE MATHEMATICS STUDENTS' ATTITUDES AND THEIR TEACHERS' CHARACTERISTICS

A Dissertation

Presented for the

Doctor of Philosophy

Degree

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DEDICATION

To Ian

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ABSTRACT

This study examined those behaviors and characteristics of teachers of seventh-grade mathematics students which have relationships with student attitudes toward mathematics and student perceptions of teacher quality.

Data for this study were collected in Oregon in 1979-1980 on 868 seventh grade mathematics students and their 40 teachers. Pearson product-moment correlation coefficients were computed between 32 selected teacher variables and the two student variables of class attitudes toward mathematics and class perceptions of teacher quality and also between the two student variables.

When the class scores for student attitudes toward mathematics were partitioned into quartiles, it was found that in the highest quartile teaching experience had a substantial positive correlation ($\underline{r} = .57$, $\underline{p} < .08$) with student attitudes toward mathematics. Additionally, the teacher variable of having students read aloud in class had a substantial negative correlation ($\underline{r} = -.67$, $\underline{p} < .03$) with student attitudes toward mathematics. When the class scores for student perceptions of teacher quality were partitioned into quartiles, it was determined that in the highest quartile there were substantial positive correlations with frequency of testing ($\underline{r} = .65$, $\underline{p} < .04$) and with diversity of activities in the classroom ($\underline{r} = .55$, $\underline{p} < .10$).

Stepwise regression analyses were conducted. The best set of teacher variables for predicting student attitudes toward mathematics in the highest quartile were number of years of teaching experience and teacher attitudes toward activity and noise in the classroom. Frequency of attendance at mathematics inservice workshops or courses, amount of discipline, and frequency of testing were found to be the best set of teacher predictor variables for the student variable of student perceptions of teacher quality.

The strongest finding of this study was that there is a very strong positive correlation ($\underline{r} = .74$, $\underline{p} < .0001$) between student attitudes toward mathematics and student perceptions of teacher quality. It is recommended that future research into the affective domain be coupled with consideration of the students' cognitive domain.

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CHAPTER I

INTRODUCTION

Of late, teachers have been bearing the brunt of much dissatisfaction with schools and schooling. Many observers both within and outside of education have detailed their dissatisfactions with the curricula, the student outcomes, and the personnel of schools. These observers have leveled many charges for change and action against current educational practice; indeed, the multiplicity in kind and number of dissatisfied observers of education is remarkable. Teachers seem to be caught in a no-win situation, wanting perhaps to effect change and knowing little of how to do so. Teachers and teacher trainers, moreover, are all too often ill-equipped to know what effect their current practices have upon their students and upon their content.

Teachers' effects upon students encompass a wide range of areas. Teachers' effects upon students seem of importance in mathematics more so than in many other disciplines. This importance is only magnified by the fact that too little consideration is given to the student's affective domain in mathematics education; it is also true that teachers little realize this aspect of their teaching responsibilities.

There is no question that teachers play an important role in the learning of mathematics or in the fostering of attitudes of students toward mathematics. Of all the factors affecting students' attitudes and achievements, the teacher may be the most important. Fey (1981), in his review of case studies in 11 school systems aptly noted

> One of the clearest themes running throughout the reports of case study observers was the absolutely crucial role of classroom teachers in determining the character and effectiveness of science and mathematics education. As case study author Rob Walker noted, "Any observer cannot fail to be impressed by the fact that the resources tied up in teaching here are almost entirely human resources." (p. 7)

Gage (1976a) supported Fey's perspective on the importance of teachers when he stated

> For teaching is well-nigh the point of the whole educational enterprise and the enormous establishment that supports it. After everything else has been done and provided--the curriculums developed, the buildings erected, the money raised, the supervisors and administrators trained, the parents and citizens consulted--we come to the point which is teaching, where all of it makes contact with the student, and knowledge, understanding, appreciation, and attitudes are influenced in what we all hope will be desirable ways. (p. 1)

Additionally, Brassell, Petry, and Brooks (1980) note that teachers need to be made aware that their behaviors in the classroom have affective as well as cognitive results upon students:

> Teachers should be aware of the fact that . . . the teacher's attitudes toward mathematics and mathematics students are recognized by their pupils and may be the determinants of pupils' attitudes towards mathematics. (p. 28)

Purpose

The purpose of this study was to examine those behaviors and characteristics of teachers that most affect students in terms of students' attitudes in the mathematics classroom. This purpose was accomplished by making use of data gathered on students and teachers in mathematics classrooms; the data were analyzed by a correlational analysis and regression analysis. The data concerned seventh grade mathematics students' attitudes and their teachers' characteristics and behaviors; students' attitudes encompassed both attitudes towards mathematics and their teachers.

Research Questions

In attempting to identify the characteristics of an effective seventh grade classroom teacher of mathematics, several specific questions for study were posited. Specifically,

1. What are the correlation coefficients between student class attitudes toward mathematics and 32 teacher variables?
2. What are the correlation coefficients between student class perceptions of teacher quality and 32 teacher class variables?

3. What are the teacher variables which correlate highly (.70 or greater) with student attitudes toward mathematics?
4. What are the teacher variables which correlate highly (.70 or greater) with student perceptions of teacher quality?
5. What are the correlation coefficients between the variables of the most effective teachers and the student variable of attitudes toward mathematics?
6. What are the correlation coefficients between the variables of the most effective teachers and the student variable of perceptions of teacher quality?
7. What are the correlation coefficients between student attitudes toward mathematics and student perceptions of teacher quality?
8. What is the set of teacher variables which best predicts student attitudes toward mathematics?
9. What is the set of teacher variables which best predicts student perceptions of teacher quality?

Rationale

Much work has been done in regard to student attitudes in mathematics, and much has been done in the area of teacher effectiveness in terms of achievement. A need exists, however, to bring together these interests in student attitudes and the multitude of teacher variables in the mathematics classroom. Several kinds of studies have prepared the groundwork for a study such as this one.

First, there have been a number of research studies conducted on attitudes toward mathematics. Most of these research studies on attitudes toward mathematics have focused on achievement, innovative programs, or intelligence. Few have concentrated on the relationship of teacher characteristics or behaviors to student attitudes.

A second kind of study that lays the groundwork for the research of this current study is a wealth of recent research conducted in the area of teacher effectiveness. Robitaille (1975b) stated, "The area of teacher effectiveness has produced probably more research than any other in the field of education" (p. 249). In nearly all of these studies, emphasis was placed on the student variable of achievement. Rarely have studies dealt with teacher effectiveness in terms of student attitudes.

Further studies have indicated that grades five through nine can be considered the crucial years in students' mathematical development (Wheeler & Bezuszka, 1982) as well as in the development of attitudes toward mathematics (Callahan, 1971; Taylor, 1970). Even though these grades have been deemed vital, there has been relatively little research focusing on the variables which influence the development of attitude in the junior high grades (Shaughnessy, Haladyna, & Shaughnessy, 1983). In fact, the young adolescent has rarely been the focus of intense investigation (Wheeler & Buzuska, 1982). The lack of cohesive bodies of knowledge about the middle school or junior high student and learning of the sciences was described in a National Science Foundation paper by Haertel (1978).

Moreover, current public demands and recent reports such as A Nation at Risk: The Imperative for Educational Reform by the National Commission on Excellence in Education (1983) have pointed to the fact that effective teaching is imperative. School administrators who must make hiring decisions or renewal of contract decisions need ways to identify effective teachers. Teacher training programs also need ways to be able to identify effective or less effective potential teachers (Begle, 1979).

Thus, it is evident that research is needed in the area of teacher effectiveness with respect to the affective domain, particularly in the junior high grades. Not only is it imperative that the affective domain be further investigated, but also it is necessary that research into the relationships between various aspects of student affects and teacher behaviors and characteristics be examined.

Definition of Terms

The following definitions are given for the context of this study and will be utilized in the course of reporting results:

1. Attitudes toward mathematics. "A general emotional disposition toward the school subject of mathematics" (Haladyna, Shaughnessy, & Shaughnessy, 1983). The authors note that this definition should

   > not be confused with attitude toward the field of mathematics, toward one's ability to perform in the field of mathematics, or toward some specific area within mathematics (e.g., geometry, word problems). (p. 20)

   This study utilizes the same definition.

2. Student perceptions of teacher quality. Student respect for the teacher, teacher praise and reinforcement, teacher fairness to students, teacher commitment to help students learn, and teacher support for the individual.

3. Teacher effectiveness. The ability of a classroom teacher to produce relative high classroom scores on attitudes towards mathematics or on student perceptions of overall teacher quality.

Assumptions

The following assumptions are implicit in this study:

1. Teachers play an important role in students' acquisition of attitudes toward mathematics.
2. Student attitudes towards mathematics are related positively to achievement in mathematics.
3. More effective teachers have characteristics different from less effective teachers.
4. The affective domain is important in the process of schooling and in terms of long-range student outcomes.
5. The instruments used to gather data about the teachers and the students were appropriate measures given the focus of the investigation.
6. The data were gathered, recorded, and stored accurately.
7. All survey respondents, both teachers and students, answered as honestly and as accurately as possible.

Limitations

1. The sample was limited to 40 classes of students and their teachers in the state of Oregon.
2. Minority groups were not well represented.
3. Self-report measures may have questionable validity. For example, teachers may wish to present themselves in a "good light" and may have answered with what they perceived to be the "correct" responses

rather than with their true feelings. However, since the current state of the art in instrumentation in affective studies affords no better alternative instrument, for the work of this study, respondents' answers to the questionnaire are considered accurate replies to the items of the instrument.

4. Teaching is a very complex process, and as Cooney (1980) states,

> This complexity makes it very difficult to conduct, review, and synthesize research on teaching particularly with respect to specific variables. Further, the complexity also ensures that correlations with specific variables and student achievement will be low. (p. 455)

   The same might be stated of student attitudes.

5. Measures of teacher effectiveness are relative. As Begle (1979) said, "We can only deal with the effectiveness of a teacher relative to the effects of a pool of teachers. . . ." (p. 29).

Organization of the Study

The chapters are organized in the following manner. Chapter I consists of the introduction, purpose, research questions, rationale, definition of terms, assumptions, limitations, and organization of the study.

Chapter II presents a review of the literature related to student attitudes toward mathematics, student perceptions of teacher quality, mathematics attitudes in the junior high years, and teacher effectiveness.

Chapter III contains the methodology of the study, including background, sample, instruments, procedures, and analysis of data.

Chapter IV is comprised of the results and findings of the study.

Chapter V consists of the summary, conclusions, and recommendations and suggestions for further study.

CHAPTER II

REVIEW OF THE LITERATURE

Since the purpose of this effort is to identify the characteristics of effective mathematics teachers with respect to student attitudes toward mathematics and toward their teachers, various studies concerning student attitudes toward mathematics will be discussed. Second, literature relating to student perceptions of teacher quality will be reviewed. Third, research on mathematics attitudes in the junior high years will be described; and fourth, recent research on teacher effectiveness will be presented.

Student Attitudes Toward Mathematics

A vast number of research studies have focused on attitudes toward mathematics, and there have been extensive reviews of these research studies (Aiken, 1970a, 1976; Begle, 1979; Kulm, 1980). Aiken (1976) stated that in the decade of the seventies there were more dissertations and articles relating to the subject of attitudes toward mathematics than in the preceding decade. Shaughnessy, Haladyna, and Shaughnessy (1982) described the research of this topic as a "popular enterprise" (p. 21).

The measurement of student attitudes toward mathematics is most important since:

1. positive attitudes may promote among students the desire to take additional high school and college advanced level mathematics courses and to pursue mathematics or mathematics-related careers.
2. some states have mandated that schools promote and certify competencies, one of which is the cultivation and promotion of positive attitudes toward learning.
3. a number of educators and psychologists have independently recognized and supported the importance of the affective domain in the schooling process.
4. there is in the literature a documented positive relationship between student achievement and attitude.

Each of these reasons is supported by the research literature and will be discussed briefly.

Aiken (1970b) noted that attitudes can be expected to predict which courses a high school or college student selects and whether he persists in the class. He stated of the relationship between attitudes and future coursework in mathematics:

> . . . this in itself constitutes reason enough to search for ways of improving attitudes, especially when one considers the fact that mathematics is listed by high-school and college students as one of their most disliked subjects. (p. 252)

The large amount of research on attitudes toward mathematics may indicate that mathematics educators intuitively recognize that negative attitudes toward mathematics may result in declining enrollment in high school advanced mathematics courses. One's tendency to elect to take mathematics courses in both high school and college and to choose or pursue careers in scientific and technological areas might be enhanced by positive attitudes toward mathematics (Haladyna, Shaughnessy, & Shaughnessy, 1983; Reyes, 1980; Shaughnessy, Haladyna, & Shaughnessy, 1983).

Another reason that the study of attitudes is important is that some states have insisted that schools "promote and certify competencies in a wide variety of areas, one of which deals with the fostering of a positive attitude toward learning" (Haladyna & Thomas, 1979a, p. 19). For example, Oregon has mandated the promotion of positive attitudes toward learning in their minimum standards for public schools (Haladyna & Thomas, 1979b).

Affective education and the role of attitudes toward learning and future learning is deemed important by educators and psychologists. For example, Mager (1965) stated: "The sole intent is to aid in sending students away from your instruction anxious to use what you have taught them--

and eager to learn more" (p. 3). Shaughnessy, Haladyna, and Shaughnessy (1983) observed that

> By including measures of student attitude toward mathematics in evaluations of curriculum innovations, mathematics educators are acknowledging that improved student achievement is not the only desired outcome of the experimental treatment. (p. 22)

Some studies have considered the improvement of student attitudes as a valuable end product in and of itself (Conference Board of the Mathematical Sciences National Advisory Committee on Mathematical Education, 1975; Epstein, 1981; Pavlic, 1975). Begle (1979) states, "I am sure that most readers would agree with me that positive attitudes toward mathematics, even if they did not correlate at all with achievement, would be intrinsically desirable" (p. 99). Aiken (1970b) points out that

> Educators sometimes forget that cognitive achievement is not the only criterion of the success of an educational program. In addition to being a place where facts, principles, and methods are learned, school is also a place where attitudes, values, beliefs, and the desire for further learning are shaped. (p. 253)

A number of studies have found that students' achievement and grades in mathematics were significantly and positively related to their attitudes toward mathematics. Reyes (1980) states that

> Not only do attitudes toward mathematics influence a student's willingness to enroll in more

> mathematics courses, but these attitudes also influence how much effort a student will put into learning mathematics after enrolling in mathematics classes. Beginning in the elementary school years, continuing into the middle school years, and increasingly in the high school years, students who have positive feelings about mathematics exert more effort, spend more time on tasks, and are more effective learners than students with poor attitudes. (p. 163)

Husen (1967), in his study of achievement in mathematics, found that achievement was positively correlated with interest in mathematics at all levels in the twelve countries included in his study. Reyes (1980) stated, "Some students . . . are prevented from learning as much as they might by negative attitudes and feelings about mathematics" (p. 162). According to Aiken (1972), some investigators have found that the correlation between attitudes and achievement is often higher for mathematics than for other school subjects which have more verbal content. Aiken further noted that it has been shown that if attitudes, interests, or anxiety levels are considered when designing mathematics tests and lessons, performance can improve. Riedesel and Burns (1973) report that their research survey revealed that there is a low positive relationship between student attitudes toward mathematics and mathematics achievement. Aiken (1970a) stated, "The relationship of attitudes, which are integrally related to expectations, to performance appears to be especially important in mathematics learning" (p. 559). Begle (1979) examined 93 studies concerning mathematics attitudes and found that there is a significant positive correlation between attitudes and achievement and observed that "positive attitudes go with greater achievement." Other investigations found significant relationships between attitudes toward mathematics and mathematics achievement (Aiken, 1961, 1970a, 1972, 1976; Alpert, 1963; Burbank, 1970; Marijoribanks, 1976; Moore, 1972; Neale, 1969). In summary, it can be noted that there is a modest relationship between attitudes and achievement in school mathematics.

A few studies have addressed the question of teacher and learning environment variables with respect to mathematics attitudes. Aiken (1970a) stated that of all the factors affecting student attitudes toward mathematics, teacher attitudes are viewed as being especially important. Torrance and Parent (1966) provided evidence on the importance of the teacher in mathematics attitudes development. Phillips (1970, 1973) reported evidence that the teacher's attitudes toward arithmetic is significantly related to the students' attitudes and achievement. Poffenberger and Norton (1956) opined that elementary mathematics teachers can have a strong positive or negative effect upon a student's attitudes and achievement in mathematics. Aiken (1970a) stated

> Although it is certainly unfair to indict teachers too strongly as creators of negative

> student attitudes toward mathematics, the results of research have suggested that the teacher, perhaps even more than the parents, is an important determiner of student attitudes. (p. 589)

Student Perceptions of Teacher Quality

Campbell and Schoen (1977) found a strong relationship between the students' attitudes toward mathematics and their attitudes toward their teachers. Students who make better grades in mathematics than in other courses tend to have positive attitudes toward both mathematics and their mathematics teacher. Brassell, Petry, and Brooks (1980) noted that students' attitudes toward their teacher could affect their attitudes toward mathematics.

Further, there is evidence that student self-reports on teacher quality seem to be related to mathematics attitudes (Haladyna, Shaughnessy, & Shaughnessy, 1983). Shaughnessy, Haladyna, and Shaughnessy (1983) reported that nearly all endogenous teacher variables correlate highly with attitudes toward mathematics in the seventh and ninth grades. Overall teacher quality in the seventh grade shows a strong relationship with mathematics attitudes and is described as one of the most potent predictors of attitudes toward mathematics. For example, Rosenshine (1971) located six studies which show that student ratings of teachers did have a positive relationship with student achievement. Evertson, Anderson, Anderson, and Brophy (1980) reported significant associations between measures of students' attitudes toward their teachers and measures of student achievement. Seventh and eighth grade mathematics teachers who obtain higher student achievement levels are rated more favorably than those teachers who obtain lower achievement levels (Evertson, Emmer, & Brophy, 1980).

Mathematics Attitudes in the Junior High Years

Both student attitudes toward mathematics and student perceptions of teacher quality are necessary aspects to be investigated in any study of affective variables. One other such variable all too often overlooked is the relative importance of the junior high years in the development of affects in mathematics that may well preclude any reversal of attitudes at a later date. In other words, the junior high years may set patterns in effect that may never be changed.

Riedesel and Burns (1973) noted that evidence exists showing attitudes toward arithmetic might be created in the early elementary grades and that the intermediate grades are of particular importance in attitudes formation to mathematics. Upper elementary and junior high grades are perceived as being especially vital to the development of attitudes toward mathematics (Aiken, 1976; Callahan, 1971; Taylor, 1970). Carpenter et al. (1981) noted that from the ages of 13 to 17 there was a decline in overall favorableness toward mathematics. Reys and Delon (1968) stated that the greatest percentage of prospective teachers surveyed felt that the junior high years were the time when the students' attitudes toward arithmetic reached a developmental peak. They said, "Even under more contemporary mathematics curricula, junior high school seems to be a critical point in determination of attitudes toward mathematics" (p. 556).

Haladyna and Thomas (1979a) stated, in their study on student attitudes toward school and subject matters, "The sharp decline in virtually all attitudes between grades six and seven is dramatic and provocative" (p. 22). Little research, however, has been done in regard to the teacher characteristics or classroom behaviors which might influence these student attitudes. Wheeler and Bezuszka (1982) observe that even though the middle school grades are vital, comparatively little professional material has focused on these grades.

Teacher Effectiveness

In determining the variables associated with teacher effectiveness, a wealth of research has been produced. Teacher data has been collected and analyzed on everything from knowledge of subject matter to personality traits to mental hygiene and from citizenship to physical fitness.

This review of the research encompasses the following categories: biographical (teaching experience, age, sex, number of degrees held, and professional preparation); inservice or workshop activities; mathematics classroom activities (lectures, seatwork, audiovisual aids and games, homework, questioning techniques, and tests); classroom management (formality or rules, discipline, need for structure, and business-like manner); teacher attitudes toward mathematics; and affective characteristics (warmth, enthusiasm, and praise).

Most of the research surveyed finds no major differences in teacher effectiveness when biographical information on teachers is considered. Teachers' age, sex, and years of experience do not, in most of the studies, relate to students' mathematics achievement (Amidon & Flanders, 1967; Begle, 1973, 1979; Eisenberg, 1977; Morsh & Wilder, 1954; Paulsen, 1977; Rosenbloom, Torrance, & Flanders, 1966). Popham (1971) concluded that experienced teachers do no better than nonteachers in the promotion of significantly better achievement of given instructional objectives.

However, Evertson, Emmer, and Brophy (1980) found that the more effective teachers had slightly more experience. In Rosenshine's review of nine studies of the amount of teaching experience, all but two studies showed positive correlations with student achievement, but in only two are the comparisons statistically significant (1971). Robitaille (1975a) did find that the amount of teaching experience is a good predictor for teacher effectiveness.

Little relationship between teacher effectiveness and number of degrees held has been found (Begle, 1979; Evertson, Emmer, & Brophy, 1980). Professional preparation, however, is often found to have a relationship with teacher effectiveness (Barr, 1961; Morsh & Wilder, 1954; Rosenshine, 1971), although Popham (1971) casts doubt on the importance of professional training.

Inservice training or workshops has been shown to have some positive effects. For example, Good and Grouws (1978, 1979) opined that when fourth grade teachers received instructions about the characteristics of effective mathematics teachers, an effective relationship resulted in regard to student achievement scores. Smith and Haley (1981) noted that an inservice program for teachers has a significant effect on the achievement of fifth grade students who were in his study. Other researchers observed that teacher inservice training programs, in terms of student achievement, produce positive results (Begle, 1979; Charles, 1980; Good, 1979b; Haley, 1980; Houston & DeVault, 1963).

Several studies found that the more effective teacher spent more time on lecture or content presentations and discussions and less time on individual seatwork. For example, Evertson, Emmer, and Brophy (1980) concluded that the more effective teachers use about half of each classroom session for lecture-demonstration. The less effective teacher, however, uses only about one-fourth of the class session for lecture and discussion and more than half of each period is spent in seatwork. These conclusions are consistent with the findings of Dessart and Frandsen (1973), Evertson, Anderson, Anderson, and Brophy (1980), and Good and Grouws (1981).

When audiovisual aids were utilized, Evertson, Emmer, and Brophy (1980) reported no significant differences. Warren (1973) found that the lecture method is better in terms of student achievement than using commercially available games. Begle (1979), in his survey, reported that instructional TV, instructional films, audio tapes and overhead projectors sometimes produce slightly better achievement results but just as frequently, produce no gain.

More effective teachers assign homework more frequently (Evertson, Emmer, & Brophy, 1980). Austin (1979) reported that homework seems preferable to non-homework but that homework which is drill in nature might not be of much value. Good (1978) discovered that those teachers who have daily homework assignments have students who significantly exceed the performance of students in a control group who do not receive homework assignments. Good and Grouws (1977b;

1981) ascertained that teacher effectiveness has an association with higher achievement expectations including more homework and a faster pace.

Teacher effectiveness has been shown to be related to questioning techniques by the teacher. Rosenshine and Furst (1971) listed probing as a variable which has some support in having an effect on student achievement. Thornton (1977) reported observing significant correlations between clarity, questioning, and pupil involvement and student achievement. Evertson, Anderson, Anderson, and Brophy (1980) and Good and Grouws (1977b) showed that the effective mathematics teacher asks more questions which are public in nature, thus creating more response opportunities. They detected a positive relationship between the proportion of questions asked which called for student explanations and mathematics achievement. Teachers who had higher frequencies of students who failed to respond to the questions are found to be not as academically effective. In the same study, it is noted that teachers who asked new academic questions and integrated the students' contributions into the class discussion or simplified the original question are rated higher by the students than teachers who ignored the students' questions, asked another student, or gave the answer. Evertson, Emmer, and Brophy (1980) discovered that the more effective teachers ask more process and product questions of both volunteers and nonvolunteers than the less effective teachers. Concerning questioning, Gage (1976a) stated

> Finally, let me turn to another variable that seems to be yielding fairly consistent results. This is the degree to which the teacher asks higher-order questions, that is, questions that call upon the student to do some thinking, or information processing, rather than merely recall and regurgitate what he has already been told or has read. Questions that call for mere recall of what has been read or heard are called lower-order questions . . . . it has . . . consistently been found that lower questions produce better student knowledge and also comprehension than do higher proportions of higher-order questions. (pp. 19-20)

Begle (1979) reported that increased frequency of testing does result in better student performance. Difficult tests, however, are less effective than easy ones. On the other hand, Evertson, Emmer, and Brophy (1980) noted that there are no significant differences in the amount of time devoted to testing when comparing the more effective teachers with the less effective teachers.

Managerial factors seem to play an integral role in determining teacher effectiveness. Haladyna, Shaughnessy, and Shaughnessy (1983) reported that management-organization and teacher quality seem to be strongly associated, more so in the seventh grade than in grades four or nine. Evertson, Anderson, Anderson, and Brophy (1980) noted that the teachers who were more academically effective had, in general, better organized classrooms and fewer behavior problems. These teachers stopped problems before they got out of hand and managed their classes efficiently. Robitaille (1975b) examined three teacher patterns described by Ryans (1960) in an effort to discover which of the patterns best describes the classroom behavior of highly effective teachers of high school mathematics. He found the most effective teachers have Ryans' Pattern Y behavior characteristics (businesslike and systematic in their teaching). Cooney (1980) and Rosenshine and Furst (1971), in their reviews, reported that task-oriented or businesslike behaviors relate significantly to teacher effectiveness. Kounin (1970) reported that a significant link exists between student achievement and the teacher who exhibits strong managerial skills and minimizes inappropriate behavior, makes more efficient transitions, and maintains the focus of the group (had more student attentiveness). Brophy and Evertson (1976) showed that the more successful teachers have classroom rules which are more general in nature while less effective teachers either have so many specific rules that the rules are of no use or they have no classroom rules at all. The importance of managerial variables are noted by a number of other researchers (Emmer, 1981; Evertson, 1979; Evertson, Emmer, & Brophy, 1980; Good, 1979a; Good & Grouws, 1975, 1979). In fact, Good (1979a) stated, "Teachers' managerial abilities have been found to relate positively to student achievement in every process-product study conducted to date" (p. 54). Berlinger (1980) found that achievement has a positive correlation with the teacher behavior of monitoring and states that teachers should be trained as executives.

There are conflicting reports concerning the relationship between teacher effectiveness and the variable of teacher attitudes toward mathematics. Aiken (1970a) reported that teacher attitudes toward mathematics are of particular importance. Phillips (1973) found evidence that the teacher's attitudes toward arithmetic are related significantly to the student's attitudes and achievement. He noted, however, that this relation was not evident if the attitude of only the student's most recent teacher were under consideration, but when two of the student's teachers of the three preceding years have positive attitudes, student attitudes and achievement seem to be related in a positive manner. Gitlin (1980) found no significant differences between pupil achievement gains and teacher attitudes toward mathematics. Fey (1981) stated: "The teachers' beliefs about the nature of mathematics . . . are more subtle, but equally important, influences in their impact on students" (pp. 19-21). Begle (1979) reports that out of six studies he reviewed, only two resulted in significant relationships between teacher attitudes and student achievement, and one of those showed that negative attitudes correlate with higher achievement. According to Begle, although most studies done on the attitudes of teachers toward mathematics assume that it is of importance that teachers have positive attitudes toward mathematics, these attitudes may not be as important as it is thought to be.

Cooney (1980) reported that affective variables include a teacher's conviviality, enthusiasm, use of sarcasm, and attitudes. Evertson, Anderson, Anderson, and Brophy (1980) reported that the more effective teachers display more affection, enthusiasm, and are more geared to students' personal needs. Students give higher ratings to those teachers who show the characteristics of warmness, nurturing, and responsiveness to the students' personal needs. Gillett and Gall (1980) tested the causal link between student achievement and teacher enthusiasm and perceived that teachers who had enthusiasm training exhibited a significant increase in their own level of enthusiasm and that their pupils had a significantly higher level of at-task performance. Rosenshine and Furst (1971) reported that enthusiasm is one of five teacher behavior variables that has strong support from empirical studies as having an effect upon student achievement. Gage (1976a) stated

> Whether enthusiasm has been rated or measured by observers, or on the other hand, manipulated by experimenters, it has quite uniformly turned out that more enthusiastic teachers have students who learn differently than those of less enthusiastic teachers. (p. 18)

Rosenshine and Furst (1971) discovered support for the "warm" teacher. Rosenshine (1971) reviewed 16 reports which compare teacher behavior with student achievement. Four of these show significant positive effects of teachers' warmth on student achievement.

Teacher praise and encouragement has been noted to be of importance by a number of researchers (Amidon & Flanders, 1967; Dunkin & Biddle, 1974; Evertson, Anderson, Anderson, & Brophy, 1980; Evertson, Emmer, & Brophy, 1980; Robitaille, 1975a; Sandefur & Adams, 1976). Stallings (1976) observed that while students with low entering ability gain more from a high praise rate, students who have a higher entering ability do not profit as much. Stallings and Kaskowitz (1975) found a positive correlation of using criticism preceding an incorrect answer with achievement. Good and Grouws (1977b) noted that they found praise to be negatively related to achievement. In their study, the more effective teachers consistently praise less than the less effective teachers. In their 1981 study, Good and Grouws stated that teacher effectiveness was associated with comparatively little use of praise and criticism. Brophy and Evertson (1974) questioned the use of high praise for capable students.

It seems that patterns or clusters of variables are more likely to be associated with teacher effectiveness than a single variable. Powell (1976) stated that specific teacher behaviors may be less important than patterns of teacher behaviors. This concept is supported by the findings of McDonald (1976) and McDonald and Elias (1976). Good and Grouws (1977b) noted that patterns of consistent behavior can be identified for both high-effective and less effective mathematics teachers and that there are differences in the patterns for the two groups. Evertson, Emmer, and Brophy (1980) stated that there are multiple aspects to teacher effectiveness which cannot be reduced to a single behavior. They further stated

> Effective teaching is not the mastery of a few "key" skills; it is the orchestration of a great many skills into a coherent system that meets the needs of the class. (p. 177)

Good and Grouws (1977a) stated that it is very unlikely that any single teacher behavior will have a great effect on achievement or be a determining factor in who is or is not an effective teacher. It is more probable that a number of behaviors which are interrelated act together to enhance student learning. Furthermore, it is possible that some of the behaviors labeled as being related to teacher effectiveness are not valid. Therefore, it is important for researchers to look for groups or clusters of related behaviors which appear to be linked to teacher effectiveness. Gage (1976b) noted that the effects of several variables are additive in nature while the effect of any one variable of teaching is small.

Summary

The measurement of student attitudes toward mathematics is important because positive attitudes may promote the desire of students to take more mathematics courses and to choose mathematics or mathematics related careers, because a number of educators and psychologists have recognized the importance of the affective domain in the education process, because some states have mandated that schools promote the cultivation of positive attitudes toward learning, and because a positive relationship between student achievement and attitudes toward mathematics has been found to exist.

Since there exists the demand for developing in students positive attitudes toward mathematics, several knowledge bases about developing such positive attitudes in students should be explored. These areas of concern for developing positive attitudes center around student and teacher variables such as learning environment, attitudes towards teachers, teacher effectiveness, and students' perceptions of teacher quality. One caveat, however, should be kept in mind: variables should be examined in combination rather than single, isolated differences; indeed, a number of researchers conclude that there is no one single teacher variable which determines teaching effectiveness. Rather, these teacher variables are to be seen in collections of variables.

Few studies have addressed the question of teacher and learning environment variables with respect to students' attitudes toward mathematics. Some evidence is found to support the fact that the teacher plays an important role in determining students' attitudes towards mathematics. In fact, several studies have found evidence that there exists a strong relationship between the students' attitudes toward mathematics and their attitudes toward their teachers. Also, student reports on teacher quality and effectiveness seem to be related to attitudes toward mathematics and to the grade of the student in school with the junior high years seemingly bearing the crux of attitudes formation in mathematics.

The need for research on teacher effectiveness, then, is clear. There has, indeed, been a vast amount of recent research conducted on teacher quality and effectiveness. Most of these studies have addressed the issue of teacher effectiveness as related to student achievement. What these research accounts have omitted, however, is the relationship of teacher effectiveness and its role in fostering positive student attitudes towards mathematics. It seems that the teacher variables already examined as strongly related to teacher effectiveness in regard to student achievement are inservice activities, time spent on lecture or presentation of course content, amount of homework assigned, questioning techniques, managerial factors, enthusiasm, warmness, and praise-giving. These factors now need to be interrelated in the research with outcomes such as student attitudes as a result of teacher effectiveness.

Since there is a relationship between student attitudes toward mathematics and achievement, and since there seems to be a relationship between student reports of teacher quality and attitudes toward mathematics and also achievement, both cognitive and affective student variables should be considered in determining teacher effectiveness. Because there is such a preponderance of research on the cognitive domain, this study will focus on the affective domain, that is, teacher effectiveness in terms of student attitudes toward mathematics and student perceptions of teacher quality.

CHAPTER III

METHOD

Background

Haladyna and Shaughnessy (1982) developed the Manual for the Inventory of Affective Aspects of Schooling (IAAS) as a by-product of a six-year research endeavor concerning attitudes toward school and a variety of subject matters. The purpose of the IAAS was to provide an inventory to survey systematically aspects of the affective domain. Additionally, data were gathered on more than 6,000 Oregon students and their teachers. This effort, in part, was funded by a grant from the National Science Foundation.

This study utilized the IAAS testing instrument, the Manual, and a portion of the data base described above as the basis for inquiry and analysis.

Sample

Data were collected during the 1979-80 school year on over 6,000 students and approximately 350 elementary and junior high teachers in the state of Oregon. The collection of this data was partially funded by a National Science Foundation grant. Data were collected on teachers and their classes of grades four, seven, and nine in the areas of mathematics, social studies, and science.

The data analyzed in this study were extracted from the data on seventh-grade students and their teachers in the area of mathematics. Students and their teachers in 40 seventh-grade classes participated in the study. The sample sizes are shown in Table 1.

Table 1

Sample Sizes of Seventh Grade Mathematics Students and Their Teachers in the Oregon Data, 1979-1980

	Students	Teachers
Male	418	27
Female	450	12
Unreported	-	1
Total	868	40

Samples were drawn utilizing a stratified, random sampling scheme which controlled for school size and district size at each grade level and state region. The purpose was to draw from schools that widely represented rural and urban localities and from varied school environments. Of the student sample, 10.4% was nonwhite including 1.7% Mexican-American and 5.7% American Indian. Thus, minority groups were not especially well represented. There was a wide variation within the sample with regard to socio-economic status, family mobility, attendance at school, and television viewing habits.

Instruments

One version of the Inventory of Affective Aspects of Schooling (IAAS) was administered to fourth grade students, and another version was administered to seventh and ninth grade students. A teacher version of the IAAS was completed by the teachers of these students. The IAAS was developed by Haladyna and Shaughnessy (1982) for the Teaching Research Division of the Oregon State System of Higher Education. It was designed expressly as a multiscale instrument to tap aspects of student motivation, teacher quality, social-psychological class climate, management-organization class climate, and attitudes toward mathematics. It measures theoretically relevant variables which may be classified as student, teacher, or learning environment.

Scales were developed by selecting items from the Learning Environment Inventory by Anderson and Walberg (1976) and the Classroom Environment Scales by Moos and Trickett (1974). A number of items from other scales were either adopted or adapted from the National Assessment of Educational Progress (NAEP) and other existing research instruments. In addition, the scales of the Affective Reporting System (ARS) by Haladyna and Thomas (1979b) were adopted in the IAAS. When the IAAS is used as a research instrument, the yield is very high. It is the belief of Haladyna and Shaughnessy (1982) that the IAAS offers considerable information about important affective variables. The seventh and ninth grade version of the IAAS is given in Appendix A.

A comprehensive teacher version of the IAAS was constructed by Haladyna and Shaughnessy (1982) as a research instrument. Content experts selected and constructed items which reflect concerns of the study of attitudes. The teachers' version of the IAAS is presented in Appendix B.

Procedures

District administrators gave written permission to administer the tests. A trained test administrator visited the classroom and administered the IAAS to the students. During the student IAAS administration, the teacher left the classroom and completed the teacher version of the IAAS. The IAAS was self-administered at the seventh-grade level, but assistance was offered to students who had difficulty in reading items. All the responses were anonymous to promote honest answers and to guarantee confidentiality.

Analysis of Data

Student attitudes toward mathematics is defined by Haladyna and Shaughnessy (1982) to be a general emotional disposition toward the school subject of mathematics: this study utilized the Haladyna and Shaughnessy definition.

Student perceptions of teacher quality included student respect for the teacher, teacher praise and reinforcement, teacher fairness to students, teacher commitment to help students learn, and teacher support for the individual. Items for the student variable of attitudes toward mathematics are listed in Table C-1, Appendix C, and items for the student variable of perceptions of teacher quality are listed in Table C-2, Appendix C. Reliability estimates for attitudes towards mathematics and perceptions of teacher quality are .67 and .93, respectively, as determined by Haladyna and Shaughnessy (1982).

The class was the unit of analysis for this study; many studies reviewed have used the individual student as the unit of analysis. Lavin (1965) objected to this latter approach and says that by disregarding the effects of the class, the students are treated as though they are in a vacuum. Moos and David (1981) observed that the classroom is a microenvironment with its own features. Haladyna, Shaughnessy, and Shaughnessy (1983) noted that instructional changes would probably have a more permeating effect on a class of students than on the individuals within the class. They stated

> Perhaps the most compelling argument for studying class effects is that most classrooms are organized so as to produce such effects. Although certain factors such as aptitude, achievement, sex, and motivation are known to correlate to

> some extent with attitude toward mathematics, some of the more prominent, yet virtually unstudied, variables are measured at the class level and may have the most telling effects at this level. These variables include teacher quality and the learning environment. (p. 19)

Student scores on the two sections of attitudes toward mathematics and perceptions of teacher quality and scores for teachers' responses on each of the 32 variables were converted to z scores where $z = (X-\bar{X})/s$, and the z scores were converted to T scores where $T = 10z + 50$; $\mu = 50$; $\sigma = 10$. Means and standard deviations were determined for each class with respect to student attitudes toward mathematics and student perceptions of teacher quality. Data for students who did not complete the items under consideration in this study were eliminated. Utilizing all 40 classes, Pearson product-moment correlation coefficients were computed between the class means of the T scores (class scores) of the two student variables of attitudes toward mathematics and perceptions of teacher quality and the 32 teacher variables. The means of the T scores of the 40 classes were then partitioned into quartiles, and a high group-low group comparison was made utilizing a <u>t</u>-test. The null hypothesis was that there was no significant difference between the means, and alpha was set at .01. The highest quartile and the lowest quartile means were examined and the teacher data from the teacher version of the IAAS for those classes were analyzed. The 32 teacher variables under consideration in this study and the test items for the teacher variables are listed in Table C-3, Appendix C.

Pearson product-moment correlations were computed between the teacher variables of the classes with mean scores in the highest quartile for the student variable of attitudes toward mathematics and the teacher variables of the classes with mean scores in the highest quartile for the student variable of perceptions of teacher quality. The same procedure was followed for classes with mean scores in the lowest quartile. In addition, Pearson product-moment correlations were computed between the variables of student attitudes toward mathematics and student perceptions of teacher quality in the highest and lowest quartiles.

To determine the set of teacher variables which best predicts student attitudes toward mathematics, a stepwise multiple regression analysis was conducted. Stepwise multiple regression analysis was also utilized to determine the set of teacher variables which best predicts student perceptions of teacher quality. For example, out of 10 teacher variables there might be three main predictor teacher variables, X_1, X_2, X_3, which account for, say, 85% of the explained variance of students' perceptions of teacher quality (Y'). The inclusion of the other remaining variables would account for small and diminishing amounts to prediction. Suppose X_1 is the frequency of classroom discussions, X_2 is the amount of discipline in the clasroom, and X_3 is a measure of the teacher attitudes toward mathematics. Then, the multiple regression prediction equation provided by the computer might be

$$Y' = .30 + .40X_1 + .03X_2 + .75X_3$$

In other words, suppose a teacher had T scores of 40 on classroom discussion, 70 on amount of discipline, and 36 on attitudes towards mathematics. Then Y' (predicted scores of students' perceptions of teacher quality) would be

$$Y' = .30 + .40(40) + .03(70) + .75(36) = 45.40$$

If $R^2 = .85$, then 85% of the variance is accounted for by the three teacher variables.

CHAPTER IV

RESULTS

Data on seventh-grade mathematics students and their teachers from the Oregon study were statistically analyzed. From these analyses, several tables of results were constructed for the variables being studied.

Class means (class scores) and standard deviations of student attitudes toward mathematics and student perceptions of teacher quality are listed in Table 2. The mean of student attitudes toward mathematics for the 40 classes was 49.89, and the standard deviation was 4.26. The range was 19.54. The mean of the class scores of student perceptions of teacher quality for the 40 classes was 49.71, and the standard deviation was 4.83. The range was 19.70.

Research Questions

RESEARCH QUESTION #1: What Are the Correlation Coefficients Between Student Class Attitudes Toward Mathematics and 32 Teacher Variables?

Pearson product-moment correlation coefficients were computed between 32 teacher variables and the student class means (class scores) of attitudes toward mathematics. The correlation coefficients and *p* values are listed in Table 3.

Table 2

Summary of Class Scores (Class Means) and Standard Deviations of Student Attitudes Toward Mathematics and Student Perceptions of Teacher Quality

Class ID	$\underline{n}$	Class score (class mean) of student attitudes toward mathematics	Standard deviation	Class score (class mean) of student perceptions of teacher quality	Standard deviation
1	24	58.21	10.92	55.45	9.24
2	18	55.01	11.37	54.80	10.91
3	25	46.98	6.98	45.15	5.32
4	25	49.32	10.75	59.18	11.64
5	19	47.32	9.70	53.09	7.08
6	28	46.50	9.63	47.46	6.65
7	19	42.55	9.75	42.26	7.94
8	25	49.09	10.97	49.15	11.19
9	17	49.84	7.61	48.73	9.53
10	12	51.27	10.68	53.03	10.01
11	26	44.71	6.47	47.70	6.55
12	17	48.29	10.59	43.54	6.82
13	29	55.47	11.06	56.84	12.54
14	22	49.85	9.05	47.44	5.77
15	13	55.62	6.74	46.27	8.12
16	20	54.58	10.20	52.58	11.52
17	20	52.54	7.16	51.60	9.51
18	28	47.86	7.27	43.85	4.36
19	26	53.82	11.23	52.13	8.29
20	22	52.38	10.66	53.88	11.73
21	31	47.15	6.27	48.23	7.44
22	22	51.58	9.02	53.46	9.36
23	20	49.32	8.27	49.62	7.57
24	23	60.76	7.68	59.98	11.63
25	15	44.64	6.52	45.38	9.83
26	21	49.04	11.69	46.82	9.02
27	23	50.21	9.39	50.63	10.72
28	23	53.39	9.40	54.27	8.23
29	23	46.14	8.31	47.70	8.90
30	28	49.32	5.28	49.36	6.80
31	26	44.26	8.62	42.92	4.47
32	14	46.81	8.42	48.12	6.57
33	26	49.43	6.64	50.83	9.77
34	28	57.26	11.78	59.99	11.24
35	24	47.25	11.42	47.03	10.30
36	19	51.32	12.45	44.46	11.07
37	13	41.22	9.86	40.29	4.20
38	16	50.96	9.12	44.80	3.93
39	22	48.39	8.91	50.40	8.86
40	16	46.03	7.84	50.10	10.63
	$\underline{N}$ = 868	$\bar{X}$ = 49.89;	$\underline{s}$ = 4.26	$\bar{X}$ = 49.71;	$\underline{s}$ = 4.83

Table 3

Pearson Product-Moment Correlation Coefficients for 32 Teacher Variables as Measured by the Teacher Version of the IAAS and the Student Class Means of Attitudes Toward Mathematics and Perceptions of Teacher Quality as Measured by the Student Version of the IAAS

Teacher variables	Correlation coefficients of the teacher variables with the class means of student attitudes toward mathematics (N = 40)	$p <$	Correlation coefficients of the teacher variables with the class means of teacher quality (N = 40)	$p <$
Teaching experience	-.03	.84	.09	.57
Attendance of mathematics inservice workshops or courses	-.06	.70	-.10	.52
Conduct workshops	-.18	.27	.04	.81
Attendance at regional or national meetings	-.28	.08***	-.18	.28
Recent mathematics courses	-.17	.30	-.27	.09***
Lecture	.04	.79	.10	.56
Seatwork	-.03	.86	-.06	.71
Students read aloud	.39	.01*	.34	.03**
Students read text	.10	.53	.09	.58
Students write reports	.01	.97	-.04	.81
Library work	-.03	.87	-.08	.62
Manipulatives, lab materials, or games	-.04	.79	-.03	.84
Students read other materials	-.01	.95	.03	.84
Homework	.09	.56	-.04	.81
Class discussion	.14	.40	.03	.88
Work sessions or projects	.23	.15	.14	.38
Testing	.14	.39	.11	.51
Informal counseling time	.01	.97	-.12	.48
Formality	-.11	.52	.08	.64
Diversity	.09	.57	.19	.25
Activity and noise	-.16	.32	-.05	.77

Table 3 (continued)

Teacher variables	Correlation coefficients of the teacher variables with the class means of student attitudes toward mathematics (N = 40)	$p <$	Correlation coefficients of the teacher variables with the class means of teacher quality (N = 40)	$p <$
Questioning techniques	-.03	.85	-.06	.69
Stress problems, contradictions, issues, etc.	-.01	.93	-.10	.54
Students move freely in classroom	.18	.26	.25	.12
Discipline	-.10	.55	-.06	.70
Importance of mathematics to teacher	.15	.35	.23	.16
Teacher attitudes toward mathematics	-.002	.99	-.12	.45
Teacher preparation in mathematics	.23	.16	.19	.25
Philosophy of instruction	.07	.67	-.001	.99
Need for structure	.18	.27	.25	.12
Attitudes toward simulation and games	.33	.03**	.22	.18
Attitudes toward films	.22	.16	.28	.08***

*Significant at the .01 level.

**Significant at the .05 level.

***Significant at the .10 level.

All 40 classes were utilized in determining these correlation coefficients.

Research Question #2: What Are the Correlation Coefficients Between Student Class Perceptions of Teacher Quality and 32 Teacher Variables?

Pearson product-moment correlation coefficients were calculated between 32 teacher variables and the student class means (class scores) for perceptions of teacher quality. The correlation coefficients and *p* values are listed in Table 3. All 40 classes were utilized in determining these correlation coefficients.

Research Question #3: What Are the Teacher Variables Which Correlate Highly (.70 or Greater) with Student Attitudes Toward Mathematics?

When all 40 classes were utilized, none of the teacher variables had a high correlation (.70 or greater) with the class scores of student attitudes toward mathematics.

Research Question #4: What Are the Teacher Variables Which Correlate Highly (.70 or Greater) with Student Perceptions of Teacher Quality?

None of the 32 teacher variables correlated highly (.70 or greater) with the class scores of student perceptions of teacher quality. This finding was obtained when the scores of all 40 classes were used.

Research Question #5: What Are the Correlation Coefficients Between the Variables of the Most Effective Teachers and the Student Variable of Attitudes Toward Mathematics?

The class scores for the student variable of attitudes toward mathematics were partitioned into quartiles to determine the most effective teachers and the least effective teachers in terms of student attitudes toward mathematics. The upper quartile scores determined the most effective teachers, and the lower quartile scores determined the least effective teachers. The class scores for the highest and lowest quartiles are listed in Table 4. The mean for the scores of attitudes toward mathematics in the highest quartile was 55.67, and the standard deviation was 2.47. The mean for the scores of attitudes toward mathematics in the lowest quartile was 44.98, and the standard deviation was 1.91.

A high group-low group comparison was made between the highest quartile group and the lowest quartile group. The null hypothesis was that there was no significant difference between the means of the two groups, and alpha was set at .01. A two-tailed $\underline{t}$ test was conducted ($\underline{t}$ = 10.81, $\underline{df}$ =

Table 4

Highest and Lowest Quartile Class Scores of Student Attitudes Toward Mathematics Listed by Descending Order

Highest quartile		Lowest quartile	
Class ID number	Class score	Class ID number	Class score
24	60.76	3	46.98
1	58.21	32	46.81
34	57.26	6	46.50
15	55.62	29	46.14
13	55.47	40	46.03
2	55.01	11	44.71
16	54.58	25	44.64
19	53.82	31	44.26
28	53.39	7	42.55
17	52.54	37	41.22
N = 10		N = 10	
$\bar{X}$ = 55.67, s = 2.47		$\bar{X}$ = 44.98, s = 1.91	

18), and the null hypothesis was rejected since the *t* value greatly exceeded the critical value of 2.87.

Pearson product-moment correlation coefficients were computed between the 32 teacher variables of the classes with class scores in the highest quartile for the student variable of attitudes toward mathematics. The correlation coefficients and *p* values are shown in Table 5. The teacher variables which correlated, with a significance level of .10, with the student variable of attitudes toward mathematics were teaching experience (*r* = .57) and having students read aloud (*r* = -.67).

Additionally, Pearson product-moment correlation coefficients were computed for the class scores of attitudes toward mathematics in the lowest quartile and the 32 teacher variables of the teachers of those classes. The correlation coefficients and *p* values are shown in Table 6. Those teacher variables which correlated most highly with the student variable of attitudes toward mathematics in the lowest quartile at the .10 level of significance were: manipulatives, lab materials, or games (*r* = .63); discipline (*r* = .61); and attitudes toward simulations and games (*r* = -.58).

A summary of the teacher variables which correlated at the .10 level of significance with the student variable of attitudes toward mathematics is presented for both the highest and the lowest quartiles in Table 7.

Table 5

Pearson Product-Moment Correlation Coefficients Between 32 Teacher Variables and the Student Variable of Attitudes Toward Mathematics (Highest Quartile)

Teacher variables	Correlation coefficients of the teacher variables and the class scores for student attitudes toward mathematics (N = 10)	p <
Teaching experience	.57	.08***
Attendance of mathematics inservice workshops or courses	.06	.88
Conduct workshops	.16	.65
Attendance at regional or national meetings	.26	.46
Recent mathematics courses	-.27	.44
Lecture	-.44	.20
Seatwork	-.19	.60
Students read aloud	-.67	.03**
Students read text	.006	.99
Students write reports	-.39	.26
Library work	-.23	.53
Manipulatives, lab materials, or games	-.22	.55
Students read other materials	-.26	.47
Homework	-.52	.12
Class discussion	-.09	.80
Work sessions or projects	.34	.34
Testing	.30	.40
Informal counseling time	-.05	.90
Formality	-.20	.59
Diversity	-.03	.93
Activity and noise	-.50	.14
Questioning techniques	.06	.87
Stress problems, contradictions, issues, etc.	.09	.80
Students move freely in classroom	-.16	.65
Discipline	.11	.76
Importance of mathematics to teacher	.24	.51
Teacher attitudes toward mathematics	-.03	.93
Teacher preparation in mathematics	-.18	.62
Philosophy of instruction	.18	.63
Need for structure	.003	.99
Attitudes toward simulations and games	.12	.74
Attitudes toward films	.19	.60

**Significant at the .05 level.

***Significant at the .10 level.

Table 6

Pearson Product-Moment Correlation Coefficients Between 32 Teacher Variables and the Student Variable of Attitudes Toward Mathematics (Lowest Quartile)

Teacher variables	Correlation coefficients of the teacher variables and the class scores for student attitudes toward mathematics (N = 10)	p <
Teaching experience	-.53	.12
Attendance of mathematics inservice workshops or courses	-.39	.27
Conduct workshops	-.28	.44
Attendance at regional or national meetings	-.10	.79
Recent mathematics courses	-.38	.28
Lecture	-.07	.85
Seatwork	.05	.89
Students read aloud	-.14	.69
Students read text	-.004	.99
Students write reports	.13	.71
Library work	.32	.37
Manipulatives, lab materials, or games	.63	.05**
Students read other materials	.52	.12
Homework	-.13	.73
Class discussion	-.06	.86
Work sessions or projects	.15	.69
Testing	-.10	.78
Informal counseling time	.16	.66
Formality	-.24	.51
Diversity	.09	.81
Activity and noise	.25	.49
Questioning techniques	.50	.14
Stress problems, contradictions, issues, etc.	.00	1.00
Students move freely in classroom	.36	.30
Discipline	.61	.06***
Importance of mathematics to teacher	-.38	.28
Teacher attitudes toward mathematics	-.07	.85
Teacher preparation in mathematics	-.02	.97
Philosophy of instruction	.37	.29
Need for structure	-.12	.75
Attitudes toward simulations and games	-.58	.08***
Attitudes toward films	-.16	.67

**Significant at the .05 level.

***Significant at the .10 level.

Table 7

Summary of Pearson Product-Moment Correlation Coefficients and *p* Values for Teacher Variables Which Correlated at the .10 Level of Significance with the Student Class Means of Attitudes Toward Mathematics and Perceptions of Teacher Quality in the Highest and Lowest Quartiles of Class Means

Teacher variables	Correlation coefficients of teacher variables with class scores of student attitudes toward mathematics (N = 10)	*p* <	Correlation coefficients of teacher variables with class scores of student perceptions of teacher quality (N = 10)	*p* <
Highest quartile				
Teaching experience	.57	.08		
Students read aloud	-.67	.03**		
Testing			.65	.04**
Diversity			.55	.10
Lowest quartile				
Manipulatives, lab materials, or games	.63	.05**		
Discipline	.61	.06		
Attitudes toward simulations and games	-.58	.08		

**Significant at the .05 level.

Research Question #6: What Are the Correlation Coefficients Between the Variables of the Most Effective Teachers and the Student Variable of Perceptions of Teacher Quality?

Class scores for the student variable of perceptions of teacher quality were partitioned into quartiles. The teachers of the classes in the highest quartile were considered to be the most effective in terms of student perceptions of teacher quality, and the teachers in the lowest quartile were considered to be the least effective in regard to student perceptions of teacher quality. The class scores for the highest and lowest quartiles are listed in Table 8. The mean for the scores of student perceptions of teacher quality in the upper quartile was 56.09, and the standard deviation was 2.72. The mean for the scores of student perceptions of teacher quality in the lowest quartile was 43.89, and the standard deviation was 1.74. A high group-low group comparison was made between the highest quartile group and the lowest quartile group. The null hypothesis was that there was no significant difference between the means of the two groups, and alpha was set at .01. A two-tailed t test was conducted (t = 11.94, df = 18). Thus, the null hypothesis was rejected since t greatly exceeded the critical value of 2.87.

Table 8

Highest and Lowest Quartile Class Scores of Student Perceptions of Teacher Quality Listed by Descending Order

Upper quartile		Lower quartile	
Class ID number	Class score	Class ID number	Class score
34	59.99	15	46.27
24	59.98	25	45.38
4	59.18	3	45.15
13	56.84	38	44.80
1	55.45	36	44.46
2	54.80	18	43.85
28	54.27	12	43.54
20	53.88	31	42.92
22	53.46	7	42.26
5	53.09	37	40.29
N = 10		N = 10	
$\bar{X}$ = 56.09, s = 2.72		$\bar{X}$ = 43.89, s = 1.74	

Pearson product-moment correlation coefficients were computed between the 32 teacher variables of the classes with class scores in the highest quartile for the student variable of perceptions of teacher quality. The correlation coefficients and $\underline{p}$ values are shown in Table 9. The teacher variables of the most effective teachers which correlated substantially with student perceptions of teacher quality were testing ($\underline{r}$ = .65) and diversity ($\underline{r}$ = .55) when the level of significance was .10.

Pearson product-moment correlation coefficients were also computed for the lowest quartile (the least effective teachers) teacher variables and the student variable of perceptions of teacher quality. The correlation coefficients and $\underline{p}$ values are shown in Table 10. None of the correlations were significant at the .10 level.

The teacher variables which had statistical associations at the .10 level with the student variable of perceptions of teacher quality are summarized in Table 7.

Research Question #7: What Are the Correlation Coefficients Between Student Attitudes Toward Mathematics and Student Perceptions of Teacher Quality?

A Pearson product-moment correlation coefficient was computed between the two student variables of attitudes

Table 9

Pearson Product-Moment Correlation Coefficients Between 32 Teacher Variables and the Student Variable of Perceptions of Teacher Quality (Highest Quartile)

Teacher variables	Correlation coefficients of the teacher variables and the class scores for student perceptions of teacher quality (N = 10)	p <
Teaching experience	.30	.40
Attendance of mathematics inservice workshops or courses	-.14	.71
Conduct workshops	-.37	.30
Attendance at regional or national meetings	-.21	.55
Recent mathematics courses	-.04	.92
Lecture	-.09	.79
Seatwork	-.29	.42
Students read aloud	-.29	.41
Students read text	.25	.48
Students write reports	.004	.99
Library work	.13	.72
Manipulatives, lab materials, or games	.15	.69
Students read other materials	-.12	.73
Homework	.00	1.00
Class discussion	.03	.94
Work sessions or projects	.46	.18
Testing	.65	.04**
Informal counseling time	-.004	.99
Formality	-.22	.55
Diversity	.55	.10***
Activity and noise	-.29	.42
Questioning techniques	-.54	.11
Stress problems, contradictions, issues, etc.	-.03	.94
Students move freely in classroom	-.24	.50
Discipline	.28	.43
Importance of mathematics to teacher	.52	.12
Teacher attitudes toward mathematics	-.05	.89
Teacher preparation in mathematics	-.08	.83
Philosophy of instruction	.02	.96
Need for structure	.37	.30
Attitudes toward simulations and games	.40	.25
Attitudes toward films	.34	.34

**Significant at the .05 level.

***Significant at the .10 level.

Table 10

Pearson Product-Moment Correlation Coefficients Between 32 Teacher Variables and the Student Variable of Perceptions of Teacher Quality (Lowest Quartile)

Teacher variables	Correlation coefficients of the teacher variables and the class scores for student perceptions of teacher quality (N = 10)	*p* <
Teaching experience	-.35	.32
Attendance of mathematics inservice workshops or courses	-.12	.75
Conduct workshops	.00	1.00
Attendance at regional or national meetings	.27	.44
Recent mathematics courses	-.13	.71
Lecture	-.09	.81
Seatwork	-.10	.79
Students read aloud	.07	.84
Students read text	.21	.57
Students write reports	-.07	.84
Library work	.13	.73
Manipulatives, lab materials, or games	-.02	.96
Students read other materials	.46	.19
Homework	.05	.90
Class discussion	-.01	.98
Work sessions or projects	-.26	.48
Testing	-.46	.18
Informal counseling time	-.15	.67
Formality	-.32	.37
Diversity	.14	.71
Activity and noise	-.18	.62
Questioning techniques	.46	.18
Stress problems, contradictions, issues, etc.	-.24	.50
Students move freely in classroom	.37	.29
Discipline	.20	.58
Importance of mathematics to teacher	-.50	.14
Teacher attitudes toward mathematics	.48	.16
Teacher preparation in mathematics	.26	.46
Philosophy of instruction	.26	.47
Need for structure	.11	.75
Attitudes toward simulations and games	-.50	.14
Attitudes toward films	.11	.76

toward mathematics and perceptions of teacher quality. All 40 class scores for the two variables were utilized. There was a very strong positive correlation (r = .74, p < 0.0001) between the two student variables of attitudes toward mathematics and perceptions of teacher quality.

Research Question #8: What Is the Set of Teacher Variables Which Best Predicts Student Attitude Toward Mathematics?

A stepwise multiple regression analysis was conducted to determine the best set of 32 teacher variable predictors for the student variable of attitudes toward mathematics. When all 40 classes were utilized, no small best set (4 or less) of teacher variables for prediction student attitudes toward mathematics was found. It required sixteen teacher variables to account for 79% of the variance of student attitudes toward mathematics (R^2 = .79; F = 5.30; df = 16,23; p < .0002). The 32 predictor teacher variables utilized in all the stepwise multiple regression analyses are listed in Table 11. The stepwise prediction equations for predicting student class scores of attitudes toward mathematics from the 32 teacher variables when all 40 classes are considered are listed in Table 12.

When the class scores for attitudes toward mathematics were partitioned into quartiles, the best small set of

Table 11

32 Teacher Variables Used for Predicting Student Class Scores of Attitudes Toward Mathematics and for Predicting Student Class Scores of Perceptions of Teacher Quality

X_n (Teacher variable)		
X_1	=	Teaching experience
X_2	=	Attendance of mathematics inservice workshops or courses
X_3	=	Conduct workshops
X_4	=	Attendance at regional or national meetings
X_5	=	Recent math courses
X_6	=	Lecture
X_7	=	Seatwork
X_8	=	Students read aloud
X_9	=	Students read text
X_{10}	=	Students writing reports
X_{11}	=	Library work
X_{12}	=	Manipulatives, lab materials, or games
X_{13}	=	Students read other materials
X_{14}	=	Homework
X_{15}	=	Class discussions
X_{16}	=	Work sessions or projects
X_{17}	=	Testing
X_{18}	=	Informal counseling time

Table 11 (continued)

X_n (Teacher variable)	
X_{19} =	Formality
X_{20} =	Diversity
X_{21} =	Activity and noise
X_{22} =	Questioning techniques
X_{23} =	Stress problems, contradictions, issues, etc.
X_{24} =	Students move freely
X_{25} =	Discipline
X_{26} =	Importance of mathematics
X_{27} =	Attitudes toward mathematics
X_{28} =	Preparation in mathematics
X_{29} =	Philosophy of instruction
X_{30} =	Need for structure
X_{31} =	Attitudes toward simulations and games
X_{32} =	Attitudes toward films

Table 12

Stepwise Prediction Equations for Predicting Student Class Scores of Attitudes Toward Mathematics from 32 Teacher Variables When All 40 Classes Are Considered

Step	Equation	F	R^2
I	$Y' = 55.95 + 0.12X_4$	3.34***	.08
II	$Y' = 50.21 + .13X_{29} + .14X_4$	3.90**	.17
III	$Y' = 43.41 + .15X_{29} + .14X_4 + .12X_{15}$	4.10*	.25
IV	$Y' = 34.10 + .21X_{29} + .15X_4 + .13X_{15} + .12X_{32}$	4.15*	.32
. . .	. . .	. . .	. . .
XXXII	$Y' = 44.48 - .13X_{19} + .21X_{20} - .17X_{25} - .09X_{26} - .14X_{27} - .07X_{28} + .10X_{29} + .16X_{30} - .10X_1 + .26X_2 - .06X_3 + .63X_4 - .57X_5 - .37X_6 + .04X_7 - .29X_8 + .06X_9 - .0001X_{10} - .12X_{11} + .04X_{12} + .06X_{13} + .02X_{14} + .35X_{15} + .18X_{16} + .16X_{17} + .04X_{18} + .04X_{18} + .04X_{21} + .17X_{22} + .03X_{23} + .04X_{24} - .06X_{31} + .17X_{32}$	1.89	.90

*Significant at the .01 level.

**Significant at the .05 level.

***Significant at the .10 level.

Note. Y' is predicted student class scores of attitudes toward mathematics; X_1, X_2, X_3, ... X_{32} are teacher predictor variables as defined in Table 11.

teacher variable predictors for student attitudes toward mathematics in the highest quartile was number of years of teaching experience and teacher attitudes concerning activity and noise in the classroom. Eighty-one percent of the variance of student attitudes toward mathematics was accounted for by these two teacher variables ($R^2 = .81$; $\underline{F} = 14.50$; $\underline{df} = 2,7$; $\underline{p} < .003$). The stepwise prediction equations for predicting student class scores in the highest quartile of attitudes toward mathematics from the 32 teacher variables are listed in Table 13. The best set of teacher variable predictors for student attitudes toward mathematics in the lowest quartile was teacher preparation in mathematics, frequency of use of manipulatives, lab materials, or games in the classroom and teacher questioning techniques. Eighty-nine percent of the variance was accounted for by these three teacher variables ($R^2 = .89$; $\underline{F} = 15.44$; $\underline{df} = 3,6$; $\underline{p} < .003$). The stepwise prediction equations for predicting student class scores in the lowest quartile of attitudes toward mathematics from the 32 teacher variables are listed in Table 14.

Research Question #9: What Is the Set of Teacher Variables Which Best Predicts Student Perceptions of Teacher Quality?

Table 13

Stepwise Prediction Equations for Predicting Student Class Scores in the Highest Quartile of Attitudes Toward Mathematics from the 32 Teacher Variables

Step	Equation	F	R^2
I	$Y' = 66.56 - .21X_8$	6.51**	.45
II	$Y' = 74.27 + .20X_1 - .17X_{21}$	14.5*	.81
III	$Y' = 71.23 + .20X_1 + .05X_{17} - .16X_{21}$	13.05*	.87
.	.	.	.
.	.	.	.
.	.	.	.
IX	$Y' = 50.99 + .19X_{20} + .27X_{26} + .28X_1 - .08X_4 - .04X_5 - .03X_6 + .08X_{10} - .16X_{21} - .08X_{32}$	999999.99*	1.00

*Significant at the .01 level.

**Significant at the .05 level.

Note. Y' is predicted student class scores in the highest quartile of attitudes toward mathematics; X_1, X_2, X_3, ... X_{32} are teacher predictor variables as defined in Table 11.

Table 14

Stepwise Prediction Equations for Predicting Student Class Scores in the Lowest Quartile of Attitudes Toward Mathematics from 32 Teacher Variables

Step	Equation	$\underline{F}$	$\underline{R}^2$
I	$Y' = 37.46 + .15X_{12}$	5.25**	.40
II	$Y' = 31.77 + .15X_{12} + .12X_{22}$	5.79**	.62
III	$Y' = 36.06 - .22X_{28} + .19X_{12} + .19X_{22}$	15.44*	.89
.	.	.	.
.	.	.	.
.	.	.	.
IX	$Y' = 31.97 - .04X_{26} - .13X_{28} - .02X_{2} - .05X_{5} + .14X_{12} + .001X_{16} + .02X_{17} + .01X_{18} + .18X_{22}$	999999.99*	1.00

*Significant at the .01 level.

**Significant at the .05 level.

Note. Y' is predicted student class scores in the lowest quartile of attitudes toward mathematics; X_1, X_2, X_3, ... X_{32} are teacher predictor variables as defined in Table 11.

When all 40 classes were utilized in a stepwise regression analysis to determine the best set of teacher variable predictors for the student variable of perceptions of teacher quality, no small best set of teacher variables was found. Twelve teacher variables were required to account for 80% of the variance of student perceptions of teacher quality ($R^2 = .80$; $\underline{F} = 9.29$; $\underline{df} = 12,27$; $\underline{p} < .0001$). The stepwise prediction equations for predicting student class scores of perceptions of teacher quality are listed in Table 15. When the class scores of student perceptions of teacher quality were partitioned into quartiles, the best set of teacher predictor variables for student perceptions of teacher quality in the highest quartile was amount of discipline in the classroom, frequency of attendance of mathematics inservice workshops or courses, and frequency of testing. These three teacher variables accounted for 89% of the variance in the class scores of student perceptions of teacher quality in the highest quartile ($R^2 = .89$; $\underline{F} = 16.53$; $\underline{df} = 3,6$; $\underline{p} < .003$). The stepwise prediction equations for predicting student perceptions of teacher quality in the highest quartile from the 32 teacher variables are listed in Table 16. In the lowest quartile of class scores of student perceptions of teacher quality, the teacher variables of attitudes toward mathematics, need for structure, and attitudes toward simulations and games

Table 15

Stepwise Prediction Equations for Predicting Student Class Scores of Perceptions of Teacher Quality from 32 Teacher Variables When All 40 Classes Are Considered

Step	Equation	F	R^2
I	$Y' = 39.42 + .21X_{16}$	8.41*	.18
II	$Y' = 30.56 + .16X_{15} + .23X_{16}$	7.38*	.29
III	$Y' = 23.18 + .13X_{7} + .18X_{15} + .22X_{16}$	6.67*	.36
IV	$Y' = 29.95 - .13X_{19} + .14X_{7} + .18X_{15} + .21X_{16}$	6.57*	.43
⋮	⋮	⋮	⋮
XXXII	$Y' = 26.21 - .17X_{19} + .05X_{20} + .08X_{25} - .02X_{26}$ $- .07X_{27} + .04X_{28} + .003X_{29} + .14X_{30}$ $- .19X_{1} + .14X_{2} + .11X_{3} + .44X_{4} - .24X_{5}$ $- .12X_{6} + .14X_{7} - .14X_{8} - .01X_{9} - .19X_{10}$ $+ .13X_{11} - .17X_{12} + .16X_{13} - .12X_{14} + .25X_{15}$ $+ .29X_{16} + .19_{27} + .02X_{18} + .12X_{21} + .06X_{22}$ $- .06X_{23} - .05X_{24} + .07X_{31} + .11X_{32}$	2.92***	.93

*Significant at the .01 level.

***Significant at the .10 level.

Note. Y' is predicted student class scores of perceptions of teacher quality; X_1, X_2, X_3, ... X_{32} are teacher predictor variables as defined in Table 11, p. 58.

Table 16

Stepwise Prediction Equations for Predicting Student Class Scores in the Highest Quartile of Perceptions of Teacher Quality from the 32 Teacher Variables

Step	Equation	*F*	R^2
I	$Y' = 48.06 + .17X_{17}$	5.97**	.42
II	$Y' = 40.46 + .16X_{20} + .17X_{17}$	9.38*	.73
III	$Y' = 26.96 + .16X_{25} - .18X_2 + .25X_{17}$	16.53*	.89
.	.	.	.
.	.	.	.
.	.	.	.
X	$Y' = 6.20 + .18X_{25} + .05X_{26} - .19X_{29}$ $- .34X_2 + .10X_5 + .05X_{13} + .16X_{14}$ $- .001X_{16} + .38X_{17} + .17X_{22}$	999999. *	1.00

*Significant at the .01 level.

**Significant at the .05 level.

Note. Y' is predicted student class scores of perceptions of teacher quality in the highest quartile; $X_1, X_2, X_3, \ldots X_{32}$ are teacher predictor variables as defined in Table 11, p. 58.

accounted for 78% of the variance in the class scores of student perceptions of teacher quality ($R^2 = .78$; $F = 7.10$; $df = 3,6$; $p < .02$). The stepwise prediction equations for predicting student class scores in the lowest quartile of perceptions of teacher quality from the 32 teacher variables are listed in Table 17.

Summary of Results

When all 40 classes were utilized in the correlational analysis, none of the 32 teacher variables correlated highly (.70 or greater) with the student variables of attitudes toward mathematics and perceptions of teacher quality. Even so, the following variables were statistically significant at the .10 level when correlated with the student variable of attitudes toward mathematics: attendance at national or regional mathematics meetings ($r = -.28$); students read aloud ($r = .39$); and attitudes toward simulations and games ($r = .33$). Those teacher variables which were statistically significant at the .10 level when correlated with the student variable of perceptions of teacher quality were: recent mathematics courses ($r = -.27$); students reading aloud in class ($r = .34$); and attitudes toward films ($r = .28$).

When the 40 classes were partitioned into quartiles and a comparison was made between the means of the highest

Table 17

Stepwise Prediction Equations for Predicting Student Class Scores in the Lowest Quartile of Perceptions of Teacher Quality from the 32 Teacher Variables

Step	Equation	F	R^2
I	$Y' = 48.81 - .10X_{26}$	2.64	.25
II	$Y' = 40.13 + .18X_{30} - .12X_{31}$	5.92**	.63
III	$Y' = 34.46 + .09X_{27} + .19X_{30} - .11X_{31}$	7.10**	.78
.	. .	.	
.	. .	.	
.	. .	.	
X	$Y' = 5.45 - .02X_{19} + .25X_{27} + .20X_{30} - .25X_{3}$ $- .09X_{2} + .01X_{6} - .03X_{10} + .14X_{17}$ $+ .003X_{18} - .18X_{31}$	999999.99*	1.00

*Significant at the .01 level.

**Significant at the .05 level.

Note. Y' is predicted student class scores of perceptions of teacher quality in the lowest quartile; X_1, X_2, X_3, ... X_{32} are teacher predictor variables as defined in Table 11, p. 58.

quartile and the lowest quartile, there was, as expected, a significant difference between the two groups. Fifty percent of the least effective teachers with respect to student attitudes toward mathematics were also the least effective in terms of student perceptions of teacher quality. Additionally, 60% of the most effective teachers when considering student attitudes toward mathematics were also the most effective with respect to student perceptions of teacher quality. This is consistent with the finding that there was a definite strong correlation between student attitudes toward mathematics and student perceptions of teacher quality (r = .74, $p < .0001$). Such a strong association was not found between any other two variables in this study; such a strong association is seen as one that should be given careful consideration because the association is both so robust and so unique in this study.

Teaching experience had a substantially positive correlation (r = .57, $p < .08$) with student attitudes toward mathematics in the highest mathematics attitude quartile. When considering student perceptions of teacher quality, the highest group also had a positive correlation with teaching experience; however, the correlation of this high group was not statistically significant. It is interesting to note that the lowest groups, both in terms of student mathematics attitudes and perceptions of teacher experience, had moderate negative correlations with teaching experience; however, the correlations of these lowest groups were not statistically significant.

The variable which correlated most strongly ($r = -.67$, $p < .03$) in the highest quartile with respect to attitudes toward mathematics was students reading aloud during class. This was a substantial negative correlation.

Student perceptions of teacher quality in the highest group correlated substantially with frequency of testing ($r = .65$, $p < .04$). In other words, the more effective teachers with respect to student perceptions of teacher quality tested more frequently. Student perceptions of teacher quality in the highest group also had a substantial positive correlation with the teacher variable of diversity ($r = .55$, $p < .10$). That is, better teachers tried out new ideas and had the students do a wider variety of activities on different days.

Three teacher variables correlated substantially with student attitudes toward mathematics in the lowest quartile of classes: discipline ($r = .61$, $p < .06$); use of manipulatives, lab materials, or games ($r = .63$, $p < .05$); and the teacher attitudes toward simulations and games ($r = -.58$, $p < .08$). These correlations in the lowest quartile reveal several interesting findings. First, among the lowest quartile, these correlations reveal that more discipline in the classroom yields better attitudes toward mathematics. This is consistent with a number of studies which indicate that classroom management is an important factor in teacher effectiveness (Anderson, Anderson & Brophy, 1980; Evertson, Emmer, & Brophy, 1980; Good & Grouws, 1975, 1979; Kounin, 1970). Second, positive attitudes toward mathematics were substantially associated with the more frequent use of manipulatives, lab materials, or games in the lowest quartile of classes. When the variable of teacher attitudes toward simulations and games was considered, however, there was a substantial negative correlation with student attitudes toward mathematics. This seemingly inconsistent finding is hard to interpret but could be due to the fact that the item for the variable of teacher attitudes toward simulations and games might be misinterpreted. The test item states, "Simulations are fun for students but of little value for learning." Teachers could respond with strongly agree, agree, neutral, disagree, or strongly disagree. What would it mean if a teacher responded with disagree? Would it mean that he or she thought simulations and games were not fun and were not of much value? Would it mean that the teacher thought that simulations and games were fun and of great value? Or would it mean that the teacher felt simulations and games were not fun but of great value? Because of the nebulous nature of the question, it was not possible to attach any firm interpretation to this item.

The results of the statistical manipulation of the data by using the 40 classes as a whole and by using the highest versus the lowest quartile were not impressive. Extremely high correlations were not expected since the complexity of the teaching process virtually guarantees that correlations between particular teacher variables and the student variables of attitudes toward mathematics and perceptions of teacher quality will be low. Furthermore, the sample size of classes was quite small when the classes were subdivided into quartiles. Had the number of classes in each quartile been much greater, it is likely that stronger associations could be found.

When a stepwise multiple regression analysis was conducted utilizing all 40 mathematics classes, no small (4 or less) set of teacher predictor variables was found for predicting either student class scores of attitudes toward mathematics or student class scores of perceptions of teacher quality. However, when the class scores were subdivided into quartiles, it was determined that the best set of teacher predictor variables for student attitudes toward mathematics in the highest quartile was number of years of teaching experience and teacher attitudes concerning activity and noise in the classroom. These two teacher variables accounted for 81% of the variance of student attitudes toward mathematics in the highest quartile. Teacher preparation in mathematics, frequency of use of manipulatives, lab materials, or games, and teacher questioning techniques comprised the set of teacher predictor variables which accounted for 89% of the variance of student attitudes toward mathematics in the lowest quartile. It was determined that the best set of teacher predictor variables for predicting the student variable of perceptions of teacher quality in the highest quartile was amount of discipline in the classroom, frequency of attendance of mathematics inservice workshops or courses, and frequency of testing. Eighty-nine percent of the variance in the class scores of student perceptions of teacher quality in the highest quartile was explained by these three teacher predictor variables. In the lowest quartile of student perceptions of teacher quality, it was found that the teacher variables of attitudes toward mathematics, need for structure, and attitudes toward simulations and games accounted for 78% of the variance in the class scores of student perceptions of teacher quality.

CHAPTER V

SUMMARY OF THE STUDY, CONCLUSIONS, AND RECOMMENDATIONS

Summary of the Study

The purpose of this study was to determine which teacher variables contribute to effective teaching with respect to the affective domain in seventh grade mathematics classes. Teacher and student data collected in Oregon in 1979-1980 were utilized. Students and their teachers completed versions of the Inventory of Affective Aspects of Schooling (IAAS), a testing instrument developed by Haladyna and Shaughnessy (1980) which was designed to provide an inventory to survey aspects of the affective domain. Student scores for the IAAS sections on attitudes towards mathematics and perceptions of teacher quality and teacher scores on 32 variables were converted first to z and then to T scores.

The class was used as the unit of statistical analysis, and class scores (class means of the student T scores) were determined for forty seventh-grade mathematics classes for the student variables of attitudes toward mathematics and perceptions of teacher quality. Pearson product-moment correlation coefficients were determined, first for all forty classes and then for the upper and lower quartiles of the classes, between the student variables of attitudes towards mathematics and perceptions of teacher quality and the 32 teacher variables. When all forty classes were utilized, it was found that none of the teacher variables correlated highly with the two student variables.

When the classes were partitioned into quartiles, it was found that there were substantially high correlations in the highest quartile between student attitudes toward mathematics and the teacher variables of number of years of teaching experience (r = .57, p < .08) and having students read aloud in class (r = -.67, p < .03). Student perceptions of teacher quality in the highest quartile had a substantial positive correlation with diversity in the classroom (r = .55, p < .10) and with frequency of testing (r = .65, p < .04).

When Pearson product-moment correlation coefficients were determined between the two student variables of attitudes toward mathematics and perceptions of teacher quality, a very strong positive correlation was found (r = .74, p < .0001).

When the lowest quartile was considered, it was found that a substantial positive correlation existed between student attitudes toward mathematics and the teacher variables of discipline (r = .61, p < .06) and frequency of use of manipulatives, lab materials or games (r = .63, p < .05).

The results of t tests between the means of the highest quartile and the lowest quartile of classes showed, as expected, that there was a significant difference between the two groups with respect to student attitudes towards mathematics and to student perceptions of teacher quality.

When all 40 classes were utilized in a stepwise multiple regression analysis, it was found that there was no best set of teacher predictor variables for either student attitudes toward mathematics or student perceptions of teacher quality. The best set of teacher predictor variables for student attitudes toward mathematics in the highest quartile was number of years of teaching experience and teacher attitudes concerning activity and noise in the classroom. For the lowest quartile, teacher preparation in mathematics, frequency of use of manipulatives, lab materials or games, and teacher questioning techniques were found to comprise the best set of predictors for student attitudes toward mathematics. Student perceptions of teacher quality in the highest quartile were best predicted by the teacher variables of amount of discipline in the classroom, frequency of attendance of mathematics inservice workshops or courses, and frequency of testing; in the lowest quartile, the best teacher variable predictors were attitudes toward mathematics, need for structure, and attitudes toward simulations and games.

Conclusions

None of the 32 teacher variables have a .70 correlation or greater with either measures of student attitudes toward mathematics or student perceptions of teacher quality; therefore, the assumption that any one of these variables has any dramatic impact in the ordinary mathematics classroom on student attitudes toward mathematics or student perceptions of teacher quality cannot be maintained. However, several of the teacher variables did have a substantial association (.50 to .69) with student attitudes toward mathematics and their teachers.

In looking at the lowest quartile of student class scores, that is, the classes with the lowest attitudes toward mathematics and the lowest perceptions of teacher quality, several conclusions can be drawn. First, there is no one teacher variable from among the list of 32 teacher variables that correlates highly (.70 or greater) with student perceptions of teacher quality. At first glance, this finding would seem to indicate that these students view their teachers in a negative manner; however, there were no very strong negative correlations found between any one of the 32 teacher variables and student perceptions of teacher quality. In terms of attitudes toward mathematics in the lowest quartile, there were substantial positive associations between two teacher variables and student attitudes toward mathematics; those two teacher variables were frequency of use of manipulatives, laboratory materials, and games (r = .63, p < .05) and classroom discipline (r = .61, p < .06). Among these lowest quartile students, then, the frequent classroom use of manipulatives, laboratory materials, and games correlates substantially with student attitudes toward mathematics. Perhaps the change in the pace of instruction in moving from direct instruction that happens during the classroom use of manipulatives leads to a more positive attitude among the students in the lowest quartile. Also, in the lowest quartile, there is a substantial positive correlation between student attitudes toward mathematics and teachers' perceptions of classroom time spent on discipline; in other words, the more time the teacher feels he or she is spending on discipline, the higher the attitudes toward mathematics among students in the lowest quartile. This finding seems attributable to several different possibilities. One explanation could be that students among this lowest quartile need a great deal of structure and classroom management from the teacher. This structure might lead these students to feel more comfortable within an explicit and predictable classroom climate. Thus, the findings for these students are consistent with much research about classroom management techniques. This finding of a substantial positive correlation between teacher time spent on discipline and positive student attitudes toward mathematics may also be explained by dealing with teacher perception of discipline, for these teachers perceived that too much time had to be spent in their classrooms on discipline. It may well be that teachers of these students feel that any classroom time spent on discipline would be better spent on other more productive classroom activities. This teacher attitudes toward discipline might be manifest itself in the classroom so as to produce more positive attitudes in the students toward mathematics by keeping the classroom attuned to the content of mathematics rather than to the mechanical workings of discipline.

In the highest quartile, two teacher variables correlated substantially with student attitudes toward mathematics. Teaching experience, in terms of the number of years of teaching, correlated substantially with student attitudes toward mathematics ($\underline{r} = .57$, $\underline{p} < .08$). Thus, the more years of teaching experience a teacher has, the better are the student attitudes toward mathematics in this highest quartile of student attitudes toward mathematics. Perhaps teachers derive benefit from their previous teaching experience and are more skillful in their classroom presentations and classroom techniques, thus promoting more positive attitudes among students. Also among the highest quartile was a substantial negative correlation ($r = -.67$, $p < .03$) between the teacher variable of frequency of having students read aloud in class and student attitudes toward mathematics. This would indicate that these types of student do not like this classroom procedure. It may well be that these students view reading aloud in mathematics as a waste of time, an insult to their abilities, or as a classroom procedure appropriate only during the elementary years.

In the highest quartile of student perceptions of teacher quality, there are teacher variables worthy of discussion. For these students, more frequent testing or quizzes was found to correlate well with student perception of teacher quality ($r = .65$, $p < .04$). Perhaps this finding shows that these students constantly want to know how they are progressing in the content; their conscientiousness demands that they receive constant feedback. Or perhaps teachers are spending more time in a concerted effort--here as manifested in test construction--to accomplish definite mathematics objectives. A second teacher variable with a substantial positive high correlation to student perceptions of teacher quality was diversity in the mathematics classroom ($r = .55$, $p < .10$). The teachers who indicated diversity did so by stating that they tried new ideas in the classroom and that their students did not do the same kind of classwork day in and day out. Most educators would readily perceive these kinds of teachers as being conscientious professionals: planning for diverse activities, being open to new techniques and procedures, and employing a variety of methods for presentation of material.

Most important to this study in its examination of variables in the seventh grade mathematics classroom is the highly significant association found for the very strong association of student attitudes toward mathematics and student perceptions of teacher quality (r = .74, p < .0001). In other words, those students with positive attitudes toward mathematics are often those students who think they have high-quality teachers. In this study, student perceptions of teacher quality included judgments of student respect for the teacher, praise and reinforcement of students, teacher fairness to students, teacher support for the individual, teacher commitment to help students learn, and the teacher as instructor. Students, in order to have positive attitudes toward mathematics, seem to have positive attitudes about the quality of their teachers. Thus, teachers who are liked by their students, who praise and reinforce their students, who are fair in discipline, testing, and grading, who are willing to help students learn, who explain things very well, who give extra help when needed, who listen to what the students have to say, who have friendly attitudes, who ask good questions, and who provide interesting demonstrations, are teachers whose students have positive attitudes toward mathematics. Thus, teacher quality is most important as it relates to student attitudes toward mathematics, and students need to be assigned to teachers who exhibit these qualities.

Recommendations and Suggestions for Further Research

This study provides evidence that seventh grade student attitudes toward mathematics have a very strong association with student perceptions of teacher quality. This important finding supports and is consistent with the findings of Shaughnessy, Haladyna, and Shaughnessy (1983). Since a number of studies have found that there is a positive relationship between student achievement and attitudes toward mathematics and since there is a very strong association between student attitudes toward mathematics and student perceptions of teacher quality, it is strongly recommended that teachers be made aware, through inservice training and in publications, that their students' views of them in terms of teaching quality is of great importance. Teacher quality includes student respect for the teacher, teacher praise and reinforcement for the student, teacher fairness to the student, teacher support for the individual, teacher commitment to help students learn, and the teacher as instructor. School systems should periodically assess students' perceptions of teacher quality by utilizing such testing instruments as the IAAS and by taking measures to assist those teachers who are not seen by their students as possessing high teacher qualities so as to make needed professional changes. Often teachers, if they are made aware of their shortcomings, can and will take appropriate measures to correct them.

While this study did not determine a profile of the most effective teachers in regard to teacher characteristics, it did find several variables which were substantially related to teacher effectiveness in terms of student attitudes towards mathematics and teachers. Student class scores in the highest quartile of attitudes toward mathematics had a substantial positive association with number of years of teacher experience. Thus, teachers with several years' experience in the teaching of mathematics would be well placed if assigned to teach classes consisting of these highest quartile students. Conversely, inexperienced teachers would be best assigned to classes consisting of other kinds of students.

The teacher variable of frequency of having students read aloud in class had a substantial negative correlation with student attitudes toward mathematics. Thus, it is recommended that seventh-grade teachers avoid frequent use this classroom activity.

Frequency of testing and diversity in the classroom had substantial associations with student perceptions of teacher quality in the highest quartile. Therefore, it is recommended that teachers of these students give tests or quizzes frequently and that they provide a variety of classroom activities to avoid the dull routines day in and day out.

When considering the lowest quartile of student class scores of attitudes toward mathematics, student attitudes toward mathematics had a substantial positive association with frequency of use of manipulatives, lab materials, and games. The teachers of these students would do well to consider their use in the classroom. Additionally, it was found that of this lowest group of students, better attitudes toward mathematics were associated with more discipline. Teachers should be made aware that it is of importance to maintain good discipline within the classroom.

Even though this study did find several teacher variables which were substantially associated with student attitudes toward mathematics and student perceptions of teacher quality, cause and effect conclusions should not be implied or inferred without further research. Conclusions of cause and effect relationships must be determined by studies of an experimental nature.

Because teaching is such a complex process, it is recommended that other teacher variables such as enthusiasm, satisfaction with work, amount of class preparation time, or amount of praise be investigated with regard to teacher effectiveness in the affective domain. Factor analysis, discriminate analysis, cluster analysis, or path analysis could be utilized as statistical tools for a study of this nature.

Questions which also need to be pursued include what other factors are important in influencing student attitudes such as the cultural background, socioeconomic class, and ability level of the students as well as the classroom environment variables. More research in teacher effectiveness in the affective domain coupled with the results of studies in teacher effectiveness in the cognitive domain should be pursued, and interactions among the entire realm of affective and cognitive variables should be investigated. Such studies should be multivariant and multidimensional in nature. This research should include measures of environmental, situational, contextual, and behavioral variables.

Results of studies such as these would be timely and pragmatic in nature, particularly during an era when the nation has focused its attention on master teacher programs and accountability. Results could possibly be utilized by school administrators and educators to identify certain behaviors and characteristics of effective teachers with regard to student affective and cognitive outcomes. Schools could use basic research findings to assess, diagnose, and improve their effectiveness.

However, determining these types of results requires a great deal of optimism on the part of the researcher. Thus far, no "miracle" cure for the improvement of teacher effectiveness has been found. No studies have evolved which have clearly delineated effective teaching with respect to the entire domain of affective and cognitive aspects of schooling. As Cooney (1980) noted:

> Much needs to be done to define potentially significant variables in a lucid way. The pursuit of knowledge about teaching mathematics and educating mathematics teachers is both frustrating and exhilarating. It is frustrating because of the immense complexity of teaching; it is exhilarating because the generation of knowledge represents our finest achievement. (p. 471)

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APPENDICES

APPENDIX A

SEVENTH AND NINTH GRADE VERSION OF THE IAAS

BIOGRAPHICAL INFORMATION

Please answer all questions. Check the correct box.

1. 1 ☐ boy 2 ☐ girl

2. Family Background

1 ☐ American Indian
2 ☐ Oriental
3 ☐ Black
4 ☐ White (Caucasian)
5 ☐ Mexican American

3. How many times have you moved since you started first grade?

1 ☐ never moved
2 ☐ one
3 ☐ two
4 ☐ three
5 ☐ four
6 ☐ more than four

4. Which of the following does your family have at home?

1 ☐ newspaper delivered every day
2 ☐ magazines delivered regularly
3 ☐ more than 25 books
4 ☐ encyclopedia
5 ☐ dictionary
6 ☐ record player
7 ☐ tape recorder or cassette player
8 ☐ typewriter
9 ☐ vacuum cleaner
10 ☐ automatic dishwasher
11 ☐ two or more cars or trucks that run
12 ☐ two or more TV sets

5. On the average about how much TV do you watch each day?

1 ☐ none
2 ☐ about one hour or less
3 ☐ about one to two hours
4 ☐ two to three hours
5 ☐ more than three hours

6. The total number of school days I missed last year was about...

1 ☐ 0 - 3 days
2 ☐ about 1 week
3 ☐ about 2 weeks
4 ☐ more than 2 weeks

	Yes ☐ 1	? ☐ 2	No ☐ 3
1. Do you check books out from the public library?	☐	☐	☐
2. Do you check books out from the school library?	☐	☐	☐
3. Do your parents remind you to do your school work?	☐	☐	☐
4. Do your parents talk to you about your school work?	☐	☐	☐
5. Do your parents think that school is important?	☐	☐	☐
6. Do your parents care about how well you do in school?	☐	☐	☐
7. Do you tell your parents about the things you do well?	☐	☐	☐

Do your parents:	Often	Sometimes	Hardly Ever
8. take you interesting places?	☐	☐	☐
9. talk to you about the news?	☐	☐	☐
10. spend a lot of time talking with you?	☐	☐	☐
11. offer to help you with schoolwork?	☐	☐	☐
12. trust you to do things?	☐	☐	☐
13. argue with you a lot about rules?	☐	☐	☐
14. let you make decisions?	☐	☐	☐
15. encourage you to read?	☐	☐	☐

16. How far in school do you think you will get?

☐ 1 drop out as soon as possible

☐ 2 finish high school

☐ 3 go on to a vocational or technical or business school

☐ 4 complete some college

☐ 5 finish college

☐ 6 go beyond college, for example, become a doctor or a lawyer.

THE TREAT

This inventory is intended to reflect your feelings about school and various subject matters. We understand that you may not be taking all these classes right now, but nevertheless, try to respond to the questions in terms of <u>when</u> you were taking that class. Please respond honestly.

How do (did) you feel . . .	Very Happy 1	Happy 2	Neutral 3	Unhappy 4	Very Unhappy 5	
1. when it is time to go to school?	☐	☐	☐	☐	☐	1.
2. during school?	☐	☐	☐	☐	☐	2.
3. when it is time to go home?	☐	☐	☐	☐	☐	3.
4. if you knew you would never go to school again?	☐	☐	☐	☐	☐	4.
5. when it is time for English (Language Arts)?	☐	☐	☐	☐	☐	5.
6. during English?	☐	☐	☐	☐	☐	6.
7. when English is over?	☐	☐	☐	☐	☐	7.
8. if you knew you would never go to English again?	☐	☐	☐	☐	☐	8.
9. when it is time for Math?	☐	☐	☐	☐	☐	9.
10. during Math?	☐	☐	☐	☐	☐	10.
11. when Math is over?	☐	☐	☐	☐	☐	11.
12. if you knew you would never go to Math again?	☐	☐	☐	☐	☐	12.
13. when it is time for Social Studies?	☐	☐	☐	☐	☐	13.
14. during Social Studies?	☐	☐	☐	☐	☐	14.
15. when Social Studies is over?	☐	☐	☐	☐	☐	15.
16. if you knew you would never go to Social Studies again?	☐	☐	☐	☐	☐	16.
17. when it is time for Science?	☐	☐	☐	☐	☐	17.
18. during Science?	☐	☐	☐	☐	☐	18
19. when Science is over?	☐	☐	☐	☐	☐	19
20. If you knew you would never go to Science again?	☐	☐	☐	☐	☐	20

	Yes 1	Maybe 2	No 3
About the class:			
1. A student has the chance to get to know all other students in the class.	☐	☐	☐
2. Students are asked to follow strict rules.	☐	☐	☐
3. The class has plenty of time to cover the assigned work.	☐	☐	☐
4. The students would be proud to show the classroom to a visitor.	☐	☐	☐
* 5. A lot of students seem to be only half awake during this class.	☐	☐	☐
6. Some students in this class have no respect for other students.	☐	☐	☐
7. Some students have little idea of what the class is trying to do.	☐	☐	☐
8. The better students are granted special privileges.	☐	☐	☐
9. Students cooperate equally well with all class members.	☐	☐	☐
* 10. Students try hard to get the best grade.	☐	☐	☐
11. There is considerable dissatisfaction with the work of the class.	☐	☐	☐
12. The class is well organized.	☐	☐	☐
13. The subject studied requires no particular skills on the part of the students.	☐	☐	☐
14. Students don't care about the future of the class as a group.	☐	☐	☐
* 15. New ideas are always being tried out here.	☐	☐	☐
16. Most students know each other very well.	☐	☐	☐
17. There are few rules in this class.	☐	☐	☐
18. Students do not have to hurry to finish their work.	☐	☐	☐
19. The room is bright and comfortable.	☐	☐	☐
* 20. Very few students participate in class discussions or activities.	☐	☐	☐
21. There is a group of students that interfere with class activities.	☐	☐	☐
22. Most students know the goals of the course.	☐	☐	☐
23. The class is controlled by the actions of a few students who are favored.	☐	☐	☐
24. Some groups of students work together regardless of what the rest of the class is doing.	☐	☐	☐
25. Students don't compete with each other here.	☐	☐	☐

		Yes 1	Maybe 2	No 3
26.	After the class, the students has a sense of satisfaction.	☐	☐	☐
27.	The class is disorganized.	☐	☐	☐
28.	Most students consider this subject matter easy.	☐	☐	☐
29.	Students share a common concern for the success of the class.	☐	☐	☐
* 30.	What students do in class is very different on different days.	☐	☐	☐
31.	The class is made up of students who do not know each other well.	☐	☐	☐
32.	There is a set of rules for the students to follow.	☐	☐	☐
33.	The class members feel rushed to finish their work.	☐	☐	☐
34.	There is enough room for both individual and group work.	☐	☐	☐
* 35.	Most students in this class really pay attention to what the teacher is saying.	☐	☐	☐
36.	Certain students in the class are responsible for arguments.	☐	☐	☐
37.	Most students in the class have a clear idea of the class goals.	☐	☐	☐
38.	Certain students are favored more than the rest.	☐	☐	☐
39.	Certain students stick together in small groups.	☐	☐	☐
* 40.	Grades are not very important in this class.	☐	☐	☐
41.	Students are well satisfied with the work of the class.	☐	☐	☐
42.	The class is well organized and efficient.	☐	☐	☐
43.	Many students in the school would have trouble doing the difficult work of this class.	☐	☐	☐
44.	Failure of the class would mean nothing to most students.	☐	☐	☐
* 45.	Students do the same kind of class work almost every day.	☐	☐	☐
46.	In this class students work at their own speed.	☐	☐	☐
47.	Students can work by themselves in this class.	☐	☐	☐
48.	There are good materials to read for this class.	☐	☐	☐
49.	We have good work sheets in this class.	☐	☐	☐
50.	Too much time is spent asking students to be quiet or to sit down.	☐	☐	☐

*Reproduced by special permission from: The Classroom Environment Scale by Rudolf Moos, Ph.D., and Edison Trickett, Ph.D., Copyright date: 1974.

About this School	Yes 1	Maybe 2	No 3	
1. Kids like this school.	☐	☐	☐	1.
2. The classrooms in this school are too crowded.	☐	☐	☐	2.
3. Students and teachers work together at our school.	☐	☐	☐	3.
4. The school is a friendly place.	☐	☐	☐	4.
5. I wish that my classes were smaller so that my teachers could spend more time with me.	☐	☐	☐	5.
6. Our school is too small.	☐	☐	☐	6.
7. My school has a lot of books and materials that I can use to help myself.	☐	☐	☐	7.
8. This school is old and crummy.	☐	☐	☐	8.
9. The teachers in my school seem to like what they are doing.	☐	☐	☐	9.
10. The people who run my school probably like what they are doing.	☐	☐	☐	10.
11. Students treat each other fairly at this school.	☐	☐	☐	11.
12. The school treats students fairly.	☐	☐	☐	12.

13. How do you rate the school spirit at your school?

☐ a. very good ☐ b. good ☐ c. fair ☐ d. poor ☐ e. very poor

Your Feelings

	Yes 1	Maybe 2	No 3	
1. Learning things in school is easy for me.	☐	☐	☐	1.
2. There are a lot of things I don't understand, no matter how hard I study.	☐	☐	☐	2.
3. I am rarely told when I do good work.	☐	☐	☐	3.
4. My classmates like what I say.	☐	☐	☐	4.
5. I believe I can do most things well.	☐	☐	☐	5.
6. I like the work that I do.	☐	☐	☐	6.
7. I am only punished when I deserve it.	☐	☐	☐	7.
8. My classmates listen to my suggestions.	☐	☐	☐	8.
9. I think that I am a successful student.	☐	☐	☐	9.
10. When I work hard in school I do better in school.	☐	☐	☐	10.
11. How well I do in school depends on my good luck.	☐	☐	☐	11.

	very much 1	Some 2	not much 3	
1. How much do you like your school?	☐	☐	☐	1.
2. How much do you like your class?	☐	☐	☐	2.
3. How much do you like the students in your class?	☐	☐	☐	3.
4. How much do you like your teacher?	☐	☐	☐	4.
5. Is it important to you to get good grades?	☐	☐	☐	5.
6. Do you prefer to sit in the back of the classroom?	☐	☐	☐	6.
7. How much do you speak out in class?	☐	☐	☐	7.

About Math

		Yes 1	Maybe 2	No 3	
1.	My teacher likes math.	☐	☐	☐	1.
2.	Math doesn't scare me at all.	☐	☐	☐	2.
3.	As long as I pass, my parents don't care how I do in math.	☐	☐	☐	3.
4.	I'm sure I can learn math.	☐	☐	☐	4.
5.	Math is enjoyable to me.	☐	☐	☐	5.
6.	My teacher is excited about teaching us math.	☐	☐	☐	6.
7.	My teacher knows a lot about math.	☐	☐	☐	7.
8.	Math makes me feel uneasy and confused.	☐	☐	☐	8.
9.	I wish I could have the same math teacher next year.	☐	☐	☐	9.
10.	Math has no usefulness in my life.	☐	☐	☐	10.
11.	My parents think I could be good in math.	☐	☐	☐	11.
12.	My parents want me to plan to take more math.	☐	☐	☐	12.
13.	Math is a worthwhile and necessary subject.	☐	☐	☐	13.
14.	I'm not the type to do well in math.	☐	☐	☐	14.
15.	Most time in math is spent doing other things than listening to the teacher.	☐	☐	☐	15.
16.	I do as little work as possible in math.	☐	☐	☐	16.
17.	I can get good grades in math.	☐	☐	☐	17.
18.	There is little chance for students to talk in math.	☐	☐	☐	18.
19.	Things go smoothly in our math class.	☐	☐	☐	19.

20. What kind of grades do you usually get in math?

☐ 1. mostly A's ☐ 2. mostly A's & B's ☐ 3. mostly B's ☐ 4. mostly B's & C's

☐ 5. mostly C's ☐ 6. lower than C ☐ 7. no grades are given

21. About how much of the time does your teacher talk during math?

☐ 1. almost all the time ☐ 2. most of the time ☐ 3. sometimes ☐ 4. hardly at all

22. Is there a place in your home for homework? ☐ 1. Yes ☐ 2. No

23. About how much time do you spend on homework each week?

☐ a. none ☐ b. up to 30 min. ☐ c. 31-60 min. ☐ d. more than 60 min.

24. About how much homework is assigned each week in math?

☐ a. none ☐ b. up to 15 min. ☐ c. 15-30 min. ☐ d. more than 30 min.

My math teacher:	Yes 1	Maybe 2	No 3
1. is interested in me.	☐	☐	☐
2. tells me when I do good work.	☐	☐	☐
3. is often too busy to help me when I need help.	☐	☐	☐
4. is fair to me.	☐	☐	☐
5. encourages me to do new and unusual things.	☐	☐	☐
6. tries very hard to help me understand hard schoolwork.	☐	☐	☐
7. really cares about me.	☐	☐	☐
8. appreciates our work.	☐	☐	☐
9. is willing to help students learn.	☐	☐	☐
10. is fair when disciplining students.	☐	☐	☐
11. wants me to say what I think.	☐	☐	☐
12. explains things very well.	☐	☐	☐
13. has a friendly attitude.	☐	☐	☐
14. says nice things to me when I complete my work.	☐	☐	☐
15. gives me extra help when needed.	☐	☐	☐
16. is fair in testing and grading.	☐	☐	☐
17. would let the class plan an event.	☐	☐	☐
18. doesn't take enough time to explain things.	☐	☐	☐
19. makes things worse when I have a problem.	☐	☐	☐
20. scares me.	☐	☐	☐
21. listens to what I have to say.	☐	☐	☐
22. has said sometimes that s(he) doesn't know something.	☐	☐	☐
23. lets me work at my own speed.	☐	☐	☐
24. spends too much time asking students to be quiet or to sit down.	☐	☐	☐
25. asks good questions.	☐	☐	☐
26. has interesting demonstrations.	☐	☐	☐

APPENDIX B

TEACHER VERSION OF THE IAAS

AFFECTIVE ASSESSMENT QUESTIONNAIRE

TO THE TEACHER

Mark answers where indicated. All responses to this questionnaire will be treated confidentially and anonymously. The form is coded with an ID number for purposes of accurate processing.

Your honest and accurate responses to all items are appreciated. Thank you.

BIOGRAPHICAL INFORMATION

1. How many years have you been teaching? _____

2. What is your principle area of preparation?

science	math	social studies	elementary	other
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

3. About how many inservice days a year do you devote to social studies?

none	one	two	more than two
1 ☐	2 ☐	3 ☐	4 ☐

4. Please indicate the approximate number of courses you have in social studies.

Lower Division (Freshman & Sophomore)	Upper Division (Junior & Senior)	Graduate
_____ 1	_____ 2	_____ 3

5. Male ☐ 1 Female ☐ 2

6. For what grade levels are you certified to teach?

☐ 1 Elementary (K-8) ☐ 2 Secondary (5-12) ☐ 3 K-12

☐ 4 Other (explain) ______________________________

7. What type of certification do you hold?

☐ 1 Basic ☐ 2 Standard

What type of norm do you have? Check all that apply.

8. SOCIAL STUDIES (SS)

1 ☐ Language Arts/SS

2 ☐ Social Studies

9. MATH

1 ☐ Pre-Algebra

2 ☐ Algebra/Geometry

3 ☐ Advanced Math

10. SCIENCE

1 ☐ Biology

2 ☐ Chemistry

3 ☐ Physics

4 ☐ Earth Science

5 ☐ Integrated Science

11. ☐ 1 OTHER (please explain) ______________________________

In this math class, about how often do you:	daily 1	about twice a week 2	about once a week 3	less than once per week 4	never 5
1. lecture to your students?	☐	☐	☐	☐	☐
2. have group work sessions, e.g., projects?	☐	☐	☐	☐	☐
3. have students writing reports?	☐	☐	☐	☐	☐
4. have students do seatwork using handouts or workbooks?	☐	☐	☐	☐	☐
5. have class discussions?	☐	☐	☐	☐	☐
6. have students read aloud during class?	☐	☐	☐	☐	☐
7. have students reading the text during class?	☐	☐	☐	☐	☐
8. have students reading other materials in class?	☐	☐	☐	☐	☐
9. have students do library work or research?	☐	☐	☐	☐	☐
10. test or quiz?	☐	☐	☐	☐	☐
11. have students do homework?	☐	☐	☐	☐	☐
12. have work on manipulatives, math lab materials, or math games for your students?	☐	☐	☐	☐	☐

13. How do you use the textbook?

☐ 1 as a supplement to other things; ☐ 2 mainly for instruction; ☐ 3 as a reference; ☐ 4 other (specify ____________)

1. Please check all professional journals in mathematics that you regularly read or peruse.

   1 ☐ Mathematics Teacher
   2 ☐ Arithmetic Teacher
   3 ☐ The Oregon Mathematics Teacher
   4 ☐ Scientific American
   5 ☐ School Science and Mathematics
   6 ☐ Others ____________

2. Indicate the professional organizations to which you belong.

   1 ☐ National Education Association (NEA)
   2 ☐ Oregon Education Association (OEA)
   3 ☐ Association for School and Curriculum Directors (ASCD)
   4 ☐ Oregon Council of Teachers of Mathematics (OCTM)
   5 ☐ National Council of Teachers of Mathematics (NCTM)
   6 ☐ American Academy for the Advancement of the Sciences (AAAS)
   7 ☐ Others ____________

3. Check those items indicating sources of knowledge about new trends and practices in teaching mathematics.

   1 ☐ professional journals
   2 ☐ curriculum consultants
   3 ☐ principal or vice principal
   4 ☐ fellow teachers
   5 ☐ consultant
   6 ☐ inservice meetings
   7 ☐ professional meetings
   8 ☐ yourself
   9 ☐ department chairman (if applies)
   10 ☐ others ____________

4. I am familiar with the materials called "Mathematics Resources Project" that was developed in Oregon.

   yes ☐ 1　　no ☐ 2

   If yes, how often have you used these materials in this class.

   never ☐ 1　　once or twice a month ☐ 2　　once or twice a week ☐ 3　　almost daily ☐ 4

5. About how often have you attended a mathematics inservice workshop or course during the past two years?

none	once	twice	more than twice
☐ 1	☐ 2	☐ 3	☐ 4

6. Have you conducted any math workshops or sessions for teachers?

yes	no
☐ 1	☐ 2

7. How often in the past two years have you attended a regional or national mathematics teacher's meeting (such as NCTM or the Northwest meeting)?

none	once	twice	more than twice
☐ 1	☐ 2	☐ 3	☐ 4

8. How many math courses have you taken in the past two years?

none	one	two	more than two
☐ 1	☐ 2	☐ 3	☐ 4

9. Does your school district encourage participation in inservice math courses and workshops?

often	sometimes	never
☐ 1	☐ 2	☐ 3

About the class:	Yes ☐ 1	Maybe ☐ 2	No ☐ 3
1. A student has the chance to get to know all other students in the class.	☐	☐	☐
2. Students are asked to follow strict rules.	☐	☐	☐
3. The class has plenty of time to cover the assigned work.	☐	☐	☐
4. The students would be proud to show the classroom to a visitor.	☐	☐	☐
* 5.	☐	☐	☐
6. Some students in this class have no respect for other students.	☐	☐	☐
7. Some students have little idea of what the class is trying to do.	☐	☐	☐
8. The better students are granted special privileges.	☐	☐	☐
9. Students cooperate equally well with all class members.	☐	☐	☐
* 10.	☐	☐	☐
11. There is considerable dissatisfaction with the work of the class.	☐	☐	☐
12. The class is well organized.	☐	☐	☐
13. The subject studied requires no particular skills on the part of the students.	☐	☐	☐
14. Students don't care about the future of the class as a group.	☐	☐	☐
* 15.	☐	☐	☐
16. Most students know each other very well.	☐	☐	☐
17. There are few rules in this class.	☐	☐	☐
18. Students do not have to hurry to finish their work.	☐	☐	☐
19. The room is bright and comfortable.	☐	☐	☐
* 20.	☐	☐	☐
21. There is a group of students that interfere with class activities.	☐	☐	☐
22. Most students know the goals of the course.	☐	☐	☐
23. The class is controlled by the actions of a few students who are favored.	☐	☐	☐
24. Some groups of students work together regardless of what the rest of the class is doing.	☐	☐	☐
25. Students don't compete with each other here.	☐	☐	☐

	Yes ☐ 1	Maybe ☐ 2	No ☐ 3
26. After the class, the students has a sense of satisfaction.	☐	☐	☐
27. The class is disorganized.	☐	☐	☐
28. Most students consider this subject matter easy.	☐	☐	☐
29. Students share a common concern for the success of the class.	☐	☐	☐
* 30.	☐	☐	☐
31. The class is made up of students who do not know each other well.	☐	☐	☐
32. There is a set of rules for the students to follow.	☐	☐	☐
33. The class members feel rushed to finish their work.	☐	☐	☐
34. There is enough room for both individual and group work.	☐	☐	☐
* 35.	☐	☐	☐
36. Certain students in the class are responsible for arguments.	☐	☐	☐
37. Most students in the class have a clear idea of the class goals.	☐	☐	☐
38. Certain students are favored more than the rest.	☐	☐	☐
39. Certain students stick together in small groups.	☐	☐	☐
* 40.	☐	☐	☐
41. Students are well satisfied with the work of the class.	☐	☐	☐
42. The class is well organized and efficient.	☐	☐	☐
43. Many students in the school would have trouble doing the difficult work of this class.	☐	☐	☐
44. Failure of the class would mean nothing to most students.	☐	☐	☐
* 45.	☐	☐	☐
46. In this class students work at their own speed.	☐	☐	☐
47. Students can work by themselves in this class.	☐	☐	☐
48. There are good materials to read for this class.	☐	☐	☐
49. We have good work sheets in this class.	☐	☐	☐
50. Too much time is spent asking students to be quiet or to sit down.	☐	☐	☐

	SA 1	A 2	N 3	D 4	SD 5	
About Math						
1. Relative to reading, science and arithmetic, math is of little importance in a child's life.	☐	☐	☐	☐	☐	1.
2. Math cannot be fun, interesting, and relevant if textbooks are the main ingredients in math classes.	☐	☐	☐	☐	☐	2.
3. A teacher who has a negative attitude toward teaching math can still be an effective teacher.	☐	☐	☐	☐	☐	3.
4. Our society places too much emphasis on math.	☐	☐	☐	☐	☐	4.
5. If the opportunity developed, I would encourage others to teach math.	☐	☐	☐	☐	☐	5.
6. Most of my students are confident that they can solve math problems.	☐	☐	☐	☐	☐	6.
7. My students who are weak in math are usually the ones who dislike math.	☐	☐	☐	☐	☐	7.
8. I have some students who cannot learn math.	☐	☐	☐	☐	☐	8.
9. Most of my students are eager to learn math.	☐	☐	☐	☐	☐	9.
10. Children must learn certain basic facts in the elementary school math so they can apply these facts in later years.	☐	☐	☐	☐	☐	10.
11. Most of my students cannot read the math text.	☐	☐	☐	☐	☐	11.
12. My better readers enjoy math more than the poor readers.	☐	☐	☐	☐	☐	12.
13. I enjoy discussing math topics with other teachers.	☐	☐	☐	☐	☐	13.
14. I believe that math is a difficult subject to learn.	☐	☐	☐	☐	☐	14.

15. I'm afraid that I don't have the background to teach math. ☐ ☐ ☐ ☐ ☐ 15.

16. I'm afraid that I don't have the interest to teach math. ☐ ☐ ☐ ☐ ☐ 16.

17. I enjoyed courses in math. ☐ ☐ ☐ ☐ ☐ 17.

18. Math is one of my most favorite subjects. ☐ ☐ ☐ ☐ ☐ 18.

19. If given a choice of professional improvement, I would choose any area but math. ☐ ☐ ☐ ☐ ☐ 19.

20. I don't understand math as well as I should. ☐ ☐ ☐ ☐ ☐ 20.

21. I enjoy teaching math. ☐ ☐ ☐ ☐ ☐ 21.

22. I am well prepared to teach math. ☐ ☐ ☐ ☐ ☐ 22.

23. I learned the least in courses in math in college. ☐ ☐ ☐ ☐ ☐ 23.

24. I am competent to teach math at this level. ☐ ☐ ☐ ☐ ☐ 24.

25. In teaching math, a teacher might spend as much time listening to students as talking to them. ☐ ☐ ☐ ☐ ☐ 25.

26. Teachers should enjoy teaching math. ☐ ☐ ☐ ☐ ☐ 26.

27. Math is a dull subject to teach. ☐ ☐ ☐ ☐ ☐ 27.

28. A teacher should be a resource person rather than an information giver. ☐ ☐ ☐ ☐ ☐ 28.

About the central administration:

		SA 1	A 2	N 3	D 4	SD 5
1.	The central administration supports the disciplinary measures by teachers.	☐	☐	☐	☐	☐
2.	The central administration encourages classroom innovations with real practical support.	☐	☐	☐	☐	☐
3.	The central administration encourages teachers' initiative in new programs (as opposed to handing down decisions for teachers to carry out).	☐	☐	☐	☐	☐
4.	Teachers are treated professionally by the central administration.	☐	☐	☐	☐	☐
5.	Classroom policies are supported by the central administration.	☐	☐	☐	☐	☐

About the School

6.	There is unity among students and faculty at this school.	☐	☐	☐	☐	☐
7.	This school has a friendly atmosphere.	☐	☐	☐	☐	☐
8.	There is good student cooperation here.	☐	☐	☐	☐	☐
9.	Students respect one another at this school,	☐	☐	☐	☐	☐
10.	The school treats students fairly here.	☐	☐	☐	☐	☐

About Classes

11.	Classes are too large for effective teaching.	☐	☐	☐	☐	☐
12.	The students are really interested in learning.	☐	☐	☐	☐	☐
13.	Too much time has to be spent on discipline.	☐	☐	☐	☐	☐
14.	This class is like a big family.	☐	☐	☐	☐	☐
15.	Students at this level cannot work well in groups.	☐	☐	☐	☐	☐
16.	Students at this level cannot do library projects or write independent reports.	☐	☐	☐	☐	☐
17.	I have adequate time to prepare for my classes.	☐	☐	☐	☐	☐
18.	I don't have time to prepare classes because I get bogged down at filling out forms.	☐	☐	☐	☐	☐
19.	I am spread too thin over my classes and lack time for planning.	☐	☐	☐	☐	☐

About Teaching

20.	A teacher should be a resource person rather than an information giver.	☐	☐	☐	☐	☐
21.	Students should be permitted to move about freely in a room.	☐	☐	☐	☐	☐
22.	If a student chooses what he wants to work on, he will keep busy and learn more.	☐	☐	☐	☐	☐

		SA 1	A 2	N 3	D 4	SD 5
23.	Students are able to learn in an atmosphere of activity and noise.	☐	☐	☐	☐	☐
24.	My instructional resources are satisfactory.	☐	☐	☐	☐	☐
25.	I desire additional instructional resources (e.g., filmstrips, films, commercially prepared materials, models).	☐	☐	☐	☐	☐
26.	I don't like to work on a problem unless there is a possibility of coming out with a clear-cut, definite answer.	☐	☐	☐	☐	☐
27.	I like to have a place for everything and everything in its its place.	☐	☐	☐	☐	☐
28.	I don't care for things that are uncertain and unpredictable.	☐	☐	☐	☐	☐
29.	A good teacher is guided by a set schedule.	☐	☐	☐	☐	☐
30.	Materials besides the textbook are unimportant.	☐	☐	☐	☐	☐
31.	The students talk more than I do.	☐	☐	☐	☐	☐
32.	When I talk, I question, "play the devil's advocate," more than telling or explaining.	☐	☐	☐	☐	☐
33.	I stress problems, contradictions, issues, unknown elements, and questions in our subject matter.	☐	☐	☐	☐	☐
34.	There are days when I spend more time disciplining, recordkeeping, etc., than explaining or discussing content.	☐	☐	☐	☐	☐
35.	I encourage students to arrive at value and policy positions of their own that they understand and can defend.	☐	☐	☐	☐	☐
36.	Students bring newpaper articles, magazines, flyers to class or mention radio, television, dramatic, musical ideas they've found or heard.	☐	☐	☐	☐	☐
37.	Simulations and games are fun for students but of little value for learning.	☐	☐	☐	☐	☐
38.	Films are a crutch for lazy teachers.	☐	☐	☐	☐	☐

Teacher Opinions and Impressions

Use the options at the right to evaluate your students in your classroom, using the items below:	very few students 1	some students 2	more than 50% of my students 3	almost all students 4
1. lazy	☐	☐	☐	☐
2. highly motivated	☐	☐	☐	☐
3. bored	☐	☐	☐	☐
4. restless	☐	☐	☐	☐
5. above average	☐	☐	☐	☐
6. underachievers	☐	☐	☐	☐
7. cooperative	☐	☐	☐	☐
8. hostile	☐	☐	☐	☐

How often do you as a teacher	very often 1	often 2	seldom 3	never 4
1. encourage students to state their opinions?	☐	☐	☐	☐
2. recognize a student's right to have his/her own opinion?	☐	☐	☐	☐
3. admit to the student that you don't know something?	☐	☐	☐	☐

In your teaching situation, how satisfied are you with your relationships with	very dissatisfied 1	somewhat dissatisfied 2	very satisfied 3	somewhat satisfied 4
1. parents of students?	☐	☐	☐	☐
2. fellow teachers?	☐	☐	☐	☐
3. administrators?	☐	☐	☐	☐
4. students?	☐	☐	☐	☐

For each pair, select the class which you would rather teach (check your choice for each item).

1.	math ☐ 1	or	science ☐ 2	
2.	reading ☐ 1	or	math ☐ 2	
3.	science ☐ 1	or	reading ☐ 2	
4.	science ☐ 1	or	social studies ☐ 2	
5.	math ☐ 1	or	social studies ☐ 2	
6.	social studies ☐ 1	or	reading ☐ 2	

For each of the topics listed below, rate the degree to which each topic is given attention in your math class:

4 - very heavy emphasis
3 - average emphasis
2 - light coverage
1 - no coverage

1. How much is actually given (as required by math curriculum):

_____ Geometry

_____ Arithmetic of whole numbers

_____ Ratio and proportion

_____ Arithmetic of decimals and per cents

_____ Problem solving strategies

_____ Estimation

_____ Arithmetic of fractions

_____ Measurement

_____ Using calculators for computations

_____ Probability

_____ Graphing skills

_____ Algebra

_____ Other _____________________

____

2. How much you would like to give:

_____ Geometry

_____ Arithmetic of whole numbers

_____ Ratio and proportion

_____ Arithmetic of decimals and per cents

_____ Problem solving strategies

_____ Estimation

_____ Arithmetic of fractions

_____ Measurement

_____ Using calculators for computations

_____ Probability

_____ Graphing skills

_____ Algebra

_____ Other _____________________

____

	Agree 1	Neutral 2	Disagree 3
3. The school administration requires me to follow a specific outline of topics in my math courses.	☐	☐	☐
4. Math competencies make me teach toward them rather than the regular curriculum.	☐	☐	☐
5. Math competencies allow much flexibility in what I can teach.	☐	☐	☐

6. I am familiar with the materials called "Mathematics Resources Project" that was developed in Oregon.

☐ yes 1 ☐ no 2

7. If yes, how often have you used these materials in this class.

never	once or twice a month	once or twice a week	almost daily
☐ 1	☐ 2	☐ 3	☐ 4

Scheduling:

1. How often do you teach math each day?

   ☐ 1 once

   ☐ 2 twice

   ☐ 3 three times

   ☐ 4 four times

   ☐ 5 full time

2. How many minutes are your class periods? ________ minutes

3. How many students are in this math class? ________ students

4. How many periods a week does this math class meet?

   ☐ 1 one

   ☐ 2 two

   ☐ 3 three

   ☐ 4 four

   ☐ 5 daily

5. Type of School

   ☐ 1 Middle School, Grades 6-7-8

   ☐ 2 Junior High School, Grades 7-8

   ☐ 3 Junior High School, Grades 7-8-9

   ☐ 4 Elementary School, Grades 1 - 8

   ☐ 5 High School, Grades 9-10-11-12

   ☐ 6 High School, Grades 10-11-12

6. Type of Class (For seventh grade teachers)

   ☐ 1 Remedial

   ☐ 2 Average

   ☐ 3 Above average

7. Type of Class (For ninth grade teachers)

   ☐ 1 General math

   ☐ 2 Introductory algebra

   ☐ 3 Accelerated algebra

Teacher:	Among The Best 1	Above Average 2	Average 3	Below Average 4	Poor 5	No Opinion 6
1. In your opinion, what is the general reputation of your school?	☐	☐	☐	☐	☐	☐
2. In general, rate the following aspects of the school in which you presently teach.						
A. Grading of Students	☐	☐	☐	☐	☐	☐
B. Evaluations of teachers	☐	☐	☐	☐	☐	☐
C. Opportunities to try out new teaching approaches	☐	☐	☐	☐	☐	☐
D. Your role as a teacher	☐	☐	☐	☐	☐	☐
E. Your relationship with the principal	☐	☐	☐	☐	☐	☐
F. Resources or instructional materials available.	☐	☐	☐	☐	☐	☐

	Totally 1	Mostly 2	Some 3	Little 4	None 5
3. To what extent are students grouped according to academic performance in your classroom?	☐	☐	☐	☐	☐

4. How do the following descriptions tions apply to most of the classes that you teach? (Make this applicable to the subject matter of issue.)

	Usually 1	Sometimes 2	Seldom 3
A. All students work approximately at the same pace.	☐	☐	☐
B. Students are divided into two groups working at different paces.	☐	☐	☐
C. Students are divided into three or more groups working at different paces.	☐	☐	☐
D. Each student works at his/her own pace.	☐	☐	☐

	None 1	1-2 Hours 2	3-5 Hours 3	6-10 Hours 4	11 or More Hours 5
5. Disregarding formal assignment to guidance duties, how many hours a week do you spend in informal individual or group counseling?	☐	☐	☐	☐	☐

About the School Administration

	Excellent 1	Good 2	Average 3	Fair 4	Poor 5
1. Rate the school administration on the following dimensions:					
A. Support for teaching staff	☐	☐	☐	☐	☐
B. Group involvement in school decision-making	☐	☐	☐	☐	☐
C. Attendance and discipline of students	☐	☐	☐	☐	☐
D. Instructional leadership	☐	☐	☐	☐	☐
E. Availability of materials	☐	☐	☐	☐	☐
2. How would you rate your principal regarding each of the following areas?					
A. Providing teachers with ways to gain new teaching ideas (e.g., through inservice training or visits to other schools)	☐	☐	☐	☐	☐
B. Record keeping	☐	☐	☐	☐	☐
C. Supporting special projects you may wish to undertake	☐	☐	☐	☐	☐
D. Relations with parents in the community	☐	☐	☐	☐	☐
3. Overall, how would you rate the leadership ability of the principal in your school?	☐	☐	☐	☐	☐

	Always 1	Usually 2	Sometimes 3	Seldom 4	Never 5
4. The principal listens a lot to what teachers have to say.	☐	☐	☐	☐	☐
5. The principal looks out for the personal welfare of teachers.	☐	☐	☐	☐	☐
6. The principal is there when a teacher needs him/her.	☐	☐	☐	☐	☐
7. The principal personally participates in classroom activities.	☐	☐	☐	☐	☐
8. Teachers help select which curriculum will be taught.	☐	☐	☐	☐	☐
9. The faculty has control over program changes in the school.	☐	☐	☐	☐	☐

At which levels has your principal had teaching experience? Check all that apply.

10. ☐ Elementary 11. ☐ Jr. High 12. ☐ High School 13. ☐ I don't know

APPENDIX C

IAAS ITEMS FOR SELECTED STUDENT AND TEACHER VARIABLES

Table C-1

IAAS Items for Student Variable of Attitudes Toward Mathematics

Item
How do you feel when
a. it is time for math?
b. during math?
c. when math is over?
d. if you knew you would never go to math again?

Table C-2

IAAS Items for Student Variable of Perceptions of Teacher Quality

Item
Student respect for the teacher
How much do you like your teacher?
Teacher praise and reinforcement
My teacher tells me when I do good work.
My teacher really cares about me.
My teacher appreciates our work.
My teacher says nice things to me when I complete my work.
Fairness to students
My teacher if fair to me.
My teacher is fair when disciplining students.
My teacher is fair in testing and grading.
Teacher commitment to help student learn
My teacher tries very hard to help me understand hard schoolwork.
My teacher is willing to help students learn.
My teacher explains things very well.
My teacher gives me extra help when needed.
Teacher support for the individual
My teacher listens to what I have to say.
Other
Things go smoothly in our math class.
My teacher is interested in me.
My teacher wants me to say what I think.
My teacher has a friendly attitude.
My teacher asks good questions.
My teacher has interesting demonstrations.

Table C-3

Items for Selected Teacher Variables from the Teacher Version of the IAAS

Item
BIOGRAPHICAL
Teaching Experience
How many years have you been teaching?
PROFESSIONAL ACTIVITIES
Attendance of Mathematics Inservice Workshops or Courses
About how often have you attended a mathematics inservice workshop or course during the past two years?
Conduct Workshops
Have you conducted any math workshops or sessions for teachers?
Attendance at Regional or National Meetings
How often in the past two years have you attended a national mathematics teacher's meeting (such as NCTM or the Northwest meeting)?
Recent Math Courses
How many math courses have you taken in the past two years?
MATHEMATICS CLASSROOM ACTIVITIES
Lecture
In this math class, about how often do you lecture to your students?
Seatwork
In this math class, about how often do you have students do seatwork using handouts or workbooks?
Students Read Aloud
In this math class, about how often do you have students read aloud during class?
Students Read Text
In this math class, about how often do you have students reading the text during class?

Table C-3 (continued)

Item
<u>Students Writing Reports</u>
In this math class, about how often do you have students writing reports?
<u>Library Work</u>
In this math class, about how often do you have students do library work or research?
<u>Use of Manipulatives, Lab Materials, or Games</u>
In this math class, about how often do you have work on manipulatives, math lab materials, or math games for your students?
<u>Students Read Other Materials</u>
In this math class, about how often do you have students reading other materials in class?
<u>Homework</u>
In this math class, about how often do you have students do homework?
<u>Class Discussions</u>
In this math class, about how often do you have class discussions?
<u>Work Sessions or Projects</u>
In this math class, about how often do you have group work sessions, e.g., projects?
<u>Testing</u>
In this math class, about how often do you test or quiz?
<u>Informal Counseling Time</u>
Disregarding formal assignment to guidance duties, how many hours a week do you spend in informal individual or group counseling?
<u>Formality</u>
Students are asked to follow strict rules.
There are few rules in this class.
There is a set of rules for the students to follow.

Table C-3 (continued)

Item
Diversity
New ideas are always being tried out here.
What students do in class is very different on different days.
Students do the same kind of class work almost every day.
Activity and Noise
Students are able to learn in an atmosphere of activity and noise.
Questioning Techniques
When I talk, I question, "Play the devil's advocate," more than telling or explaining.
Stress Problems, Contradictions, Issues, Etc.
I stress problems, contradictions, issues, unknown elements, and questions in our subject matter.
Students Move Freely in the Classroom
Students should be permitted to move about freely in a room.
Discipline
Too much time has to be spent on discipline.
There are days when I spend more time disciplining, record-keeping, etc., than explaining or discussing content.
TEACHER ATTITUDE ABOUT MATHEMATICS AND THE TEACHING OF MATHEMATICS
Importance of Mathematics
Relative to reading, scinece and arithemtic, math is of little importance in a child's life.
If given a choice of professional improvement, I would choose any area but math.
Attitudes Toward Mathematics
If the opportunity developed, I would encourage others to teach math.

Table C-3 (continued)

Item
I enjoy discussing math topics with other teachers.
I'm afraid that I don't have the interest to teach math.
I enjoyed courses in math.
Math is one of my most favorite subjects.
I enjoy teaching math.
<u>Preparation in Mathematics</u>
I'm afraid that I don't have the background to teach math.
I am well prepared to teach math.
<u>Philosophy of Instruction</u>
A teacher should be a resource person rather than an information giver.
I encourage students to arrive at value and policy positions of their own that they understand and can defend.
<u>Need for Structure</u>
I don't like to work on a problem unless there is a possibility of coming out with a clear-cut definite answer.
I like to have a place for everything and everything in its place.
I don't care for things that are uncertain and unpredictable.
A good teacher is guided by a set schedule.
<u>Attitudes Toward Simulations and Games</u>
Simulations and games are fun for students but of little value for learning.
<u>Attitudes Toward Films</u>
Films are a crutch for lazy teachers.

VITA

Katherine Taggart Blackburn was born in Lynchburg, Virginia, and attended public schools in Kingsport, Tennessee. Upon graduation from Dobyns-Bennett High School, Kingsport, Tennessee, she attended George Peabody College for Teachers, Nashville, Tennessee, where she received a Bachelor of Science degree in Mathematics and Biology in 1963. She received her Master of Science degree in Mathematics Education in 1965 from the University of Wisconsin, Madison, and a Certificate of Advanced Study in Mathematics Education from the University of Chicago in 1976.

She has 11 years of teaching experience at all levels from elementary through graduate school in the areas of mathematics and mathematics education and has worked as a research assistant at Stanford Research Institute and as a programming planner at RCA Computer Based Instructional Systems.

From 1977 until 1981, the author taught mathematics and mathematics education courses at Tusculum College in Greeneville, Tennessee. Here she founded and administered the Tusculum College Summer Enrichment Program for Gifted Students and also received the annual award for Outstanding Service to Students.

In 1981, she entered the Graduate School of The University of Tennessee, Knoxville, where she was a graduate teaching assistant in the department of mathematics and was a Hilton A. Smith Fellow. She received the Doctor of Philosophy degree with a major in Education in August 1983.

She is a member of Pi Lambda Theta honorary society, National Council of Teachers of Mathematics, Tennessee Council of Teachers of Mathematics, Association for Women in Mathematics, and Smoky Mountain Mathematics Education Association. Other professional memberships include Illinois Council of Teachers of Mathematics, Chicago Metropolitan Teachers of Mathematics Association, Detroit Council of Teachers of Mathematics, and the Society of the Golden Ratio. She has been actively involved as a speaker at numerous mathematics teachers' conventions and as a presenter of workshops and inservice training sessions for teachers. She will be employed as assistant professor at the University of Georgia upon graduation.