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A STUDY OF HOW SUPERVISORS' EVALUATIONS, TEACHERS' BEHAVIOR, AND STUDENTS' ATTITUDES TOWARD TEACHERS ARE RELATED TO INSTRUCTIONALLY EFFECTIVE TEACHERS OF NINTH-GRADE MATHEMATICS

By

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ABSTRACT

A STUDY OF HOW SUPERVISORS' EVALUATIONS, TEACHERS' BEHAVIOR, AND STUDENTS' ATTITUDES TOWARD TEACHERS ARE RELATED TO INSTRUCTIONALLY EFFECTIVE TEACHERS OF NINTH-GRADE MATHEMATICS

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The purpose of this study was to determine how supervisors' evaluations of teachers, teachers' behavior, and students' attitudes toward teachers are related to instructionally effective teachers of ninth-grade mathematics.

Procedures

Forty ninth-grade mathematics teachers were chosen from 24 schools in three cities in Saudi Arabia. These teachers agreed to teach a unit of instruction from the ninth-grade algebra book for three weeks. Students of these teachers were pre- and posttested on the content of the unit so that the teachers could be ranked in terms of their instructional effectiveness. Residual-gain scores were used to do the ranking; these were computed for each teacher's students with the pretest score as a covariate. The four most instructionally effective and the four least instructionally effective teachers available were chosen for the study.

Five instruments were used to measure the dependent variables: the supervisor's report, designed by the Jeddah Board of Education,

Saudi Arabia, for supervisors to evaluate the teachers; a questionnaire designed by the researcher to measure students' attitudes toward their teachers; and three instruments for coding teachers' classroom behavior, taken from the Brophy-Good Dyadic Interaction System. The following analyses were performed: one-way analysis of variance to test individual behaviors, two-tailed t-tests to test hypotheses concerning students' attitudes, and discriminant analysis.

Findings

1. No significant difference was found between supervisors' ratings of the most and least effective teachers for the overall ratings and for each of the 12 subscales.

2. As independent variables, teacher "clarity" and "rephrasing students' correct answers" were behaviors found to be significantly different between the instructionally more effective and less effective teachers.

3. Three discriminant functions were identified that best distinguished between the two groups of teachers.

4. At the end of the 1980-81 school year, students judged instructionally effective teachers as those who demonstrated more concern for their students, were more knowledgeable about the subject matter, and made their teaching more enjoyable than did instructionally less effective teachers. At the beginning of the 1981-82 school year, students judged instructionally effective teachers as those who praised less and punished more than instructionally less effective teachers did.

بسم الله الرحمن الرحيم

In the name of Allah the most merciful and the most beneficient

This dissertation is dedicated to the memory of my parents, Khadiga Mirza and Ahmad Dhafar, and of my father-in-law, Abdulgafar Saati.

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CHAPTER I

THE PROBLEM

Introduction

There is little doubt that individual teachers make an important contribution to the achievement of students (Rakow, Arusian, & Madans, 1978), or, as Good, Biddle, and Brophy (1975) stated, that teachers do make a difference. A constant concern to educators is the identification of those teachers who are most effective in making that important difference.

In this regard, Saif and others (1976) reported that

> During the last fifteen years, voices have been raised asking for more accountability in education. . . . As the trend has become general, many states have passed laws requiring evaluation in education, often specifically identifying teachers as a sector to be evaluated. Why have lawmakers required evaluation of teachers? Some have answered this question simply by saying "to get rid of 'bad' teachers." Others have seen evaluation as means of determining salary scales. Educators did not feel comfortable with either answer. They, however, looking at the same question, have given different answers, namely: "to improve student learning" and "to promote the professional growth of teachers." (p. 126)

This study considers both concerns in a way to help teachers to be instructionally more effective and, as a result of that, to maximize students' achievement. Since no empirical research from Saudi Arabia has correlated supervision of instruction and effective teaching, such a study is needed.

Purpose of the Study

The purpose of this study is to determine how supervisors' evaluations of teachers, teachers' behavior, and students' attitudes toward teachers are related to instructionally effective teachers of ninth-grade mathematics. This study is a partial replication and extension of earlier work at the second- and third-grade levels (Brophy & Evertson, 1976), in fourth-grade mathematics classrooms (Good & Grouws, 1977), and in junior-high-school mathematics and English classes (Evertson, 1980). These and other studies have demonstrated that it is possible to identify those teachers whose students obtain higher achievement scores (Berliner & Tikunoff, 1976; Brophy & Evertson, 1974; Stallings & Kaskowitz, 1974; McDonald & Elias, 1976; Good & Grouws, 1975). Therefore, in this study, the criterion for judging teacher effectiveness was based on whether students demonstrated significantly greater achievement gains on a locally developed measure of student achievement.

Importance of the Study

Currently, there is intense concern in Saudi Arabia for the improvement of preservice and inservice education. Much attention is being paid to the development of criteria for effective teaching by Saudi Arabian teacher educators. New programs for teacher education are currently under development. There is great interest in using research on effective instruction as the basis for those programs. In the past, teacher-education programs were created without this research base. Furthermore, the methods of supervision were developed largely on the basis of the supervisors' experiences. Also,

evaluation of teacher behavior was based on criteria that may or may not have been related to student performance.

In this research, the relationship between supervisors' ratings and teachers' behavior in relation to students' performance was studied. Two aspects related to teacher education emerged:

1. The identification of selected teacher behaviors as they may be related to effective instruction in ninth-grade mathematics;

2. The relationship between supervisors' ratings of teachers' behavior and how these ratings are correlated to the effective instructors.

Careful study of both these aspects of teacher effectiveness will be useful in the following:

1. Preservice education. Teacher educators who develop preservice programs for teachers can use the research on teaching and effective instruction to help student teachers acquire those behaviors that have been shown by both sound theory and research to be effective. In addition, they can use the research on teacher evaluation and effective supervision to introduce these concepts to student teachers so that they can know in advance how to cooperate with supervisors to improve their teaching and, as a result, maximize students' achievement.

2. Inservice education. Teacher educators who develop inservice programs for teachers and supervisors could relate both effective instruction and effective supervision to students' achievement. This can be done by creating an educative environment between teachers and supervisors in such a way that teachers see supervisors as resource persons.

In addition to the significance of this study for developmental efforts for teacher education in Saudi Arabia, the study of the supervisors' ratings is unique since no attempts to define these relationships have been made in previous works. Since supervisors in Saudi Arabia are not trained systematically and since training for supervisory personnel is only emerging, results of this study will be of great interest to persons designing programs for supervision of mathematics instruction.

As a replication of the work of Brophy and Evertson (1976), Good and Grouws (1977), and Evertson (1980), this study will contribute to the body of literature on the effectiveness of teachers in mathematics instruction. This study will also contribute to a comparative analysis between American and Saudi Arabian studies.

Research Questions

The major question under investigation in this study was: Do supervisors' evaluations of teachers who are instructionally effective in ninth-grade mathematics differ from evaluations of teachers who are instructionally less effective?

To answer this question, several related questions also needed to be answered. They were as follows:

1. Do teachers whose students perform better on ninth-grade mathematics tests demonstrate different behaviors than those whose students do not perform well on the same tests?

2. What are some of the behavioral characteristics that distinguish instructionally effective and instructionally less effective teachers?

3. Do the attitudes toward teachers of students who do well on the ninth-grade mathematics achievement test differ from the attitudes toward teachers of those who do not perform well on the same test?

Limitations of the Study

This study was limited to ninth-grade mathematics teachers in the western part of Saudi Arabia, namely, in Makkah, Jeddah, and Taif. For this reason, the results obtained may not be generalized freely to other countries, to other levels of schooling, or to other subjects. However, this study may provide methodological impetus for further research in this area. In addition, the sample size in this study was small (eight teachers and two supervisors), which resulted in a total of 80 observations.

Teacher Supervision and Evaluation in Saudi Arabia

In Saudi Arabia, before 1976, supervisors worked for the Board of Education and were assigned to school districts. All teachers in each district were visited by supervisors twice a year. These visits were made without the consent or advance knowledge of the teachers. The purpose of the visits was to evaluate each teacher's performance. These evaluations were based on supervisors' definitions of effective teaching rather than on scientific criteria derived from research on effective instruction. These procedures were not acceptable to teachers, school principals, and ultimately, to the Ministry of Education for the following reasons: Two visits were not enough

to evaluate the teachers, criteria for evaluation were derived from the supervisors' experiences rather than from research on effective instruction, there was no real communication between principals and the supervisors, and teachers did not try innovations in teaching because the supervisors wanted them to follow certain procedures. Consequently, teacher educators in Saudi Arabia began to search for more effective means of supervision.

In 1976, the Ministry of Education changed the procedures for supervision. The principal of each school designated a chairman for each department, such as mathematics, science, and Arabic language. The chairman for each department and the principal made a plan for teacher evaluation for that department. Teachers were evaluated according to these plans. The supervisors' duties were to do field research, give lectures to teachers on areas related to teaching, and plan for inservice education programs.

This approach was judged unsatisfactory for the following reasons: Principals and chairmen were not trained as supervisors, hence the same problems regarding the validity of their observations occurred; furthermore, there were no clear rules for communication between supervisors and principals.

In 1978, the Ministry of Education changed the procedures for supervision to the following: Both the supervisors and the principals worked together to help evaluate the teachers.

Because of the magnitude of the changes in the procedures for teachers' evaluation, Dr. Abdulla Alzaid, the Educational General Director in the West District in Saudi Arabia, asked a number of

teacher educators, who were involved in supervision and teacher evaluation, in different districts and universities to a conference to present papers on what they had done in this area. This conference started at the beginning of the 1979 school year. Recommendations from this conference included the formation of a committee composed of the principal, a supervisor from the Board of Education district, and the chairman from each department to help evaluate teachers. Any person from the committee was considered a resource for the classroom teacher. The duties of the committee were to be as follows:

1. Develop valid instruments for collecting data from the classroom;

2. Base the criteria for teacher evaluation on sound theory and empirical research;

3. Ascertain if the school library included the current Arabic literature on teaching and the Arabic translations of the recent research on teaching;

4. Have supervisors do field research;

5. Have the committee plan for inservice education based on school and teacher needs;

6. The committee was responsible for acquiring and producing instructional media for the staff;

7. Plan extracurricular activities for the students.

The Ministry of Education studied these recommendations and provided support for released time for a number of principals to go through a one-year renewal program at the Makkah and Reiyad Colleges

of Education. The purpose of this training was to prepare the principals for their role as instructional leaders. In the near future, supervisors will receive the same kind of training. (For an extended discussion of these recommendations, see the Proceedings of the First Educational Supervision Conference in Saudi Arabia, 1979.)

Organization of the Study

This study is divided into five chapters. In Chapter I, an introduction to the study was presented. Included in the introduction were a statement of the purpose of the study, importance of the study, the research questions, limitations of the study, and a discussion of teacher supervision and evaluation in Saudi Arabia. The conceptual framework of the study is given in Chapter II. This chapter contains a presentation of the theoretical conceptualization for this study and relevant research on the following areas: research on supervision, research on teacher evaluation, research on clinical supervision, research on teaching, and research on effective instruction. A brief description of the research design and the methodology used in the preparation and conduct of the study is given in Chapter III. Chapter IV is devoted to the presentation of the findings of the study. Chapter V includes a summary of the investigation, appropriate conclusions and implications, and recommendations for further research.

CHAPTER II

CONCEPTUAL FRAMEWORK OF THE STUDY

Development of the conceptual framework for this study involved a review of literature in the following areas of research: supervision, teacher evaluation, teaching, and effective instruction. This chapter begins with a presentation of the theoretical conceptualization for this study. Following this is a presentation of the research related to this theoretical framework, which includes research on supervision, clinical supervision, teacher evaluation, teaching, and effective instruction.

Theoretical Conceptualization for This Study

This study was derived from the following assumptions: (1) that the supervisor's job in Saudi Arabia is to evaluate effective teaching; (2) that instruction is the most significant aspect of teaching that supervisors evaluate; (3) that teachers are able to be distinguished from one another in terms of the differential performances of their students. Given these assumptions, it follows that a study is possible in which an attempt is made to determine whether supervisors' evaluations of teachers correspond to teachers' performances. From a theoretical standpoint, it would be logical to expect supervisors to evaluate teachers who are instructionally effective as high and teachers who are instructionally less effective

as low. Recent advances in the study of teaching have made it possible to rank teachers in terms of their instructional effectiveness (Good & Grouws, 1975; Berliner & Tikunoff, 1976; Brophy & Evertson, 1974; Stallings & Kraskowitz, 1974; McDonald & Elias, 1976). At present, no study has been conducted in which the hypothesis has been tested that supervisors do, in fact, make discriminating judgments between instructionally effective and instructionally less effective teachers.

This study rests between the research on teaching and research on supervision and teacher evaluation. Therefore, a review of relevant literature from these areas of study is presented in this chapter. The material in this chapter represents an attempt to give perspective to the field of teacher supervision and teacher evaluation. The relevant literature in that area of study is reviewed.

Research on General Supervision

Mosher and Purpel (1972) reported that "very little research has been done on the supervision of teaching" (p. 49). Harris (1965) reported that, from 1953 to 1963, an average of one article per year was considered "supervision research." He commented:

> Notable indeed is the lack of research on the supervisor and supervisory programs and practices in education. We continue to emphasize studies in this field which deal with teacher opinions of supervisors, principals' opinions, contrasting perception of roles and role conflicts. Neither the quality nor the significance of these studies warrants much more replication. (p. 49)

Barr (1945) pointed out that supervisors' analysis or evaluations of teaching usually have both low validity and low reliability. He arrived at the following conclusion:

> There is plenty of evidence to indicate that different practitioners observing the same teacher teach, or studying data about her, may arrive at very different evaluations of her; this observation is equally true of the evaluation experts [supervisors]; starting with different approaches, and using different data-gathering devices, they, too, arrive at very different evaluations. (Mosher & Purpel, 1972, p. 50)

Mosher and Purpel (1972) reported that five skilled social-studies supervisors used tape-recorded observations and rated independently four student teachers. Their results were as follows: "The supervisors' disagreement about the teaching they were evaluating ranged from 50 to 100 percent" (p. 50). They gave three reasons for these differences in their ratings. These were the absence of agreement as to the "right" way to teach, the unreliability of the rating instruments used in supervision, and supervisors either seeing different teaching behavior during their observations or evaluating the same behavior differently.

Given the paucity of meaningful research on supervision, Sergiovanni (1982) posited the importance of a theory of supervisory practice sensitive to the needs of professional action. He reported that

> Such a theory would serve to inform the intuition of supervisors and teachers alike and would emphasize both explanation and understanding in the analysis of teaching. Its purpose would be to provide a helpful framework to supervisors and teachers in an effort to improve teaching. (p. 67)

Because this theory has not been empirically tested, McNeil (1982) suggested a modern approach to scientific supervision, which he explained as follows:

> At this time, the concept of scientific supervision changed from that of regarding research findings as fixed conclusions, formulated into a pattern for all to follow, to that of regarding

> such findings as data for sharpening observations and directing further thinking. Supervisors and teachers together were to adopt an experimental attitude, trying out new procedures and studying the effects of each newly introduced means of improvement until satisfactory results were attained. (p. 19)

Clearly, the research and thinking on supervisors suggest the use of research on teaching as a vehicle for supervision.

Clinical supervision, a special form of general supervision, is examined next in terms of its relationships to this study.

Clinical Supervision

Snyder (1981) defined clinical supervision as follows: "Clinical supervision is an important branch of general supervision; [it] focuses on helping teachers improve their performance through the analysis and feedback of observed events in the classroom" (p. 521). Clinical supervision has been characterized as "a structure by which instructional adequacy can be established" (Krey, Netzer, & Eye, 1977, p. 21). Teacher and supervisor should deal with problems together through the cycle of clinical supervision and rest on "the conviction that instruction can only be improved by direct feedback to a teacher on aspects of his or her teaching that are of concern to that teacher (rather than items on an evaluation form or items that are pet concerns of the supervisor only" (Reavis, 1976, p. 360). The clinical-supervision approach fitted the definition of Burton and Brueckner (1955) of "modern supervision" because "it involves the systematic study and analysis of the entire teaching-learning situation utilizing a carefully planned program that has been cooperatively

derived from the situation and which is adapted to the needs of those involved in it" (p. 13).

The clinical approach to supervision took its name and assumptions from the works of Cogan (1973), Goldhammer (1969), and others.

> The model associated with clinical supervision is a process model, the cycle of clinical supervision. The processes, which are initiated by a teacher who requests aid, involve conferences, observation, and analysis. The roles of the teacher and the supervisor are prescribed (as opposed to defined) and include instructing, conferencing, analyzing, and data gathering as activities. Both teacher and supervisor are to be open, flexible individuals who are careful in making judgments. Each is to contribute toward a productive working relationship that benefits both. (Sullivan, 1980, p. 13)

In his review of research in clinical supervision, Sullivan (1980) reported that "several studies, though not specifically based on clinical supervision, support some of the basic tenets of clinical supervision" (p. 182). Edgar (1972) reported an empirical study in which the autonomy attitudes of new teachers changed significantly toward the attitude of the evaluators more in situations in which there was high affect between the new teacher and the evaluator than in situations in which there was low affect (p. 15). Parsons (1972) found that closeness of the supervisor to the teacher was identified as a major factor in effectiveness. Gordon (1976) indicated that supervisors were perceived most effective by teachers when supervisors were being supportive.

Thus, "general research, then, indicates that the supervisor who is close and supportive is favored by teachers. Further, the way the supervisor is perceived affects the teacher's morale and the way the teacher expects to be perceived" (Sullivan, 1980, p. 16).

Recent Research on Clinical Supervision

Arbucci (1978) did an experimental study for implementing clinical supervision. A significant difference was found between control and experimental groups in the amount of supervision. Reavis (1977) conducted a study to investigate differences in verbal exchanges between supervisors and teachers, contrasting clinical supervision and traditional supervision. His results were as follows: "The data revealed a significant difference between the treatment groups favoring the clinical supervision style. Teachers responding on a semantic differential scale also favored the clinical supervision style" (p. 311). Sullivan (1980) reported on the research that had been done by Eaker (1972), which dealt with the perceptions of clinical supervision by different educators. The sample included teachers and administrators in the seven largest school systems in Tennessee. His results led to the following conclusions:

1. Most teachers and administrators agreed with the basic assumptions of clinical supervision;
2. Although the teachers tended to agree with the procedure of clinical supervision, they agreed more strongly with the assumptions than with the specific procedures;
3. No firm conclusions could be drawn as to how teachers felt about being trained in observational techniques for the purpose of analyzing each other's teaching;
4. Administrators tended to agree more strongly with the assumptions and procedures of clinical supervision than did teachers;
5. There was insufficient evidence to conclude that there exists significant differences in views of teachers with three years' or less experience and those with more than three years' experience. (p. 17)

Turner (1976) developed a case-study approach in which she used five stages of the Goldhammer model with three elementary

teachers. The case study was found to be a reliable method for studying the process of supervision. Sullivan (1980) summarized the previous findings as follows:

> Taken together, these studies yield some findings in support of the clinical supervision model. There is evidence which points to validation of the model (Turner, 1976) and indications that the model's tenets and processes are compatible with the desires of teachers and administrators (Eaker, 1972). (p. 23)

Using Observation for Improving Teaching

Brophy (1979) started his introduction to using valid observation instruments for improving teaching as follows:

> Philip Jackson (1968), in Life in Classrooms, pointed out that classrooms are very busy places, especially for teachers, who share hundreds of interactions with their students each day. Most teachers are too busy coping with the demanding pace of classrooms to have much time to monitor or reflect upon their behavior, so much of their behavior is habitual and not deliberate. Such teacher behavior can persist indefinitely without evaluation or revision even where it is inappropriate, because teachers are not aware of it and their students do not provide feedback about it. (p. 1)

Moore, Schaut, and Fritzger (1978); Tuckman, McCall, and Hyman (1969); Withall (1956); and Brophy and Good (1974) suggested that teaching can be improved by providing teachers with feedback about their behavior. Simon and Boyer (1970) developed more than 100 systems for classroom observations. Flanders (1970) developed one instrument for collecting data in the classroom. Brandt (1972) provided a readable survey of naturalistic approaches in schools for data collection. Good and Brophy (1978) gave detailed suggestions about classroom behavior that can be measured and methods for measuring them. Good and Brophy (1969) also used dyadic interaction systems

for coding teachers' behavior. This instrument was used in the present study. It should be clear that the data that could be collected by observation of classroom teachers were not supposed to be for evaluations of teachers. Both supervisors and teachers should work together in analyzing and interpreting these data.

Research on Teacher Evaluation

Weisenstein (1976) summarized research on teacher evaluation as follows:

> A review of the literature in teacher evaluation revealed little evidence that agreement exists among the professionals in education as to the key elements in the teacher evaluation process. Major issues generated by the teacher evaluation process were grouped into three very general categories and were felt to be characteristic of the dissonance affecting decisions relative to the process of accountability in education. In dealing with the first question, "Who is responsible for evaluating teachers?" it was suggested that the principal must play at least a passive role in the evaluation of the teaching staff, and that the degree of the principal's direct involvement in the evaluation process varies considerably. The wisdom of the principal who assumes complete responsibility for the evaluation process was questioned, with alternate plans provided which enable the principal to share responsibility in this area. Basic criteria to be applied in the selection of the evaluation modes identified are also provided.
>
> The second major question dealt with the identification and selection of an appropriate evaluation instrument. Considerations in this selection included the following: relevance, reliability, validity, fidelity, and ease of administration. In addition, the purposes of teacher evaluation, as a prerequisite to the identification and selection of an evaluation instrument, was surveyed, with primary emphasis given to the pros and cons of evaluating either the instructional process or the instructional product.
>
> The third major question pertained to the human relations difficulties which could arise as a result of the evaluation process. Characteristic human relations problems were identified and a non-inclusive list of preventive measures available to the principal was given. In conclusion, it was implied that, regardless of the frailties of current evaluation systems, a

> great deal of success in teacher evaluation can be achieved through adequate planning, staff involvement, and emphasis being placed on professional growth rather than teacher incompetence. (p. 19)

Natriello and others (1977) also reviewed the recent literature on the evaluation of teachers. Their review dealt with seven aspects of evaluation.

1. Basis for evaluation. "Alvir (1975) defines five teacher roles as the basis for evaluation: classroom facilitator, resource person, academic advisor, nonacademic liaison, and researcher-innovator" (Natriello et al., 1977, p. 30).

2. Pre-post conference.

> The Redfern (1972) approach has recently gained popularity. First, the evaluator and evaluatee have a conference to establish job targets based on broad educational goals. After the evaluator has assessed the teacher's performance, they meet again to discuss ways to improve teaching and to establish new targets. (Natriello et al., 1977, p. 31)

3. Pretest-posttest.

> Hunter (1973) suggests that the evaluator should observe the teacher teach one lesson to a student who has been pretested on the subject matter. Afterward, the student should be re-evaluated. At the end of the process, the evaluator has both a measure of the teacher's success and assessments made during observation. The combination may help to spot areas for improvement in the teacher's performance. Popham (1972) stressed that this method would be more objective than classroom observation, but without observation the evaluator may have difficulty in pointing to specific areas a teacher should work on. (Natriello et al., 1977, p. 31)

4. Videotape.

> Baltus (1974) suggested videotaping of behavior to be evaluated. The principal and the teacher can then go over the tape together. Case and Brown (1970) also suggested a videotape which can be played repeatedly for the teacher and his or her colleagues. (Natriello et al., 1977, p. 32)

5. Students' evaluation. "Shaw (1973) and Hanson (1967) both recommended student evaluation of teachers, but Bejar (1975) warns that research on the validity of such evaluations may not justify using the results for personnel decisions" (Natriello et al., 1977, p. 32).

6. Self-evaluation.

> Many administrators saw self-evaluation as an essential element of any evaluation system. Olds (1973) agreed. He argued that any formulation of performance objectives involved a substantial degree of the own self-evaluation and offered instructions for developing a self-evaluation program. Detzner (1974) suggested that videotaping provided a "nonthreatening" means of self-evaluation. (Natriello et al., 1977, p. 33)

7. Students' achievement.

> Cameron (1973) found that principals, teachers, and school board members defined student achievement as the major objective for student growth and that student growth is a more reliable measure than observational ratings for use in teacher evaluation. (Natriello et al., 1977, p. 34)

Saif (1976) explained his views about teacher evaluation as follows:

> Since the primary professional activity of a teacher is teaching, the major concern of teacher evaluation should be effective student learning experiences. With focus on the improvement of student learning, an evaluation scheme should seek to help all teachers do a better job. It does not concentrate on defining "good" versus "bad" teachers, but assumes that each teacher is competent, and that each can improve. (p. 127)

Stow and Sweeney (1981) reported that

> A performance evaluation system should be reviewed, revised, or refined every three to five years because skills needed to operate a school effectively will change. Also, planning and participation by the involved professionals will help make the process more important to them. (p. 539)

Brophy, Couleter, Crawford, Evertson, and King (1975) reported in their abstract that "a set of twelve classroom observation

scales developed from prior factor analytic work of Emmer and Peck (1973), which measure general process variables stressed in previous classroom research, showed good stability across years and across contexts within years" (p. 1). This stability across time and context that relates to student learning gains gives strong support to supervisors who work with the respective teachers.

It is worth mentioning teachers' perceptions about supervisors' feedback. In the abstract of his dissertation, Wilson (1981) summarized his findings as follows:

1. Even when teachers previously rigorously assessed their own classroom performance, their self-perceptions are apt to change as a result of receiving feedback from others.
2. Feedback data that are externally analyzed and reported appear to have somewhat stronger influence on self-perceptions than comparable data that are analyzed and reported on by the teachers themselves.
3. Teachers change their self-perceptions in accord with the direction and magnitude of the difference between their original self-perceptions and the feedback they receive.

These findings also give strong support to the need to find better ways of giving feedback to the respective teachers.

More research on teacher evaluation is needed so that both teachers and students can do freely, without pressure, what they are supposed to do.

The following section is presented to give a perspective on the field of research on teaching. This is in turn followed by a review of relevant literature within this field.

Three Phases of Research on Teaching

Teaching is a very important profession that the community as a whole, and especially parents, care about. It is not an easy job. Educators used, in traditional schools, to be teachers without adequate training. Students used to go to school to study many subjects, and the teacher's job was to present his material by lecturing and not to worry himself with how and if students could learn. There was no time for a teacher to ask himself the following questions:

1. What is my objective in teaching mathematics?
2. Do students really understand what is going on in the classroom?
3. Do I care about students' scores or their growth?
4. How can I maximize students' learning?
5. Do I know what is going on in the students' minds?
6. Do I consider individual differences?

Educators in the 1960s started to realize the problems of teaching. They started to try to understand what was going on in the classroom. Clark (1979) organized this kind of research into five facets. These five approaches were: the process-product approach, the aptitude-treatment-interaction approach, the Carroll-model approach, the ethnographic approach, and the teacher-thinking approach. For the purposes of this study, Clark's categories are organized into three approaches. First, the process-product approach is combined with the teacher-thinking approach as one approach. Second, the Carroll-model approach is combined with the aptitude-treatment-interaction approach as the second kind of research on teaching. Third, the ethnographic approach is considered as the third kind of research on teaching.

First Phase of Research on Teaching

The most important assumption in the process-product approach is that teachers' behavior influences students' achievements. Accordingly, the general question to be addressed on this topic is: What are the behaviors of teachers who influence students' achievements? The main assumption in the teacher-thinking approach is that teachers' thinking influences students' achievements. Teachers make judgments and decisions during classroom teaching that affect their students. This assumption can include the fact that both teachers' behavior and teachers' thinking influence students' achievements.

There is a cycle of supervision that the supervisor goes through with the teacher. Cogan (1969) classified this cycle into four phases. The first one is of concern here. It is the pre-observation conference. The supervisor needs to get to know the teacher in that conference. Teacher-thinking research helps both the supervisor and the teacher to know each other. They plan the lesson together. In that phase, both supervisor and teacher agree on the way in which the supervisor will observe the teacher. One way is that in the second phase, the observation phase, the supervisor can use Flanders' instrument.

Cogan (1969) and Goldhammer (1972) found that student achievement is influenced by this cycle, which depends on the teacher-thinking approach and the process-product approach. The researchers in this area are more concerned with the average achievement of the class. If supervisors know more about teachers and teachers know more about

their own behavior in the classroom, students learn more, and they more likely enjoy learning.

Second Phase of Research on Teaching

In the second phase, the aptitude-treatment-interaction approach is combined with the Carroll-model approach.

Assumptions

1. Different treatments cause different outcomes.
2. Aptitude of interest remains static at least during the time of treatment.
3. There are differences in mental ability, so different treatments are needed to maximize student learning.
4. Teachers should spend more time assisting those students who need help.
5. Not all students can learn in the same amount of time; some of them need more time, some less.
6. Teachers should consider individual differences.

The Guiding Questions

1. How do levels of achievement interact with instructional methods and amount of instructional support?
2. In what ways can teachers give every individual the time he is supposed to (and needs to) have?

Time and varied treatment should not be separated from each other. As everyone knows, students learn mathematics in segmental steps. If teachers spend adequate time and administer suitable treatment to individuals in the first lesson, students grasp the

material very well and do not have difficulty with the second lesson. The following methods were used in this kind of research:

1. Laboratory experiments
2. Instructional experiments
3. Empirical case study
4. Naturalistic comparison

Third Phase of Research on Teaching

In the third phase of research, there is appropriate research in teaching to be studied and understood. Teachers cannot fulfill their roles appropriately without knowing the dealing with this kind of research. Ethnographic research is clearly appropriate for analyzing and identifying effective teaching in intergroup settings because it permits the development of models based on concrete examples that occur in a realistic classroom. Researchers cannot explain much about any observation if they do not have an idea about the situation in which the observation occurred.

Researchers in the field try to understand more about the setting rather than predicting. The main questions in this research are:

1. What is really going on in the classroom and why?
2. What are people doing and why are they doing it? (Barko, 1979).

This kind of research began with the idea that a researcher who knows anything about the field and his job will try to know what is happening in the field and describe the setting and not predicting.

Assumptions

1. Researchers should not analyze small parts before the complete picture becomes clear to them.

2. Researchers should select experiences so that they can explain to themselves and others what is going on in the setting.

3. A single individual or couple should go to the field so that they become involved in the life of that site; after a long period of time, they begin to formulate a framework for the analysis. The researcher is free to go into the field with a very loose set of notions in the hope that observation will help him discover the critical variables.

Thus, the researcher's job is to collect as much data as he can. The first thing he should do when he arrives in his office is to look through his data. He should try to pull out, from his field notes, a key incident and link it to other incidents, phenomena, and other theoretical constructs so that he can describe and analyze the setting well. Teachers can do a lot for students if they realize and study carefully this kind of research.

The review of literature that follows is restricted to process-product studies of teaching, as they are most relevant to this study.

Research on Effective Instruction

Teachers do make a difference (Good, Biddle, & Brophy, 1975). Good (1980) stated in his introduction on the research on teaching:

> We know little about how students learn and how teachers and schools can facilitate learning for students generally or for specific types of students. We need to acknowledge and to understand that the attempt to describe and/or to affect classroom learning is an enormously complex task. The realization of the complexity of classroom phenomena should cause us to be suspicious of simple models of teaching that offer universal solutions and to be tolerant of (if not encourage) divergent approaches to the study of teaching. (p. 1)

Brophy (1979) gave some reasons for considering student outcomes as criteria for teaching effectiveness. They were: social concern about declining student achievement, teacher accountability, and related issues. The issue of considering student outcomes as criteria for teaching effectiveness is controversial. For example, Stevens (1967) theorized that achievement is determined by factors within students and little by teachers. Coleman, Campbell, Hobson, McPartland, Mood, Weinfield, and York (1966); Mosteller and Moynihan (1972); and Jencks, Smith, Acland, Bane, Cohen, Gintis, Heyns, and Michelson (1972) indicated that teachers do not have important effects on student learning. Fenstermacher (1978) declared that good teachers are born, not made, implying that there is no need for research on teaching. Popham's (1971) point of view was that there is no need for training teachers since no systematic differences in teaching behavior were found between trained and untrained teachers. In contrast, Good (1980) said,

> I suspect that most researchers interested in classroom behavior would support the contention that the 1970s were a productive period for classroom research. It seems clear to me that extant evidence does support the contention that teachers can make an important difference in student learning. (p. 1)

Brophy (1979) gave three reasons that recent classroom research efforts were successful in relating teacher behavior to student outcomes. They were:

1. The important review works by Rosenshine and Furst (1973) and Dunkin and Biddle (1974) which summarized what was known about the effects of teaching, clarified some of the weakness of earlier research, and brought an instrumental degree of conceptual coherence to the field of research on teaching.
2. An increased awareness of the methodological problems inherent in studying teacher effects and the concomitant willingness of investigators to begin to respond to those challenges in creative ways.
3. The willingness of the National Institute of Education to invest in large-scale process-product research and the ability of researchers to design broad exploratory studies. Good (1980) reported that "the field of teacher behavior changed its research emphasis from 'commitments' (Dunkin & Biddle, 1974) and the search for universal dimensions of teaching effectiveness to the study of particular aspects of teaching in manageable contexts." (p. 2)

Berliner and Tikunoff (1977); Brophy and Evertson (1974, 1976); Good and Grouws (1977, 1979); McDonald (1976); McDonald, Elias, Stone, Wheeler, Lambert, Calfee, Sandoval, Ekstrom, and Lockheed (1975); Soar and Soar (1972); Stallings (1975); Stallings and Kaskowitz (1974); and Tikunoff, Berliner, and Rist (1975) began with several large-scale field correlational studies to provide a dependable body of knowledge about the relationships between teaching and student learning of basic skills in the elementary grades. Replication studies were done in junior high school (Evertson, Emmer, & Brophy, 1979; Evertson, Anderson, & Brophy, 1978; Evertson, Anderson, Anderson, & Brophy, 1979). In addition, experimental studies were developed from earlier correlational work (Good & Grouws, 1978; Anderson, Evertson, & Brophy, 1978).

Good (1980) categorized the general findings from recent research on teaching into the following areas:

1. Active teaching
2. Classroom management
3. Teacher expectations

Brophy (1979a) characterized the pattern of active teaching as follows:

> Learning gains are most impressive in classrooms in which students receive a great deal of instruction from and have a great deal of interaction with the teacher, especially in public lessons and recitations that are briskly paced but conducted at a difficulty level that allows consistent success. (p. 747)

Good (1980) reported that

> Good and Grouws in an ongoing project have produced support for the active teaching model in a field experiment in eighth grade mathematics classrooms. Active teaching may be inconsistent with the goals of certain subjects (e.g., social studies) where process goals are more important than product goals. (p. 16)

Good (1979) reported his findings about classroom management as follows: "Teachers' managerial abilities have been found to relate positively to student achievement in every process-product study conducted to date" (p. 58). Good (1980) defined good classroom management as "those techniques which prevent misbehavior by eliciting student cooperation in general and involvement in assigned work specifically" (p. 20).

Good (1980) reported the findings of Brophy and Evertson (1976) about teacher expectations as follows: "Teachers who were obtaining the highest residual achievement from students were teachers

who perceived students as capable of learning school work and who viewed themselves as capable of teaching the curriculum" (p. 23).

Teaching Junior High Mathematics

The findings of five studies related to mathematics in junior high school are reviewed in this section.

Evertson, Anderson, Anderson, and Brophy (1979) did a study that gave predictors of student outcomes in junior high mathematics. The authors found that the more effective teachers

1. were active, well-organized, and strongly academically oriented.
2. tended to emphasize whole-class instruction, but some time spent in seatwork.
3. did not give their students many choices about what kinds of assignment they would do, and they rarely used self-paced materials.
4. managed their classes efficiently and stopped a disturbance before it could seriously disrupt the class.
5. asked many questions during class discussions; most were "lower-order" product questions, but "higher-order" process questions were also fairly common.
6. were rated as more enthusiastic, nurturant, and affectionate than their less successful colleagues. (p. 19)

These results coincided with the findings of Good and Grouws (1977) and Flanders (1970). Based on this research, Good and Grouws (1977) conducted an experimental study of teaching mathematics at the fourth-grade level. Their results strongly correlated with increased achievement gains in fourth-grade mathematics.

Evertson, Emmer, and Brophy (1979) conducted a study entitled "Predictors of Effective Teaching in Junior High Mathematics Classrooms." They found that more effective teachers

1. spent greater amounts of class time as a group rather than in seatwork, resulting in a much higher frequency of questions directed to the students;
2. enforced rules to a greater degree, accepted less disturbance, had more efficient transitions, and monitored pupils better;
3. were less likely to allow students to leave the room, but were rated as more receptive to student input;
4. were judged to have more productive time;
5. were rated as manifesting less anxiety, more confidence, greater task orientation, and more enthusiasm;
6. asked more product and process questions;
7. devoted more class time to developmental activities and less time to individual seatwork;
8. displayed stronger management skills, greater clarity, more questioning behaviors. (pp. 11-12)

Anderson, Evertson, and Brophy (1978a) did a study entitled "Process-Outcome Relationships in the Texas Junior High School Study: High Inference Ratings of General Behaviors." They reported that "the data sets depict a fairly consistent view of effective teaching in junior high math classes, when effectiveness is defined by achievement on a test of math content" (p. 3).

Teacher characteristics that were related positively to students' achievements in this study were:

1. effectiveness of teacher's management methods;
2. student respect for teachers;
3. student obedience,
4. teacher consistency in enforcing the rules,
5. teacher monitoring,
6. efficiency of transitions,
7. teacher's likability,
8. general competence,
9. enthusiasm,

10. enjoyment of teaching,
11. moderate use of public class discussion,
12. use of higher cognitive-level questions,
13. concern about students' achievement,
14. encouragement to students to perform well,
15. responsibility for their own work,
16. time spent on productive work,
17. time spent in busy work,
18. overall positive involvement with the class,
19. adequate preparation for teaching. (pp. 3-4)

Brophy and Evertson (1978) did a study entitled "Process-Outcome Relationships in the Texas Junior High School Study: Low Inference Coding of Specific Behaviors." They summarized their findings as follows:

> Effective instruction in junior high math classes was marked by an academic orientation, concentration on whole group instruction rather than individualized contact, frequent public recitation and discussion with active student involvement and initiation of questions and comments, maintenance of a rapid pace by calling mostly on volunteers and minimizing length interruptions to deal with the needs of individual students on the spot, and in general, a stress on eliciting and reinforcing high quality responses to questions designed to move the class along at a good pace. This stereotype fits the high ability classes much better than the low ability classes, though. Both the level of demand and the level of discourse was a little lower in the low ability classes (appropriately so), and effective teachers in those settings spent more time dealing with individuals especially attempting to elicit improved responses. There was much support for aspects of what Flanders has called indirect teaching, especially for the eliciting and use of student ideas, although again, more so in the high ability classes and only within the larger context of a strong academic and demanding orientation. (p. 8)

Evertson and Brophy (1978) did a study entitled "Process-Outcome Relationships in the Texas Junior High School Study: Comparison of Findings for Cognitive and Affective Criteria." They summarized their findings as follows:

> Students' attitudes seem to be affected by the amount of interpersonal warmth and competence that teachers demonstrate, whereas academic achievement is affected by a more businesslike, organized, but not cold, teacher approach. Teachers who have both high ratings and high achievement in their classes could be those who are able to blend appropriate amounts of interpersonal skill, warmth, and interest in students with the more task-like demands of delivering mathematics content. (p. 5)

Four conclusions can be drawn from such studies:

1. Evertson, Anderson, Anderson, and Brophy (1979) reported that

> these results must be interpreted with caution because of their correlational nature. They describe some of the teaching practices of some successful math teachers, but by themselves they cannot be used as the basis for statements about cause and effect; neither do we know to what degree the methods used by the more successful teachers can be taught to others who are not currently using them. (p. 20)

2. Evertson, Emmer, and Brophy (1979) closed their discussions by reporting that

> the large number of variables differentiating the more effective and less effective teachers suggests that effective teaching has multiple facets, and is not reducible to a single trait or behavior. It seems reasonable to theorize that the various classes of variables tend to occur together, and to produce effects both on each other and on the product variables. (p. 13)

3. Experimental studies are needed in junior high schools to test the previous results.

4. Both supervisors and teachers should consider these findings and select those that are applicable to their schools.

Summary

Given this substantive body of empirical research, supervisors and teachers could only benefit by becoming aware of and using the findings of research on teacher evaluation, supervision, teaching, and effective instruction appropriately in their work.

CHAPTER III

RESEARCH DESIGN AND PROCEDURE

The problem under investigation in this study was to determine how supervisors' evaluations, teachers' behavior, and students' attitudes toward teachers are related to instructionally effective teachers of ninth-grade mathematics. The following components of the research are presented in this chapter: the research questions, the design of the study, the research hypotheses, a description of the population and the sample for this study, a description of the five instruments used in the study, a discussion of the validity and reliability of these instruments, and a description of the manner in which observers were trained to collect data.

Research Questions

The major question under investigation in this study was: Do supervisors' evaluations of teachers who are instructionally effective in ninth-grade mathematics differ from evaluations of teachers who are instructionally less effective? The following related questions were asked to refine specific dimensions of the general question posed in this study:

1. Do teachers whose students perform better on ninth-grade mathematics exams demonstrate different behaviors than those whose students do not perform well on the same tests?

2. What are some of the behavioral characteristics that distinguish instructionally effective and instructionally less effective teachers?

3. Do the attitudes toward teachers of students who do well on the ninth-grade mathematics achievement test differ from the attitudes toward teachers of those who do not perform well on the same test?

Design of the Study

To address the research questions posed in this study, eight teachers were selected from a group of 40 ninth-grade mathematics teachers by means of a pretest-posttest to two classes of their students to identify residual-gain scores for a three-week unit of algebraic factoring. The eight teachers selected represented the four most instructionally effective and the four least instructionally effective teachers based on their students' residual-gain scores. Data collected about these eight teachers and their students included:

1. Supervisors' evaluations of teachers,
2. Classroom observations of teachers' behavior,
3. Students' attitudes toward the eight teachers during part of two consecutive years.

Research Hypotheses

Hypotheses Pertaining to Supervisors' Evaluations

Three primary null hypotheses pertaining to supervisors' evaluations were tested. They are as follows:

1. There is no significant difference in the supervisors' overall ratings of instructionally effective and instructionally less effective ninth-grade mathematics teachers.

2. There is no significant difference in the supervisors' ratings of instructionally effective and instructionally less effective ninth-grade mathematics teachers in relation to such factors as the following:

2.1. Teachers' personalities and their ability to control their classes;

2.2. Teachers' ability to follow the outlines of lessons they prepared;

2.3. Teachers' preparations of lessons before their lectures;

2.4. Teachers structuring their concepts progressively to introduce the simpler examples and points and then the more difficult ones;

2.5. Teachers' manner of conducting classroom discussions;

2.6. Teachers' perceptiveness of individual differences among students;

2.7. Teachers' use of such aids as the blackboard and instructional media;

2.8. Students' understanding of mathematical concepts;

2.9. Teachers' knowledge of the subject matter;

2.10. Amount of homework given and whether teachers checked it;

2.11. Students' achievements;

2.12. Evaluation methods used.

3. Of the 12 supervisor ratings of teachers, no singular subset of factors can be found that, through the use of such a subset, instructionally effective and instructionally less effective teachers can be reliably differentiated.

Hypotheses Pertaining to Classroom Observations

On the basis of classroom observations by the four observers, two primary null hypotheses were tested. They are as follows:

4. There is no significant difference between instructionally effective and instructionally less effective ninth-grade mathematics teachers in the following:

4.1. How the teachers deal with homework;

4.2. The degree of attention the teachers receive from their students;

4.3. The clarity of the teachers' presentations;

4.4. The time teachers spend in presentation of the material;

4.5. The degree of enthusiasm demonstrated by the teachers;

4.6. Whether the teachers assign homework;

4.7. Whether the teachers allow their students enough time to solve each assignment;

4.8. Whether the teachers give their students time to try some problems on the next homework assignment to familiarize themselves with the work;

4.9. Whether the teachers ask discipline questions;

4.10. Whether the teachers ask direct questions;

4.11. Whether the teachers ask open questions;

4.12. Whether the teachers let their students answer questions without being called on;

4.13. Whether the teachers let their students answer questions as a group;

4.14. Whether the teachers ask process questions;

4.15. Whether the teachers ask product questions;

4.16. Whether the teachers ask choice questions;

4.17. Whether the teachers praise students who give correct answers;

4.18. Whether the teachers give nonverbal signs for correct answers;

4.19. Whether the teachers summarize students' correct answers;

4.20. Whether the teachers ask a second student for the correct answer if the first student has given a wrong answer;

4.21. Whether the teachers neglect a student who has given a wrong answer;

4.22. Whether the teachers explain their students' mistakes;

4.23. Whether the teachers give the right answer if a wrong answer has been given;

4.24. Whether the teachers ask for more clarification from their students;

4.25. Whether the teachers praise their students if they ask for individual help;

4.26. Whether the teachers criticize their students if they ask for individual help;

4.27. Whether the teachers criticize their students for misbehavior.

5. Of the different factors constituting the basis for evaluation of teachers as given in Hypothesis 4, no singular subset of factors can be found that, through the use of such a subset, instructionally effective and instructionally less effective ninth-grade mathematics teachers can be reliably differentiated.

Hypotheses Pertaining to Students' Attitudes

Two primary null hypotheses were formulated to test the attitudes of students. They are as follows:

6. There is no significant difference in students' perceptions of instructionally effective and instructionally less effective ninth-grade mathematics teachers with respect to the following:

6.1. The degree of concern teachers express for their students;

6.2. Teachers' knowledge of their subject matter;

6.3. The way teachers praise their students;

6.4. The way teachers punish their students;

6.5. The degree to which the students enjoy a teacher's classes.

7. Of the three major areas of evaluation of teachers, namely, supervisors' ratings, classroom observations, and students' attitudes toward their teachers, no singular subset of factors can be found that, through the use of such a subset, instructionally effective and instructionally less effective ninth-grade mathematics teachers may be reliably differentiated.

Population of the Study

Forty ninth-grade mathematics teachers were chosen from 24 schools in three cities in Saudi Arabia. The cities were Makkah, Jeddah, and Taif. The 24 schools were representative of the community characteristics and socioeconomic status of the populations they served. The 40 teachers agreed to teach a unit of instruction in algebraic factoring for a period of three weeks from the ninth-grade algebra book, which is assigned by the Ministry of Education in Saudi Arabia to all ninth-grade students. This period fell at the middle of the 1980-81 school year.

The pretest and the posttest, as shown in Table 3.1, were designed by the researcher and one of the head supervisors of mathematics teachers in Saudi Arabia. A statement regarding the content validity of the pretest and posttest is contained in Appendix A. All tests were corrected by the researcher.

To rank the teachers in terms of their instructional effectiveness, residual-gain scores were computed for each student of each teacher with the pretest score as a covariate. By this regression

technique, differences in initial (prior to instruction) student differences were statistically controlled. Thus it can be argued that the differential student gains in one given classroom, for example, were due to the particular teacher in that classroom because student differences were statistically removed.

Table 3.1.--Pretest and posttest measuring students' achievements.

Question: Factor to the simplest form:

1. $X^2 - 7X + 12$
2. $-3 - 4X^2 - 7X$
3. $12X^2 - 16XY - 60Y^2$
4. $2X^2 + 2X - 12$
5. $3X^2 - 5X - 8$
6. $6X^2Y - 13XY^2 + 6Y^3$

Sample of the Study

Pretest and posttest measurements of students' achievements were made of 2,400 students of the 40 ninth-grade mathematics teachers. Each question was given a weighted score based on the operations done by the students in solving each question. The total possible score of 100 points was used in identifying the average-gain scores. These scores are presented in Table 3.2. The four teachers (1, 2, 3, and 4) whose students achieved the highest gain scores and the four teachers (37, 38, 39, and 40) whose students ahieved the lowest gain scores were chosen for this study. These eight teachers were chosen in the 1980-81 school year. Their students responded to the attitude questionnaire. (See Table 3.3).

Table 3.2.--The average-gain scores of the mathematics teachers.

Code	Mean	Standard Deviation	Variance
1	7.6842	7.5994	57.7504
2	6.4535	7.0663	49.9324
3	4.5496	8.0216	64.3456
4	4.4363	7.8591	61.7661
5	4.0923	7.6471	58.4788
6	3.4071	6.5599	43.0320
7	3.4070	7.6581	58.6468
8	2.2739	9.0285	81.5133
9	2.2424	5.9320	35.1892
10	2.1927	7.6109	57.9262
11	1.9638	7.4268	55.1574
12	1.8928	7.2823	53.0325
13	1.3863	7.7336	59.8082
14	1.3419	6.4203	41.2205
15	1.2409	7.2276	52.2383
16	1.1900	6.5944	43.4863
17	0.6802	7.4621	55.6831
18	0.6440	7.8680	61.9057
19	0.0392	8.3073	69.0112
20	-0.0193	7.2423	52.4507
21	-0.1993	7.4229	55.0988
22	-0.3911	6.9664	48.5304
23	-0.5729	5.6999	32.4883
24	-0.7858	6.5030	42.2893
25	-0.8236	5.7825	33.4370
26	-0.8404	6.0021	36.0250
27	-0.8617	6.5930	43.4673
28	-1.2818	7.2217	52.1523
29	-1.2877	5.7058	32.5564
30	-1.3806	7.9353	62.9692
31	-1.6644	5.1105	26.1169
32	-2.1097	7.8571	61.7348
33	-2.2187	5.9642	35.5716
34	-3.1685	6.4474	41.5688
35	-3.2478	6.2475	39.0311
36	-3.6018	5.6004	31.3646
37	-4.7000	5.6331	31.7315
38	-4.8374	6.5913	42.1372
39	-7.3554	4.3033	18.5183
40	-9.7831	5.5804	31.1414

Table 3.3.--Items on questionnaire concerning students' attitudes.

1. I feel comfortable participating in class discussion.
2. My teacher is friendly.
3. My teacher helps me learn mathematics.
4. I like my math teacher.
5. I feel comfortable with my math teacher.
6. I am praised when I do good work.
7. My teacher knows his subject.
8. My teacher cares about me.
9. I like mathematics.
10. If I have a question, I ask my teacher right away.
11. My teacher wants me to understand math.
12. My teacher makes sure that I do my homework correctly.
13. I do my best to understand math.
14. My teacher gives us homework for every lesson.
15. My teacher helps me when I make mistakes on my homework.
16. My teacher encourages me to ask questions.
17. I feel my teacher likes to teach math.
18. My teacher does not make me feel embarrassed when I answer his question incorrectly.
19. The teacher's blackboard is well organized.
20. My teacher hits me when I do not behave well in the class.
21. My teacher hurts my feelings in front of my classmates when I do not answer his question.
22. I am told about my bad work and not about my good work.
23. My teacher praises me when I complete my homework.
24. My teacher prepares the lesson in advance.
25. My teacher makes me feel stupid when I do not answer his question.
26. When I do not answer the teacher's question correctly, he still encourages me.
27. My teacher yells at me a lot in class when I do something wrong.
28. My teacher hits me when I cannot answer his question.

Table 3.3.--Continued.

29.	I do a lot of good work that goes unnoticed.
30.	My teacher moves gradually from the easy examples to the more difficult ones.
31.	My teacher gives enough time for each student to solve the problem.
32.	My teacher checks my homework problems.
33.	My teacher repeats his presentation to make sure that each student understands the concept.
34.	I am able to read his writing on the blackboard.
35.	My teacher builds on past experiences in introducing new concepts.
36.	My teacher explains the material very well.
37.	My teacher uses different methods to solve problems.
38.	The presentation made by my teacher attracts my attention.

At the beginning of the 1981-82 school year, two of the four instructionally effective teachers were not available; they were replaced with the next two teachers. The new group of instructionally effective teachers (as shown in Table 3.2) were Teachers 1, 4, 7, and 8. Likewise, two of the four instructionally less effective teachers had to be replaced by the next two less effective teachers. The new group of instructionally less effective teachers (as shown in Table 3.2) were Teachers 39, 37, 33, and 32.

Instruments

For this study, five instruments were used to measure three aspects of the data.

Instrument Used to Evaluate Teachers by Supervisors

The first instrument used was the supervisor's report, which was designed by the Jeddah Board of Education to evaluate teachers. This instrument contained 15 items. The supervisors responded to the first 12 items. (See Table 3.4.) The last three items were to be answered by the schools' principals. The first 12 items were used in this study. (Both the Arabic version of the supervisor's report and its English translation are given in Appendix B.)

Table 3.4.--Items included in supervisors' evaluations.

S01.	Teacher's personality and his ability to control his classes.
S02.	Teacher's ability to follow the outlines of lessons he prepared.
S03.	Teacher's preparations of lessons.
S04.	Teacher's structuring his concepts progressively to introduce the simpler examples and points, then more difficult ones.
S05.	Teacher's manner of conducting classroom discussions.
S06.	Teacher's perceptiveness of individual differences among students.
S07.	Teacher's use of such aids as blackboards and instructional media.
S08.	Students' understanding of mathematical concepts.
S09.	Teacher's knowledge of the subject matter.
S10.	Amount of homework given and whether teacher checked it.
S11.	Students' achievement.
S12.	Evaluation method used.

Instruments Used for Classroom Observations

Brophy and Good (1970) used three instruments for observing teachers in the classroom. These three instruments were used in this

study. The first was the Brophy-Good Dyadic Interaction scale. (See Table 3.5.) The second instrument (Emmer, 1973) measured homework given, the degree of attention the teachers received from their students, the clarity of the teachers' presentations, the degree of enthusiasm demonstrated by the teachers, and the time the teachers spent in presentation of the materials. (See Table 3.6.) The third instrument measured five factors of the homework assignment. (See Table 3.7.) Brief definitions of all variables involved in the above three instruments can be found in Appendix C, along with copies of all coding sheets.

Instrument Used to Measure Students' Attitudes

The researcher designed a questionnaire consisting of 38 items. (See Table 3.3.) This questionnaire was the fifth instrument used in this study. The cover sheet of the questionnaire, the questionnaire, the Arabic translation of the questionnaire, and a statement about the validity of the translation of the questionnaire are given in Appendix D.

Questionnaire Reliability

The first step in analyzing the attitude scale was to do an exploratory factor analysis. Complete results of this analysis are presented in Appendix E. On the basis of the results as presented in the varimax rotated factor matrix (see Appendix E) and of a consideration of the content of the items on the questionnaire, five scales were tentatively selected. The scales were based on the following five factors: (NOTE: Narrative continues in the middle of page 47)

Table 3.5.--Brophy-Good Dyadic Interaction scale.

RESPONSE OPPORTUNITIES			Dyadic-Teacher Contacts			
			Created		Afforded	
QUESTION	ANSWER	FEEDBACK	WORK	PROCED.	WORK	BEH
DISP DIRC OPEN CALL PROC PROD CHIC	+ +/- - DK NR	PRIS AFRR REPF NEGL NIA CRIT EXAN GIVA ASOT CALO REPT CLUE NEWQ AFMC	STPR PCSS STCR ?	+ F - + B -	+ P - + C - S ?	+ W + TDIS

Table 3.6.--High-inference codings.

Time Code	Homework	Attention	Clarity	Enthusiasm	Presentation
	1 2 3	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
	1 2 3	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
	1 2 3	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
	1 2 3	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Table 3.7.--Homework assignments.

		Yes	No
R1.	Is homework assigned?	___	___
R2.	Same assignment to all students?	___	___
R3.	Time provided in class to work on homework?	___	___
R4.	If so, how much time?	____ min.	
R5.	Describe homework assignment:		
	A. Textbook	___	___
	B. Workbook	___	___
	C. Commercial ditto	___	___
	D. Teacher-made ditto	___	___

1. Concern of the teacher for the students' progress;
2. The teacher's knowledge of the subject;
3. Praise and encouragement given to the student by the teacher;
4. Punishment meted out by the teacher;
5. The student's overall enjoyment of the subject matter and the teaching.

In a second step, reliability analyses were conducted for the five scales suggested by the results of the exploratory factor analysis. The following coefficients of reliability were obtained for the clusters of responses listed for each scale. (See Table 3.8.)

As can be seen from Table 3.8, there was a high correlation among the responses of the students to items that had close logical relationships to one another. One can conclude, based on the internal

reliability of the items, that the student-attitudes questionnaire had an acceptable level of reliability for this study. The reliability analysis of the scales on the questionnaire concerning students' attitudes is presented in Appendix F.

Table 3.8.--Subscales, clusters, and coefficients of reliability.

Scale	Clusters	Coefficient of Reliability
Concern of the teacher for the student's progress	A03, A12, A13, A16, A33, A34, A35, A39	0.83
The teacher's knowledge of the subject	A17, A18, A20, A37, A38	0.77
Praise and encouragement given to the students by the teacher	A02, A04, A05, A06, A08, A24, A27	0.82
Punishment meted out by the teacher	A21, A22, A23, A26, A28, A29	0.75
The student's overall enjoyment of the subject matter and the teaching	A01, A05, A09	0.55

Questionnaire Content Validity

The questionnaire was provided for review in terms of the overall content validity and clarity of the items to two Arabic educators, both of whom had had considerable experience as teachers and educational leaders in the Arab World. Their suggestions were considered in developing the final version of the questionnaire.

Training the Observers

There were four observers, including the researcher, who observed the eight teachers. The procedures outlined by Coulter (1976) were followed to train the observers. Accordingly, two major steps were used for the training: training of observers prior to their going into the classroom and training in the classroom.

Training of Observers Prior to Their Going Into the Classroom

This stage was divided into three steps:

1. The coders were given an overview of their tasks. A double-blind procedure was employed so that the observers would be unaware of the teacher's status, i.e., instructionally effective or instructionally less effective. The researcher tried to reassure the observers that they would be able to learn the system and that things would become clear as they progressed.

2. The observers were given the coding manual, which contained a thorough discussion of the coding system, explanations and descriptions for each category with relevant examples, and instructions about how and when the system was to be used. Observers were given enough time to study the coding manual. They were requested to write down any problems they had; problems were thoroughly discussed.

3. In addition, a videotape was used in further training the observers. Three classes were videotaped: the teacher of one class was given no instructions; teachers of the other two classes were asked to demonstrate certain teaching styles so that the observers had an example of all categories appearing on the Brophy-Good Dyadic

Interaction instrument. Viewing the videotapes gave the observers an idea of the typically fast pace of classroom events. Observers began to build up some speed in their coding, and they had an opportunity to clear up questions regarding the particulars of the category system.

Guidelines for Observers

Before observers were sent into classrooms for the first time, they were instructed on several important points concerning their behavior at the time of observing. The guidelines included the following:

1. They were requested to sit at the back of the room at an empty desk to minimize the effects of their presence in the classroom.

2. They were requested to be in the classroom before the bell rang or the class officially began.

3. They were requested to introduce themselves to teachers when they arrived and to thank teachers for their cooperation when they left.

4. They were requested to minimize personal interactions with students.

5. They were requested not to let the teacher look at the instruments.

6. They were requested not to help students with their school work or in any way assume a teaching style.

7. They were requested to check coding sheets before turning them in. All identification information, such as school, teacher, and class period, was to be completed.

8. They were requested to take along plenty of coding sheets when collecting data.

Training in the Classroom

When the trainees had familiarized themselves thoroughly with the use of the observational system, they were requested to begin in-classroom coding practice. The researcher and the other three coders agreed to observe a ninth-grade mathematics teacher. This teacher was not one of the eight teachers whom the coders would observe for the study. At this stage, the four observers went together to the assigned classroom. All completed the coding sheets independently. From these results, an index of agreement among the observers for each instrument of the Dyadic Interaction System was computed. The following Fridman two-way ANOVA equation was used:

$$X_r^2 = \left[\frac{12}{Nk(k+1)} \sum_{j=1}^{k} (R_j)^2\right] - 3N(k+1)$$

where:

N = number of rows and k = number of columns.

The data for the Fridman two-way ANOVA agreement test for the Brophy-Good Dyadic Interaction analysis is shown in Table 3.9.

Table 3.9.--Data for the Fridman two-way ANOVA agreement test for the Brophy-Good Dyadic Interaction analysis.

Category	Observer 1		Observer 2		Observer 3		Observer 4	
	Score	Order	Score	Order	Score	Order	Score	Order
1	0	2	0	2	2	4	0	2
2	1	1.5	1	1.5	6	4	3	3
3	10	2	16	4	9	1	11	3
4	1	3.5	0	1.5	0	1.5	1	3.5
5	3	2	5	3.5	5	3.5	2	1
6	8	2	11	3	7	1	13	4
7	0	1.5	1	3	4	4	0	1.5
8	7	1	13	4	12	3	8	2
9	2	3.5	0	1.5	0	1.5	2	3.5
10	1	1	3	2.5	3	2.5	6	4
11	0	2	1	4	0	2	0	2
12	2	1	7	3	3	2	8	4
13	0	1.5	2	3.5	2	3.5	0	1.5
$R_j = \Sigma$ order		24.5		37.0		33.5		35.0

Results:

X_r^2 observed = 4.22; df = 3

X_r^2 table (df = 3, α = 0.05) = 7.82

Hence $X_{obs}^2 < X_{table}^2 \rightarrow$ no difference; therefore, we may assume that the raters rated equally.

The data for the Fridman two-way ANOVA agreement test for the Emmer High-Inference Scale is shown in Table 3.10.

Table 3.10.--Data for the Fridman two-way ANOVA agreement test for the Emmer High-Inference Scale.

Category	Observer 1		Observer 2		Observer 3		Observer 4	
	Score	Order	Score	Order	Score	Order	Score	Order
1	2	3	2	3	1.33	1	2	3
2	3.5	3	3	2	2.66	1	4	4
3	3	1	3.50	2	4	4	3.66	3
4	3	1.5	3.75	4	3.33	3	3	1.5
5	4	3.5	4	3.5	3.33	1	3.66	2
ΣR_j		12		14.5		10		13.5

Results:

$$X_r^2 = 1.38;\ df = 3;\ \alpha = 0.05;\ X_{table}^2 = 7.82$$

Hence, $X_{obs}^2 < X_{table}^2 \rightarrow$ no difference. Thus, we may assume that the raters rated equally.

For the five items, which were coded in the homework assignment scale, there was 100 percent agreement among the raters.

CHAPTER IV

ANALYSIS AND INTERPRETATION OF THE DATA

The results of the analysis of the data are presented in this chapter. Discussion of the results is organized by the following topics: supervisors' evaluations of teaching; teachers' behavior; students' attitudes toward their teachers; and the overall analysis of supervisors' evaluations of teaching, teachers' behavior, and students' attitudes toward their teachers.

Supervisors' Evaluations of Teaching

The research question concerning supervisors' evaluations of teaching was as follows:

> Do supervisors' evaluations of teachers who are instructionally effective in ninth-grade mathematics differ from evaluations of teachers who are instructionally less effective?

The following hypotheses were generated to answer the question. Each hypothesis is stated. The results of the data analysis regarding each hypothesis are discussed following the statement of the hypothesis.

Hypothesis 1: There is no significant difference in the supervisors' overall ratings of instructionally effective and instructionally less effective ninth-grade mathematics teachers.

Hypothesis 2: There is no significant difference in the supervisors' ratings of instructionally effective and instructionally less effective ninth-grade mathematics teachers in relation to such factors as the following: teachers' personalities and their ability to control their classes; teacher's ability to follow the outlines of lessons they prepared; teachers' preparations of lessons before their lectures; teachers' structuring their concepts progressively to introduce the simpler examples and points and then the more difficult ones; teachers' manner of conducting classroom discussions; teachers' perceptiveness of individual differences among students; teachers' use of such aids as blackboards and instructional media; students' understanding of mathematical concepts; students' knowledge of the subject matter; amount of homework given and whether teacher checked it; students' achievement; evaluation method used.

One-way analysis of variance was used to test the above two hypotheses. Results of these analyses are given in Table 4.1.

Table 4.1.--Results of one-way analyses of variance of Hypotheses 1 and 2.

Scale	Group Mean for Group 1	Group Mean for Group 2	Group S.D. for Group 1	Group S.D. for Group 2	F	Signif.
S	128.25	136.75	9.9791	9.5699	1.5120	0.2649
S01	16.00	17.25	0.8165	1.5000	2.1430	0.1936
S02	8.75	9.25	0.5000	0.5000	2.0000	0.2070
S03	15.00	15.75	0.0000	0.9574	2.4550	0.1682
S04	8.25	8.75	0.5000	0.5000	2.0000	0.2070
S05	6.50	8.00	1.7321	1.8257	1.4210	0.2782
S06	5.50	7.25	1.0000	1.8930	2.6730	0.1532
S07	16.50	16.50	1.0000	1.2910	0.0000	1.0000
S08	6.25	7.00	1.2583	1.1547	0.7714	0.4136
S09	8.50	8.50	0.5773	1.0000	0.0000	1.0000
S10	15.00	15.75	2.9439	0.5000	0.2523	0.6333
S11	13.50	14.25	2.5166	1.5000	0.2621	0.6269
S12	8.50	8.50	0.5774	0.5774	0.0000	1.0000

Note: Group 1 = group of instructionally effective teachers.
Group 2 = group of instructionally less effective teachers.

These results indicated that the first two hypotheses were not rejected ($\alpha > 0.05$); i.e., there was no significant difference

between supervisors' ratings of instructionally effective and instructionally less effective ninth-grade mathematics teachers for the overall ratings and for each of the 12 subscales of the supervisors' ratings.

Hypothesis 3: Of the 12 supervisor ratings of teachers, no singular subset of factors can be found that, through the use of such a subset, instructionally effective and instructionally less effective teachers can be reliably differentiated.

Discriminant analysis was used to test this hypothesis. In this method of analysis, a single dimension was postulated on which instructionally effective teachers were clustered at one end and instructionally less effective teachers at the other through the formation of one or more linear combinations of the discriminant variables. These discriminant functions were of the form:

$$D_i = d_{i1}Z_1 + d_{i2}Z_2 + \ldots + d_{ip}Z_p$$

where D_i was the score on discriminant function i, the d's were weighting coefficients, and the Z's were the standardized values of p discriminating variables used in the analysis. The functions were formed in such a way as to maximize the separation of the groups. Stepwise variable selection was used to find the discriminant function if there was one.

Six scales out of the 12 subscales of supervisors' ratings, namely, S01, S04, S07, S09, S10, and S12 (see Table 4.2), were included in the discriminant analysis. (See Table 4.3.)

Table 4.2.--Items included in the discriminant analysis of supervisors' evaluations.

S01.	Teacher's personality and his ability to control his classes.
S04.	Teacher's structuring his concepts progressively to introduce the simpler examples and points, then more difficult ones.
S07.	Teacher's use of such aids as blackboards and instructional media.
S09.	Teacher's knowledge of the subject matter.
S10.	Amount of homework given and whether teacher checked it.
S12.	Evaluation method used.

Table 4.3.--Results of discriminant analysis of Hypothesis 3.

Step	Action		Wilks Lambda	Sig.	Minimum D Squared	Sig.	Between Groups	
	Entered	Removed						
1	S01	..	0.7368	0.1936	103.50	0.0000	1	2
2	S02	..	0.5742	0.2498	123.52	0.0001	1	2
3	S07	..	0.3092	0.1595	345.29	0.0001	1	2
4	S12	..	0.1913	0.1852	1044.00	0.0004	1	2
5	S04	..	0.0924	0.2152	2097.88	0.0036	1	2
6		S02	0.1301	0.1082	1653.39	0.0002	1	2
7	S09	..	0.0398	0.0963	4248.11	0.0018	1	2
8	S10	..	0.0020	0.0846	3369.16	0.0129	1	2

The standardized canonical discriminant function was in the form:

$$F(x) = 11.19\ S01 + 31.10\ S04 - 15.80\ S07 - 25.05\ S09 - 12.35\ S10 + 8.97\ S12$$

This function, as one set, best discriminated between the two groups of teachers. As it was shown in the results of Hypotheses 1 and 2, no significant difference was found in each of the subscales of supervisors' evaluation, namely, S01, S04, S07, S09, S10, and S12, between the two groups if each of the subscales was considered independently of the others. The six subscales of supervisors' evaluations as one function were significant. It was 0.005. (See Table 4.4.)

Table 4.4.--The significance of the standardized canonical discriminant function for Hypothesis 3.

Wilks Lambda	Chi-Square	df	Sig.
0.002	18.582	6	0.005

The canonical discriminant function of group means (group centereds) was -19.15 and 19.15. The analysis showed 100 percent prediction for classifying the instructionally effective and instructionally less effective ninth-grade mathematics teachers. (See Table 4.5.)

Table 4.5.--Prediction for classifying the effectiveness of teachers in Hypothesis 3.

Actual Group	Number of Cases	Predicted Group Membership	
		Group 1	Group 2
Group 1 (instructionally effective teachers)	4	4 100%	0 0%
Group 2 (instructionally less effective teachers)	4	0 0%	4 100%

These results indicated that the above hypothesis was rejected; i.e., there was one singular subset of variables, namely, S01, S04, S07, S09, S10, and S12 (see Table 4.2), which formulated F(x), that discriminated between the instructionally effective and instructionally less effective ninth-grade mathematics teachers.

Teachers' Behavior

The research question concerning teachers' behaviors was as follows:

> Do teachers whose students perform better on ninth-grade mathematics tests demonstrate different behaviors than those whose students do not perform well on the same tests?

The following hypotheses were generated to answer the question. Each hypothesis is stated. The results of the data analysis regarding each hypothesis are discussed following the statement of the hypothesis.

> Hypothesis 4: There is no significant difference between instructionally effective and instructionally less effective ninth-grade mathematics teachers in the following: how the teachers deal with homework; the degree of attention the teachers receive from their students; the clarity of the teachers' presentations; the time teachers spend in presentation of the material; the degree of enthusiasm demonstrated by the teachers; whether the teachers assign homework; whether the teachers allow their students enough time to solve each assignment; whether the teachers give their students time to try some problems on the next homework assignment to familiarize themselves with the work; whether the teachers ask discipline questions; whether the teachers ask direct questions; whether the teachers ask open questions; whether the teachers let students answer questions without being called on; whether the teachers let their students answer questions as a group; whether the teachers ask process questions; whether the teachers ask product questions; whether the teachers ask choice questions; whether the teachers praise students who give correct answers; whether the teachers give nonverbal signs for correct answers; whether the teachers summarize students' correct answers; whether the teachers ask a second student for the correct answer if the

first student has given a wrong answer; whether the teachers neglect a student who has given a wrong answer; whether the teachers explain their students' mistakes; whether the teachers give the right answer if a wrong answer has been given; whether the teachers ask for more clarification from their students; whether the teachers praise their students if they ask for help; whether the teachers criticize their students if they ask for help; whether the teachers criticize their students for misbehavior.

One-way analysis of variance was used to test Hypothesis 4. (See Table 4.6.)

Table 4.6.--Results of one-way analysis of variance of Hypothesis 4.

Scale	Group Mean for Group 1	Group Mean for Group 2	Group S.D. for Group 1	Group S.D. for Group 2	F	Signif.
H	51.250	45.750	4.7871	8.0571	1.3780	0.2850
A	102.500	115.750	10.5357	16.4596	1.8390	0.2239
C	102.250	119.500	8.6554	10.4083	6.4950	0.0436*
P	111.250	119.750	10.3401	20.9821	0.5282	0.4907
E	75.750	63.750	11.4419	18.0831	1.3110	0.2959
R1	9.750	10.000	3.3040	2.1602	0.0160	0.9033
R4	81.375	64.000	49.1704	19.9039	0.4291	0.5367
R8	15.625	25.000	17.2548	12.6029	0.7700	0.4140
DISP	3.675	1.150	3.4645	1.5177	1.7830	0.2302
DIRC	14.050	12.925	6.5292	8.6477	0.0431	0.8424
OPEN	70.100	69.050	16.5233	9.0732	0.0124	0.9149
CALL	4.975	5.650	4.6205	4.6033	0.0428	0.8429
GROUP	6.650	11.225	6.4697	6.4994	0.9955	0.3569
PROC	11.450	15.600	4.3746	5.5480	1.3800	0.2846
PROD	79.400	79.025	1.7682	7.6081	0.0092	0.9266
CHIC	8.875	5.400	3.3787	3.0056	2.362	0.1752
PRAISE	9.225	7.575	5.0910	7.1388	0.1415	0.7198
AFFR	58.600	59.325	14.1861	13.3510	0.0055	0.9431
REPF	25.418	41.025	6.6143	9.0046	7.806	0.0314*
ASOT	12.900	9.175	4.6029	7.1565	0.7666	0.4149
STPR	14.975	8.375	23.4663	7.1993	0.2892	0.6101
STCR	6.925	8.200	6.4194	9.2966	0.0510	0.8289
TDIS	20.625	18.250	19.8950	7.0069	0.0507	0.8293
NEGL	6.125	3.750	2.9432	2.1378	1.7050	0.2395
EXAN	4.180	3.150	1.2259	1.2923	1.3370	0.2914
GIVA	4.575	2.575	1.7858	0.9535	3.904	0.0956
AFMC	4.675	3.625	2.7036	4.0771	0.1843	0.6827

Note: Group 1 = group of instructionally effective teachers.
Group 2 = group of instructionally less effective teachers.

The results indicated that, in only two out of the 27 scales, significant differences between the two groups of ninth-grade mathematics teachers were found. They were as follows:

1. In the scale "Teacher's clarity," a significant difference ($\alpha < 0.0436$) was found between the two types of teachers. Instructionally effective teachers were judged to make their teaching clearer than the instructionally less effective teachers did. The respective means were 119.50 and 102.25.

2. In the scale "Rephrasing the student's correct answers," a significant difference ($\alpha < 0.0314$) was found between the two types of teachers. Instructionally effective teachers were judged to rephrase their students' correct answers more than the instructionally less effective teachers did. The respective means were 41.03 and 25.42. In the other 25 scales, no differences in the evaluation of instructionally effective and instructionally less effective teachers were found.

> Hypothesis 5: Of the different factors constituting the basis for evaluation of teachers as given in Hypothesis 4, no singular subset of factors can be found that, through the use of such a subset, instructionally effective and instructionally less effective ninth-grade mathematics teachers can be reliably differentiated.

Discriminant analysis was used to test this hypothesis. Six scales of the 27 were included in the discriminant analysis. (See Table 4.7.)

The standardized canonical discriminant function was in the form:

$$F(x) = -13.96\ \text{REPH} - 24.24\ \text{STCR} + 18.04\ \text{E} + 12.92\ \text{AFMC} + 4.84\ \text{TDIS} - 6.73\ \text{ASOT}$$

This function, as one set, best discriminated between the two groups of teachers. The significance of this function was 0.003. (See Table 4.8.)

Table 4.7.--Results of discriminant analysis of Hypothesis 5.

Step	Action		Wilks Lambda	Sig.	Minimum D Squared	Sig.	Between Groups	
	Entered	Removed						
1	REPF	..	0.4346	0.0314	5.08	0.0189	1	2
2	STCR	..	0.3074	0.0524	64.24	0.0004	1	2
3	E	..	0.1192	0.0256	333.86	0.0001	1	2
4	AFMC	..	0.0323	0.0143	1445.99	0.0020	1	2
5	TDIS	..	0.0122	0.0302	3770.90	0.0020	1	2
6	ASOT	..	0.0014	0.0690	39819.37	0.0163	1	2

Table 4.8.--The significance of the standardized canonical discriminant function for Hypothesis 5.

Wilks Lambda	Chi-Square	df	Sig.
0.001	19.75	6	0.003

The canonical discriminant function of group means (group centereds) was 23.28 and 23.28. The analysis showed 100 percent prediction for classifying the two groups. (See Table 4.9.)

These results indicated that the above hypothesis was rejected; i.e., there was one singular subset of variables, namely, REPH, STCR, E, AFMC, TDIS, and ASOT (see Table 4.10), which formulated F(x), that discriminated between instructionally effective and instructionally less effective ninth-grade mathematics teachers.

Table 4.9.--Prediction for classifying the effectiveness of teachers for Hypothesis 5.

Actual Group	Number of Cases	Predicted Group Membership	
		Group 1	Group 2
Group 1 (instructionally effective teachers)	4	4 100%	0 0%
Group 2 (instructionally less effective teachers)	4	0 0%	4 100%

Table 4.10.--Items included in the discriminant analysis for Hypothesis 5.

REPF:	The teacher summarizes the student's answer.
STCR:	Teacher criticizes a student who asks individual questions.
E:	This scale is used to judge the extent to which the teacher displays interest, vitality, and involvement in his subject and his instruction.
AFMC:	Coded for teacher statements that ask the student to provide more information (I think I understand but give me . . .).
TDIS:	Teacher criticizes a student for misbehavior.
ASOT:	Whenever the child does not answer a question and the teacher moves to another child in order to get the same answer to that same question, the teacher's feedback reaction is coded for asks another.

Students' Attitudes Toward Their Teachers

The research question concerning students' attitudes toward their teachers was as follows:

Do the attitudes toward teachers of students who do well on the ninth-grade mathematics achievement test differ from the attitudes toward teachers of those who do not perform well on the same test?

The following hypothesis was generated to answer the question. The hypothesis is stated. The results of the data analysis regarding the hypothesis are discussed following the statement of the hypothesis.

Hypothesis 6: There is no significant difference in students' perceptions of instructionally effective and instructionally less effective ninth-grade mathematics teachers with respect to the following: the degree of concern teachers express for their students; teachers' knowledge of their subject matter; the way teachers praise their students; the way teachers punish their students; the degree to which the students enjoy a teacher's classes.

The above hypothesis was tested twice: at the end of the 1980-81 school year and two months after the beginning of the 1981-82 school year.

Test at the End of the 1980-81 School Year

Two-tailed t-tests were computed to test the five subhypotheses concerning students' attitudes. The results were as follows.

1. Scale 1: Concern of teachers for students (CONC). In the scale "Concern," a highly significant difference ($\alpha < 0.000$) was found between the rating of instructionally effective and instructionally less effective ninth-grade mathematics teachers in that teachers who were judged effective instructionally showed more concern for their students than instructionally less effective teachers did. The respective means were 3.5 and 3.2. (See Table 4.11.)

2. Scale 2: Teachers' knowledge of the subject matter (KNOW). In the scale "Knowledge," a significant difference ($\alpha < 0.01$) was found

Table 4.11.--Results of two-tailed t-tests for Scale 1: 1980-81.

Group 1: Instructionally less effective teachers
Group 2: Instructionally effective teachers

Variable	Number of Cases	Mean	SD	Std. Error
Group 1	147	3.2228	0.676	0.056
Group 2	195	3.5192	0.458	0.033

Pooled Variance Estimate

T-Value	Degrees of Freedom	Two-Tailed Prob.
-4.83	340	0.000

between the rating of the two groups of teachers in the sense that instructionally effective teachers were judged to be more knowledgeable about the subject matter than instructionally less effective teachers. The respective means were 3.38 and 3.54. (See Table 4.12.)

Table 4.12.--Results of two-tailed t-tests for Scale 2: 1980-81.

Group 1: Instructionally less effective teachers
Group 2: Instructionally effective teachers

Variable	Number of Cases	Mean	SD	Std. Error
Group 1	150	3.3800	0.657	0.054
Group 2	196	3.5388	0.484	0.035

Pooled-Variance Estimate

T-Value	Degrees of Freedom	Two-Tailed Prob.
-2.59	344	0.01

3. Scale 3: Praise and encouragement from teachers (PRAS). In the scale "Praise," no differences were found in evaluations of instructionally effective and instructionally less effective teachers; $\alpha = 0.958$, which was greater than 0.05. (See Table 4.13.)

Table 4.13.--Results of two-tailed t-tests for Scale 3: 1980-81.

Group 1: Instructionally less effective teachers Group 2: Instructionally effective teachers				
Variable	Number of Cases	Mean	SD	Std. Error
Group 1	147	3.1619	0.643	0.053
Group 2	187	3.1583	0.598	0.044
Pooled-Variance Estimate				
T-Value	Degrees of Freedom		Two-Tailed Prob.	
0.05	332		0.958	

4. Scale 4: Punishment received from teachers (PUNS). In the scale "Punishment," no differences were found in evaluations of instructionally effective and instructionally less effective teachers; $\alpha = 0.301$, which was greater than 0.05. (See Table 4.14.)

5. Scale 5: Students' enjoyment of mathematics class (ENJY). In the scale "Enjoyment," a significant difference ($\alpha < 0.024$) was found between the two groups of teachers in that instructionally effective teachers were judged to make their teaching more enjoyable than instructionally less effective teachers. The respective means were 3.11 and 3.25. (See Table 4.15.)

Table 4.14.--Results of two-tailed t-tests for Scale 4: 1980-81.

Group 1: Instructionally less effective teachers
Group 2: Instructionally effective teachers

Variable	Number of Cases	Mean	SD	Std. Error
Group 1	148	1.7392	0.775	0.064
Group 2	197	1.6609	0.626	0.045

Pooled-Variance Estimate

T-Value	Degrees of Freedom	Two-Tailed Prob.
1.04	343	0.301

Table 4.15.--Results of two-tailed t-tests for Scale 5: 1980-81.

Group 1: Instructionally less effective teachers
Group 2: Instructionally effective teachers

Variable	Number of Cases	Mean	SD	Std. Error
Group 1	150	3.1067	0.580	0.047
Group 2	197	3.2504	0.591	0.042

Pooled-Variance Estimate

T-Value	Degrees of Freedom	Two-Tailed Prob.
-2.26	345	0.024

Test at the Beginning of the 1981-82 School Year

Two-tailed t-tests were computed to test the five subhypotheses concerning the students' attitudes. The results were as follows.

1. Scale 1: Concern of teachers for students (CONC).

In the scale "Concern," no differences in evaluations of instructionally effective and instructionally less effective teachers were found; $\alpha = 0.346$, which was greater than 0.05. (See Table 4.16.)

Table 4.16.--Results of two-tailed t-tests for Scale 1: 1981-82.

Group 1: Instructionally less effective teachers
Group 2: Instructionally effective teachers

Variable	Number of Cases	Mean	SD	Std. Error
Group 1	169	3.3114	0.530	0.041
Group 2	186	3.2487	0.701	0.051

Pooled-Variance Estimate

T-Value	Degrees of Freedom	Two-Tailed Prob.
0.94	353	0.346

2. Scale 2: Teacher's knowledge of the subject matter (KNOW).

In the scale "Knowledge," no differences in evaluations of instructionally effective and instructionally less effective teachers were found; $\alpha = 0.188$, which was greater than 0.05. (See Table 4.17.)

3. Scale 3: Praise and encouragement from teachers (PRAS).

In the scale "Praise," a highly significant difference ($\alpha < 0.005$) was found between the two types of teachers in that instructionally effective teachers were judged to praise their students less than instructionally less effective teachers. The respective means were 3.1462 and 2.9263. (See Table 4.18.)

Table 4.17.--Results of two-tailed t-tests for Scale 2: 1981-82.

Group 1: Instructionally less effective teachers
Group 2: Instructionally effective teachers

Variable	Number of Cases	Mean	SD	Std. Error
Group 1	160	3.3338	0.563	0.045
Group 2	198	3.2404	0.737	0.052

Pooled-Variance Estimate

T-Value	Degrees of Freedom	Two-Tailed Prob.
1.32	356	0.188

Table 4.18.--Results of two-tailed t-tests for Scale 3: 1981-82.

Group 1: Instructionally less effective teachers
Group 2: Instructionally effective teachers

Variable	Number of Cases	Mean	SD	Std. Error
Group 1	156	3.1462	0.596	0.048
Group 2	190	2.9263	0.799	0.058

Pooled-Variance Estimate

T-Value	Degrees of Freedom	Two-Tailed Prob.
2.85	344	0.005

4. Scale 4: Punishment received from teachers (PUNS). In the scale "Punishment," a highly significant difference ($\alpha < 0.007$) was found between the two groups of teachers in that instructionally effective teachers were judged to punish their students more than

instructionally less effective teachers did. The respective means were 1.6393 and 1.8649. (See Table 4.19.)

Table 4.19.--Results of two-tailed t-tests for Scale 4: 1981-82.

Group 1: Instructionally less effective teachers
Group 2: Instructionally effective teachers

Variable	Number of Cases	Mean	SD	Std. Error
Group 1	117	1.6393	0.627	0.058
Group 2	191	1.8649	0.746	0.054

Pooled-Variance Estimate

T-Value	Degrees of Freedom	Two-Tailed Prob.
-2.73	306	0.007

5. Scale 5: Students' enjoyment of mathematics class (ENJY). In the scale "Enjoyment," no significant difference ($\alpha = 0.405 > 0.05$) was found between the two types of teachers. (See Table 4.20.)

Table 4.20.--Results of two-tailed t-tests for Scale 5: 1981-82.

Group 1: Instructionally less effective teachers
Group 2: Instructionally effective teachers

Variable	Number of Cases	Mean	SD	Std. Error
Group 1	173	3.1118	0.674	0.051
Group 2	198	3.0471	0.800	0.057

Pooled-Variance Estimate

T-Value	Degrees of Freedom	Two-Tailed Prob.
0.83	369	0.405

Overall Analysis of Supervisors' Evaluations, Teachers' Behavior, and Students' Attitudes Toward Their Teachers

The overall hypothesis was as follows:

Hypothesis 7: Of the three major areas of evaluation of teachers, namely, supervisors' ratings, classroom observations, and students' attitudes toward their teachers, and the respective variables, no singular subset of factors can be found that, through the use of such a subset, instructionally effective and instructionally less effective ninth-grade mathematics teachers may be reliably differentiated.

Discriminant analysis was used to test this hypothesis. Five scales out of 39 variables, namely, SOl, R_1, ENJY, NEGL, and PUNS (see Table 4.21) were included in the discriminant analysis. (See Table 4.22.)

Table 4.21.--Items included in the discriminant analysis for Hypothesis 7.

SOl:	Teacher's personality and his ability to control his classes.
R_1:	Teacher gives same assignment to all students.
ENJY:	Students' enjoyment of mathematics class.
NEGL:	If the teacher makes no verbal or nonverbal response whatever following the child's answer to the question, he is coded for no feedback reaction.
PUNS:	Punishment received from teachers.

The standardized canonical discriminant function was in the form:

$$F(x) = -19.26\ SOl - 7.17\ PUNS - 26.08\ ENJY - 20.22\ R_1 + 10.23\ NEGL$$

The canonical discriminant function of group means (group centereds)

was 14.70 and -14.70. The analysis showed 100 percent prediction for classifying the two groups. (See Table 4.23.)

Table 4.22.--Results of discriminant analysis of five scales of Hypothesis 7.

Step	Action		Wilks Lambda	Sig.	Minimum D Squared	Sig.	Between Groups	
	Entered	Removed						
1	SOI	..	0.7368	0.1936	103.50	0.0000	1	2
2	R_I	..	0.5950	0.2730	222.96	0.0000	1	2
3	ENJY	..	0.3608	0.2124	695.36	0.0000	1	2
4	NEGL	..	0.0299	0.0127	5215.51	0.0000	1	2
5	PUNS	..	0.0035	0.0086	46946.20	0.0002	1	2

Table 4.23.--Prediction for classifying the effectiveness of teachers for Hypothesis 7.

Actual Group	Number of Cases	Predicted Group Membership	
		Group 1	Group 2
Group 1 (instructionally effective teachers)	4	4 100%	0 0%
Group 2 (instructionally less effective teachers)	4	0 0%	4 100%

Summary of the Results

With regard to the seven hypotheses proposed in this study, the overview of the results is summarized as follows:

Hypotheses 1 and 2: No statistically significant differences were found between supervisors' ratings of instructionally effective

and instructionally less effective ninth-grade mathematics teachers for the overall ratings and for each of the 12 subscales of the supervisors' ratings.

Hypothesis 3: There was one singular subset of variables, namely, SO1, SO4, SO7, SO9, S10, and S12, out of the 12 subscales of supervisors' evaluations, that discriminated between instructionally effective and instructionally less effective ninth-grade mathematics teachers.

Hypothesis 4: Out of the 27 scales of the dyadic interaction analysis, only two scales, namely, teacher's clarity and rephrasing the students' correct answers by the teacher, showed significant differences between instructionally effective and instructionally less effective ninth-grade mathematics teachers. In the other 25 scales of the dyadic interaction analysis, no statistically significant differences were found between the two groups.

Hypothesis 5: There was one singular subset of variables, namely, REPH, STCR, E, AFMC, TDIS, and ASOT, out of the 27 variables for Hypothesis 5, that discriminated between the instructionally effective and instructionally less effective ninth-grade mathematics teachers.

Hypothesis 6:

For the 1980-81 school year: There were three statistically significant differences out of the five scales of students' attitudes between the two groups of teachers. They were:

1. Teachers who were judged effective instructionally showed more concern for their students than did instructionally less effective teachers.

2. Instructionally effective teachers were judged by their students to be more knowledgeable about the subject matter than were instructionally less effective ninth-grade mathematics teachers.

3. Instructionally effective teachers were judged to make their teaching more enjoyable than did instructionally less effective ninth-grade mathematics teachers.

For the 1981-82 school year: There were two statistically significant differences out of the five scales of students' attitudes between the two groups of teachers. They were:

1. Instructionally effective teachers were judged by their students to praise them less than instructionally less effective ninth-grade mathematics teachers did.

2. Instructionally effective teachers were judged by their students to punish them more than instructionally less effective ninth-grade mathematics teachers did.

Hypothesis 7: Out of 44 scales mentioned in Hypotheses 2 and 4, five scales, namely, SOI, R_1, ENJY, NEGL, and PUNS, formed one singular subset of variables that discriminated between the instructionally effective and instructionally less effective ninth-grade mathematics teachers.

CHAPTER V

SUMMARY, DISCUSSION, AND RECOMMENDATIONS

Summary

The purpose of this study was to determine the relationships among supervisors' evaluations of teaching, teachers' behavior, students' attitudes toward teachers, and students' achievements in ninth-grade mathematics as these factors were found in Saudi Arabia. In this research, the relationship between supervisors' ratings and teachers' behavior in relation to students' performance was studied. Two aspects related to teacher education emerged:

1. The identification of selected teacher behaviors as they were correlated with effective instruction in ninth-grade mathematics; and

2. The relationship between supervisors' ratings and teachers' behavior and how these ratings were correlated to effective instructors.

A presentation of the state of the art of teacher supervision and the related area of teacher evaluation in Saudi Arabia was given, followed by a theoretical conceptualization for this study. A review of the relevant literature included discussion of research on supervision, teacher evaluation, clinical supervision, teaching, and effective instruction. Four main analyses were made in this study:

1. Supervisors' evaluations. One-way analysis of variance tests were used--first, with overall supervisors' evaluation, in which no statistically significant difference was found between ratings of instructionally effective teachers and instructionally less effective teachers; and second, with each of the 12 subscales of supervisors' evaluations, in which no statistically significant differences in rating each subscale were found between the two groups of teachers.

2. Students' attitudes. Two-tailed t-tests were computed to test the five subhypotheses concerning students' attitudes for two consecutive years: at the end of the 1980-81 school year and at the beginning of the 1981-82 school year. From the results at the end of the 1980-81 school year, it was shown that there were no statistically significant differences for both praise and encouragement from teachers and punishment received from teachers. Instructionally effective teachers were judged (1) to be more knowledgeable about their subject matter than instructionally less effective teachers; (2) to be more concerned for their students than instructionally less effective teachers, and (3) to make their teaching more enjoyable than instructionally less effective teachers did.

From the results at the beginning of the 1981-82 school year, no statistically significant differences were shown for concern of teachers for students, teacher's knowledge of the subject matter, or students' enjoyment of studying mathematics. Instructionally effective teachers were judged (1) to praise their students less than instructionally less effective teachers did and (2) to punish their students more than instructionally less effective teachers did.

3. Individual behaviors of teachers. Data concerning individual behaviors were tested by one-way analysis of variance. Statistically significant differences were found in only two out of the 27 scales, namely, "Teacher's clarity" and "Rephrasing the students' correct answers." In other words, instructionally effective teachers were judged to make their teaching clearer than instructionally less effective teachers did, and instructionally effective teachers were judged to rephrase their students' correct answers more than the instructionally less effective teachers did.

4. Clustering of behaviors. Three discriminant analyses were used in this study. The first was used to test Hypothesis 5, which was based on the 27 behaviors of the Brophy-Good Dyadic Interaction. Six scales of the 27 were included in the discriminant analysis. These were as follows:

REPF: The teacher summarized the student's answer.

STCR: The teacher criticized the student when the student asked for individual help.

E: This scale was used to judge the extent to which the teacher displayed interest, vitality, and involvement in his subject and his instruction.

AFMC: Coded for teacher statements that asked the student to provide more information, i.e., "I think I understand but give me . . . ."

TDIS: The teacher criticized the student who misbehaved in the classroom.

ASOT: Whenever the child did not answer a question, the teacher moved to another child for the answer to that same question. The teacher's feedback reaction was coded for "asks another."

The second discriminant analysis was used to test Hypothesis 7, which was based on the 27 behaviors of the Brophy-Good Dyadic Interaction and the 12 subscales of supervisors' evaluations, giving a total of 39 behaviors. Five scales were included in the discriminant analysis. These were as follows:

SO1: Teacher's personality and his ability to control his classes.

R_1: The teacher gives same assignment to all students.

ENJY: The student's enjoyment of studying mathematics.

NEGL: If the teacher made no verbal or nonverbal response whatever following the child's answer to the question, he was coded for no feedback reaction.

PUNS: Punishment received from teachers.

The third discriminant analysis was used to test Hypothesis 3, which was based on the 12 subscales of supervisors' evaluations. Six scales were included in the discriminant analysis. They were as follows:

SO1: Teacher's personality and his ability to control his classes.

SO4: Teacher's structuring his concepts progressively to introduce the simpler examples and points, then more difficult ones.

SO7: Teacher's use of such aids as blackboards and instructional media.

SO9: Teacher's knowledge of the subject matter.

S10: Amount of homework given and whether the teacher checked it.

S12: Evaluation method used.

Conclusions and Implications

Conclusions

Three conclusions are discussed in this section, based on both the findings of the study and related research. These issues are supervisors' evaluations, teachers' behavior, and students' attitudes.

Supervisors' Evaluations

The current evaluation instruments used by supervisors from the Jeddah Board of Education, Saudi Arabia, for evaluating ninth-grade mathematics teachers did not identify those teachers selected as most effective or those selected as least effective based on their students' residual-gain scores. This finding supported other research discussed in Chapter II. Mosher and Purpel (1972) reported that "five experienced, skilled supervisors did two separate evaluations of each of four student teachers. The results? The supervisors' disagreement about the teaching they were evaluating ranged from 50 to 100 percent" (p. 50). These researchers followed this result by answering this question, "Why do analyses of teaching behavior vary so radically?" Their answer was, "A primary reason is the absence of agreement as to the 'right' way to teach. A second explanation is the unreliability of the rating instruments used in supervision and in research" (p. 51). This researcher believes that the above two reasons are valid. Furthermore, Saif (1976) answered the following question: "Why have lawmakers required evaluation of teachers?" (p. 127). Saif

gave two answers: "To improve student learning, and to promote the professional growth of teachers" (p. 127). With respect to this, there is a need for valid obsevational instruments and better ways of supervision. As shown in the review of literature on clinical supervision, teacher, principal, and supervisors seemed to prefer clinical supervision as a better way of supervision.

As Evertson, Emmer, and Brophy (1978) reported: "It seems reasonable to theorize that the various classes of variables tend to occur together, and to produce effects both on each other and on the product variables" (p. 13). Thus it was preferable to conduct discriminant analyses for the 12 subscales of supervisors' evaluations, for the 27 variables of the Brophy-Good Dyadic Interaction scale, and for the 39 variables of both the Brophy-Good Dyadic Interaction and the 12 subscales of supervisors' evaluations to ascertain if a set of variables existed that best discriminated between the two groups of teachers. The discriminant analysis indicated that six subscales of supervisors' evaluations, as a set, discriminated between the two groups of teachers. (See page 78.)

Results of the five studies concerning junior-high-school mathematics, which were reported in Chapter II, supported those results. The set of variables that best discriminated between the two groups could be considered as criteria for teachers' evaluations if the limitations of this study are kept in mind. It should be pointed out that, although the other variables were useful in defining effective instruction, these variables were not significant to show differences between the two groups.

Teachers' Behaviors

Two variables, teacher's clarity and teacher's rephrasing the students' correct answers, showed significant differences between instructionally effective and instructionally less effective teachers. This finding was, however, supported by other research such as that of Brophy and Evertson (1978) and Good and Grouws (1975). One reason for these results was the limitation of the process-product methodology in addition to general limitations of the study.

The use of discriminant analysis for analyzing the 27 variables of the Brophy-Good Dyadic Interaction resulted in six variables that discriminated between instructionally effective and instructionally less effective teachers. The six variables, REPF, STCR, E, AFMC, TDIS, and ASOT, were shown on page 77.

When the 27 variables of the Brophy-Good Dyadic Interaction were combined with the 12 items from the supervisors' evaluation, five variables were found to discriminate between the two groups of teachers. (See page 78.)

The findings in both discriminant analyses supported other research reported in Chapter II as follows: Evertson, Anderson, Anderson, and Brophy (1979) reported that the more effective teachers "managed their classes efficiently and tended to 'nip trouble in the bud,' stopping a disturbance before it could seriously disrupt the class, and they did not give their students many choices about what kinds of assignments they would do" (p. 19). Anderson, Evertson, and Brophy (1978a) reported that teachers' enthusiasm, enjoyment of

teaching, and use of higher-cognitive-level questions were related positively to students' achievements in their study.

Students' Attitudes

Students' attitudes toward their teachers at the beginning of the 1981-82 school year indicated that instructionally effective teachers punished more than instructionally less effective teachers and gave less praise. The finding supported other research such as that of Evertson (1975). Evertson examined the relationship of praise and criticism to socioeconomic status (SES). His findings regarding second- and third-grade teachers in high-SES versus low-SES schools were as follows:

> In low SES schools praise was regularly but weakly associated with learning gains on several measures, but was relatively unimportant in high SES classes. Criticism was negatively related in low SES but positively so in high SES classrooms. (p. 2)

The students' attitudes toward their teachers at the end of the 1980-81 school year indicated that instructionally effective teachers were more knowledgeable, exhibited more concern, and the students enjoyed the mathematics classes more than the students of instructionally less effective teachers. This led to the conclusion that the best time for rating teachers is at the end of the school year. Teachers could use these evaluations from their students as feedback.

Implications

Three implications can be suggested on the basis of the findings of this study:

1. Some modification of the supervisory instrument could be made to give greater visibility to the set of variables that distinguished the most effective teachers from the least effective teachers.

2. Teacher educators in both preservice and inservice programs should consider teaching the variables that highly correlated with the most effective teachers; in addition, these variables should be considered as assets rather than as individual behaviors.

3. Teachers should recognize that students' attitudes toward effective teachers may vary between the beginning and the end of the school year.

Recommendations for Further Research

Given that the number of participants in this study was small (two supervisors and eight teachers) and that there were other limitations to the study, replication of this study is recommended. In addition, the following areas of research appear to be warranted:

1. A study of the validity of the set of supervisory scales that best discriminates between instructionally effective and instructionally less effective ninth-grade mathematics teachers.

2. Investigations of the validity of the set of teacher behaviors that best discriminates between instructionally effective and instructionally less effective ninth-grade mathematics teachers as criteria for effective instruction.

3. A study of the change in students' attitudes toward teachers over the course of an entire school year.

4. Research designed to find criteria for effective instruction in areas of teaching and learning other than mathematics.

5. Experimental studies conducted to verify the findings of correlation studies for effective instruction.

APPENDICES

APPENDIX A

CONTENT VALIDITY OF THE PRETEST-POSTTEST

بسم الله الرحمن الرحيم

Directorate of Education Western Province
Ministry of Education
Mecca Al Mokarramah
SAUDI ARABIA

الادارة العامة للتعليم بالمنطقة الغربية
وزارة المعارف
منطقة مكة المكرمة
المملكة العربية السعودية

13/2/1982

To may it whome concern

We certify that the following qustions:.

1) $x^2 - 7x + 12$
2) $-3 - 4x^2 - 7x$
3) $12x^2 - 16xy - 60y^2$
4) $2x^2 + 2x - 12$
5) $3x^2 - 5x - 8$
6) $6x^2y - 13xy^2 + 6y^3$

Are valid and enough to measure the students' understanding for the materials which covered by the ninth grade teachers within three weeks - periods.

Math - Supervisor
M. G. Yam
Mohamed GaZali Yamani

General Sup. of Mati
Gamil Yamani

APPENDIX B

THE ARABIC VERSION OF THE SUPERVISORS' REPORT AND THE ENGLISH TRANSLATION

بسم الله الرحمن الرحيم

الادارة العـــامة للتعليم

بالمنطقـــة الغـــربية — **الشؤن التعليميه ـ التوجيه التربوي** — **وزارة المعـــارف**

المدرسة	
المرحلة	
تاريخ الزياره	

الصفوف							المجموع
عدد الفصول							
عدد التلاميذ							

اسم المدرس — الجنسية — المؤهل

المـاده — موضوع الدرس — الصف والفصل

جوانب التقـــويم الفـــني		الدرجة المقرره	الدرجة المعطاه	ملاحظـــات
١ـ شخصية المدرس وضبطه للفصل		١٠		
٢ـ توزيع المنهج وملاءمه ما قطعه للزمن		٥		
٣ـ تحضير الدروس		١٠		
٤ـ طريقة التدريس	ا ـ عرض الافكار والمفاهيم وتسلسلها	٥		
	ب ـ المناقشة	٥		
	جـ ـ مراعاة الفروق الفرديه	٥		
	د ـ استخدام السبوره والوسائل التعليمية	١٠		
	هـ ـ مدة اكتساب المطلوب للمفاهيم	٥		
٥ـ المـامه بالماده العلمية		٥		
٦ـ الاعمال التحريريه وكمايتها وتصحيحها		١٠		
٧ـ المستوى التحصيلي للطلاب		١٠		
٨ـ تقييم المدرس للطلاب خلال العام		٥		
٩ـ مدى تقبله للتوجيهات والنشرات التربويه		٥		
١٠ـ نشاطه وتعاونه في المدرسة		٥		
١١ـ الدوام في الصباح وانتظامه في الحضور		٥		
المجموع :		١٠٠		التقدير العام :

ملخص التوجيهات والارشادات :ـ

رأي المـــدير

التوقيـــع

اسم الموجه وتوقيعه :

ممتاز ٩٠ ـ ١٠٠ ، جيد جداً ٨٠ ـ ٨٩ ، جيد ـ ٧٠ ، حسن ٦٠ ـ ٦٩ ، متوسط ٥٠ ـ ٥٩ ، ضعيف دون ٥٠

Supervisor's Report Card

Criteria	Highest score	Given score
S01. Teacher's personality and his ability to control his classes.	10	
S02. Teacher's ability to follow the outlines of lessons he prepared.	5	
S03. Teacher's preparations of lessons.	10	
S04. Teacher's structuring his concepts progressively to introduce the simpler examples and points, then more difficult ones.	5	
S05. Teacher's manner of conducting classroom discussions.	5	
S06. Teacher's perceptiveness of individual differences among students.	5	
S07. Teacher's use of such aids as blackboards and instructional media.	10	
S08. Students' understanding of mathematical concepts.	5	
S09. Teacher's knowledge of the subject matter.	5	
S10. Amount of homework given and whether teacher checked it.	10	
S11. Students' achievements.	10	
S12. Evaluation method used.	5	
Overall Evaluation:	80	

Summary of supervisor's comments:	Principal's opinion: Signature

Supervisor name:

Signature:

APPENDIX C

BRIEF DEFINITIONS OF VARIABLES CODED IN THE BROPHY-GOOD DYADIC INTERACTION SYSTEM

Brief Definitions of Variables Coded in the Brophy-Good Dyadic Interaction System

Part One: Response Opportunities

1. Discipline Question (DISP): The discipline question is a unique type of direct question in which the teacher uses the question as a control technique, calling on the child to force him to pay better attention rather than merely providing a response opportunity in the usual sense.

2. Direct Question (DIRC): The teacher calls on a child who is not seeking a response opportunity.

3. Open Question (OPEN): The teacher creates the response opportunity by asking a public question and also indicates who is to respond by calling on an individual child, but chooses one of the children who has indicated a desire to respond by raising his hand.

4. Call Outs (CALL): Response opportunities are created by children who call out answers to teachers' questions without waiting for permission to respond.

5. Process Question (PROC): In a process question, students must explain something in a way that requires them to integrate facts or to show knowledge of their interrelationships. It most frequently is a "Why?" or "How?" question.

6. Product Question (PROD): In product questions, single correct answers are elicited that can be expressed in a single word or short phrase. Product questions usually begin with "Who?," "What?," "When?," "Where?," "How much?," or "How many?"

7. Choice Question (CHIC): In the choice question, the child does not have to produce a substantive response but may instead simply choose one of two or more implied or expressed alternatives.

8. Correct Answers (+): If the child answers the teacher's question in a way that satisfies the teacher, the answer is coded as correct.

9. Part-Correct Answers ($\dot{+}$): Part-correct answers are answers that are correct but incomplete as far as they go or answers that are correct from one point of view but are not the answer that the teacher is looking for.

10. Incorrect Answers (-): Responses coded as incorrect answers are those in which the child's response is treated as simply wrong by the teacher.

11. Don't Know (D.K.): The student verbally says, "I don't know" (or its equivalent) or nonverbally indicates that he doesn't know (shakes head).

12. No Response (N.R.): The student makes no response (verbally or nonverbally) to teacher's question.

13. Praise (PRIS): Praise refers to the teacher's evaluative reactions that go beyond the level of simple affirmation or positive feedback by verbally complimenting the child.

14. Affirmation of Correct Answers (AFFR): An answer is coded as affirmation when the teacher indicates that the child's response is correct or acceptable.

15. Summary (REPF): The teacher summarizes the student's answer (generally as part of the affirmation process).

16. No Feedback Reaction (NEGL): If the teacher makes no verbal or nonverbal response whatever following the child's answer to the question, he is coded for no feedback reaction.

17. Negation of Incorrect Answers (NIA): This is simple provision of impersonal feedback regarding the incorrectness of the response, with no further communication of a personal reaction to the child. As with affirmation, negation can be communicated both verbally ("No," "That's not right," "hmm-mm") and nonverbally (shaking the head).

18. Criticism (CRIT): Coded for evaluative reactions that go beyond the level of simple negation by expressions of anger or personal criticism of the child in addition to indications of the incorrectness of his response.

19. Process Feedback (EXAN): Coded when the teacher goes beyond merely providing the right answer and discusses the cognitive or behavioral processes that are to be gone through in arriving at the answer.

20. Gives Answer (GIVA): This category is used when the teacher gives the child the answer to the question but the answer is not sufficient to be coded for process feedback.

21. Asks Another (ASOT): Whenever the child does not answer a question and the teacher moves to another child in order to get the answer to that same question, the teacher's feedback reaction is coded for asks another.

22. Call Out: The call-out category is used when another child calls out the answer to the question before the teacher has a chance to act on his own.

23. Repeats Question (REPT): The teacher asks a question, waits some time without getting the correct answer, and then repeats the question to the same child.

24. Rephrase or Clue (CLUE): In this feedback reaction, the teacher sustains the response opportunity by rephrasing the question or giving the child a clue as to how to respond to it.

25. New Question (NEW Q): The teacher asks a new question when he requires an answer that is different from the original question, although it may be closely related. A question requiring a new answer is coded as a new question.

26. Expansion (AFMC). Coded for teacher statements that ask the student to provide more information (I think I understand but give me . . .).

Part Two: Dyadic-Teacher Contacts

Dyadic teacher-child contacts are divided into procedural contacts, work-related contacts, and behavioral or disciplinary contacts. They also are separately coded according to whether they are initiated by the teacher (teacher-afforded) or by the child (child-created). The coding also reflects certain aspects of the teacher's behavior in such contacts.

Work-related contacts.--Work-related contacts include those teacher-child contacts that have to do with the child's completion of seatwork or homework assignments. They include clarification of the directions, soliciting or giving help concerning how to do the work, or soliciting or giving feedback about work already done. Work-related interactions are considered child-created if the child takes it upon himself to bring his work up to the teacher to talk to him about it or raises his hand or otherwise indicates that he wants to discuss his work with the teacher. Work-related interactions are coded as teacher-afforded if the teacher gives feedback about work when

the child has not solicited it (the teacher either calls the child to come up to his desk or goes around the room making individual comments to the students). Created contacts are not planned by the teacher and occur solely because the child has sought him out; afforded contacts are not planned by the child and occur solely because the teacher initiates them. Separate space is provided for coding child-created and teacher-afforded work-related interactions on the coding sheets, and the coder indicates the nature of an individual dyadic contact by where he codes the information.

In addition to noting the interaction as work interaction and as an interaction that is child-created or teacher-afforded, the coder also indicates the nature of the teacher's feedback to the child during the interaction. He indicates this by using one or more of the five columns provided for coding teacher's feedback in work-related interaction: praises (STRR), gives explanation (PCSS), criticizes (STCR), or "don't know" (?). The first four of these categories have the same meaning as they have in other coding of teacher feedback. The additional "don't know" category is added for this coding because frequently the individual teacher-child interaction that occurs in the dyadic contacts will be carried on in hushed tones or across the room from the coder so that he cannot hear the content of the interaction. In such cases, the coder notes the occurrence of the work-related interaction and the fact that it was either teacher-afforded or child-created, but he enters the number in the "don't know" column.

Procedural contacts.--The category of procedural contacts includes all dyadic teacher-child interaction that is not coded as

work-related contacts or as behavioral contacts. Thus it includes a wide range of types of contacts, most of which are initiated on the basis of the immediate needs of the teacher or child involved. Procedural contacts are created by the child for such purposes as seeking permission to do something, requesting needed supplies or equipment, reporting some information to the teacher (tattling on other children, calling attention to a broken desk or pencil, etc.).

Three categories for coding teacher's response are provided: praise (++), feedback (fb), and criticism (--). Praise and criticism have the same meaning here as elsewhere.

Behavioral contacts.--Behavioral contacts are coded whenever the teacher makes some comment upon the child's classroom behavior. They are subdivided into praise (++), warnings (W), and criticism (TDIS). Praise and criticism are coded as described above.

Warning.--Usually teachers' warnings occur in situations in which the child is doing something that is not necessarily or always prohibited but which is troublesome at the moment. In such instances the teacher singles out the child to inform him that his present behavior is inappropriate. However, the teacher communicates no rejection or anger as in criticism.

High-Inference Codings (Emmer)

High-inference codes were noted at 15-minute intervals during the mathematics lesson when the teacher worked with the class as a whole in recitation, development, review, and drill (if it involved frequent teacher-pupil agreement in public discussion). (See Table 3.6.)

Homework (H)

Homework ratings indicated the extent to which time was spent in introducing homework or reviewing homework.

The attention, clarify, enthusiasm, and presentation were all taken from Emmer (1973). Definitions of these variables follow:

Attention (A)

Attention as defined for this scale referred to pupil orientation toward the teacher, the task at hand, or whatever classroom activities were appropriate. If a pupil was attending to inappropriate activities or was engaged in self-directed behavior when he was supposed to be engaged in a class activity, his behavior was not considered attentive. Therefore, appropriate behavior was that which was focused upon or engaged in whatever activity was appropriate. At times, it was difficult to determine whether a student was being attentive, such as when the teacher presented information and the student sat facing the teacher with no observable behaviors indicating inattention. In such an instance, the pupil was considered attentive until he provided a behavioral indicator to the contrary.

Observers entered one of the following codes every two minutes during times when the teacher presented material to the class.

1. Fewer than half of the students are attentive most of the time.

2. One-half to three-fourths of the students appear attentive most of the time; the remainder are attentive only some of the time.

3. Most of the students are attentive, but several (four to six) are attentive only some of the time.

4. Nearly all of the students are attentive, but a few (one, two, or three) are attentive only some of the time.

5. All the students are attentive most of the time.

Note: The phrase "most of the time" means at least 75 percent of the time the observer checked the pupils for attentiveness.

Clarity (C)

Clarity referred to the degree to which the teacher's presentation of material and his substantive interactions with students were understood by them. Low clarity meant that the teacher was "over their heads" and was confusing to the pupils.

1. Very low clarity. Pupils seem very confused by the presentation. The teacher cannot answer the pupils' questions, or answers them in an unclear manner by using concepts and terms the pupils are apparently unfamiliar with or by being overly complex and ambiguous.

2. Low clarity. Between very low and moderate.

3. Moderate clarity. The teacher seems to be understood by most pupils, but not all of the time. Sometimes the teacher is confusing and vague.

4. High clarity. Between moderate and very high.

5. Very high clarity. The teacher's explanations are easy to understand and pupil questions are adequately answered. The teacher seems aware of the pupils' levels, sensing problems they are having or may have.

Enthusiasm (E)

This scale was used to judge the extent to which the teacher displayed interest, vitality, and involvement in his subject and his instruction.

1. Very low enthusiasm. The teacher's behavior is lethargic, dull, routine; there is a minimum of vocal inflection, gesturing, movement, or change in facial features. The teacher appears to lack interest in what he is doing.

2. Low enthusiasm. Between very low and moderate.

3. Moderate enthusiasm. Occasionally the teacher seems interested and involved; there is some display of activity, such as gesturing. Sometimes the teacher is dull, routine, and lacking in vigor.

4. High enthusiasm. Between moderate and very high.

5. Very high enthusiasm. The teacher is stimulating, energetic, and very alert. He seems interested and involved in what he is teaching. He moves around, gestures, and inflects his voice.

Presentation (P)

This scale measured only one type of behavior. The observer's task was to estimate the relative amount of class time occupied by teacher presentation of substantive information. By teacher presentation was meant substantive (content-oriented) verbal or nonverbal behavior that provided information, and did not imply or require pupil response nor evaluate pupil behavior. Thus, teacher questions, procedural directions, praise, and criticism were not instances of teacher presentation. Lecture, reading to the class, answering pupil questions, and any other activity in which the teacher gave information were instances of teacher presentation.

1. Teacher presentation occurs 0-20 percent of the period.
2. Teacher presentation occurs 21-40 percent of the period.
3. Teacher presentation occurs 41-60 percent of the period.
4. Teacher presentation occurs 61-80 percent of the period.
5. Teacher presentation occurs 81-100 percent of the period.

Homework Assignments

There were four scales in this instrument, namely, assigning homework (R_1), same assignment to all students (R_2), time provided in class to work on homework (R_4), and describing the source of the homework (R_5). The scales were coded at the beginning and at the end of the class.

APPENDIX D

ARABIC AND ENGLISH VERSIONS OF THE COVER LETTER AND THE QUESTIONNAIRE

MICHIGAN STATE UNIVERSITY

COLLEGE OF ARTS AND LETTERS
DEPARTMENT OF LINGUISTICS AND
ORIENTAL AND AFRICAN LANGUAGES
WELLS HALL

EAST LANSING • MICHIGAN • 48824

March 12, 1982

To whom it may concern,

I hereby certify that Mr. Abdul-Razzag Dhafar has translated into Arabic the English version of the questionnaire used as a tool in his research for his doctoral dissertation. I have seen photocopies of English and Arabic versions of the questionnaire title "Students' responses to questionnaire concerning their attitudes". I also have seen his translation of a report titled "Supervisor's report card".

The translation of both the questionnaire and the report is accurate and reliable. The cover letter, the questionnaire, and the report were translated into Arabic in the same format, except that it follows the standard writing style for the Arabic language.

I do wish him the best of luck.

Abdul Ghaffar Eldamatty
Instructor of Arabic
Abdul Ghaffar Eldamatty
AGE:cks

Michigan State University
Department of Linguistics and Oriental
and African Languages
A615 Wells Hall
East Lansing, Michigan 48824

بسم الله الرحمن الرحيم

استفتاء

أخى الطالب /

أرجو التكرم بابداء رأيك فى كل نقطة من النقاط التالية .. هذه النقاط تتعلق بمدرسك لمادة الرياضيات لهذا العام فقط .

ثق أن هذه المعلومات التى ستبديها ستبعث الى أخ لك يدرس للحصول على درجة الدكتوراة بالولايات المتحدة الأمريكية ولن يطلع عليها أحد من المدرسين فى مدرستك . كما أرجو أن تبدى رأيك بدون أخذ آراء أصدقائك فى الفصل .

لا تكتب اسمك على الورقة .. شاكرين لك تعاونك .. والله ولى التوفيق ،،،

اتبع الطريقة التالية عند ابداء رأيك :

	دائما	معظم الاوقات	بعض الاوقات	نادرا
يعطى المدرس واجبا منزليا بعد كل درس	.....	.....	.....	.....

لديك أربعة اختيارات لابداء رأيك .. اختر فقط واحدا منها مثلا :-

- اذا كان يعطيك مدرسك لمادة الرياضيات واجبا منزليا دائما ضع x تحت دائما
- ،، ،، ،، ،، ،، ،، ،، ،، ،، معظم الاوقات ضع x تحت معظم الاوقات
- ،، ،، ،، ،، ،، ،، ،، ،، ،، بعض الاوقات ضع x تحت بعض الاوقات
- ،، ،، ،، ،، ،، ،، ،، ،، ،، نادرا ضع x تحت نادرا

سوف تكون اجابتك احدى الاجابات التالية :-

	دائما	معظم الاوقات	بعض الاوقات	نادرا
- يعطى المدرس واجبا منزليا لكل درس	..x..	.....	.....	.....
أو ،، ،، ،، ،، ،، ،، ،، ،،	.....	....x....	.....	.....
أو ،، ،، ،، ،، ،، ،، ،، ،،	.....	.....	...x...	.....
أو ،، ،، ،، ،، ،، ،، ،، ،،	.....	.....	.....	..x..

	دائما	معظم الاوقات	بعض الاوقات	نادرا
١- أرتاح للنقاش في الفصل .				
٢- معاملة المدرس لى أخوية .				
٣- يساعدنى المدرس فى فهم مادة الرياضيات .				
٤- أحب مدرس الرياضيات .				
٥- أشعر بارتياح نحو مدرس الرياضيات .				
٦- ألقى تشجيعا من المدرس عندما أعمل عملا جيدا .				
٧- المدرس جيد فى مادته .				
٨- أشعر باهتمام المدرس بى .				
٩- أحب مادة الرياضيات .				
١٠- لا أتردد فى سؤال الاستاذ اذا كان عندى سؤال .				
١١- يحب المدرس أن أتقن فهم مادة الرياضيات .				
١٢- يتأكد المدرس أننى قد أنجزت واجبى المنزلى جيدا .				
١٣- أبذل قصارى جهدى فى فهم مادة الرياضيات .				
١٤- يعطى المدرس واجبا منزليا لكل درس .				
١٥- يساعدنى المدرس فى تصحيح الاخطاء التى فى الواجب				
١٦- يشجعنى المدرس على طرح الاسئلة .				
١٧- أشعر بأن المدرس يحب تدريس مادة الرياضيات .				
١٨- لا أشعر بالحرج عندما تكون اجابتى خاطئة .				
١٩- تنظيم المدرس للسبورة جيد .				
٢٠- يضربنى المدرس اذا أسأت التصرف فى الفصل .				

- ٣ -

	دائما	معظم الاوقات	بعض الاوقات	نادرا
٢١- يوبخنى المدرس أمام الطلاب عندما لا أجيب على سؤاله .				
٢٢- يذكرنى المدرس بأخطائى ولايذكرنى بأعمالى الجيدة .				
٢٣- يمدحنى المدرس عندما أحل الواجب كاملا .				
٢٤- يحضر المدرس مادته قبل الحصة .				
٢٥- يجعلنى المدرس أشعر بالغباء عندما لا أجيب على سؤاله .				
٢٦- يحرص المدرس على تشجيعى وان أخطأت فى الاجابة على سؤاله .				
٢٧- يصيح المدرس غاضبا عندما أخطىء أثناء الحصة .				
٢٨- يضربنى المدرس اذا لم أستطع الاجابة على سؤاله .				
٢٩- أعمل أعمالا جيدة كثيرة ولكن لاتثير انتباه المدرس .				
٣٠- يبدأ المدرس شرحه للدرس بالامثلة السهلة ثم الامثلة الصعبة .				
٣١- يعطى المدرس كل طالب وقتا كافيا لكل تمرين .				
٣٢- يبدى المدرس اهتماما بحلى للواجب .				
٣٣- يكرر المدرس الشرح حتى يتأكد أن كل طالب فهم المادة .				
٣٤- أستطيع أن أقرأما يكتبه على السبورة .				
٣٥- يعتمد المدرس على المعلومات السابقة فى شرحه للدرس الجديد .				
٣٦- شرح المدرس واضح جدا .				
٣٧- يستعمل المدرس طرقا عديدة لحل التمارين .				
٣٨- شرح المدرس للمادة جذاب .				

Students' Responses to Questionnaire Concerning Their Attitudes

Dear Student:

Please respond to each item below. These items concern your math teachers for this year. This information is confidential, and no one in your school will have access to it. Your responses will be sent to your brother who is doing research in the United States. Please do not discuss the items with your friends. Thank you for your cooperation.

Directions:

Follow these steps in responding to each item:

Item	Always	Most of the Time	Some-times	Never
1. My teacher gives us homework for every lesson.	_____	_____	_____	_____
If your teacher always gives you homework for every lesson, put the sign X under always, as:	X	_____	_____	_____
OR:				
If your teacher never gives you homework for any lesson, put the sign X under never, as:	_____	_____	_____	X

	Always	Most of the time	Sometimes	Never
1. I feel comfortable participating in class discussion.				
2. My teacher is friendly.				
3. My teacher helps me learn mathematics.				
4. I like my math teacher.				
5. I feel comfortable with my math teacher.				
6. I am praised when I do good work.				
7. My teacher knows his subject.				
8. My teacher cares about me.				
9. I like mathematics.				
10. If I have a question, I ask my teacher right away.				
11. My teacher wants me to understand math.				
12. My teacher makes sure that I do my homework correctly.				
13. I do my best to understand math.				
14. My teacher gives us homework for every lesson.				
15. My teacher helps me when I make mistakes on my homework.				
16. My teacher encourages me to ask questions.				
17. I feel my teacher likes to teach math.				

	Always	Most of the time	Sometimes	Never
18. My teacher does not make me feel embarrassed when I answer his question incorrectly.				
19. The teacher's blackboard is well organized.				
20. My teacher hits me when I do not behave well in the class.				
21. My teacher hurts my feelings in front of my classmates when I do not answer his question.				
22. I am told about my bad work and not about my good work.				
23. My teacher praises me when I complete my homework.				
24. My teacher prepares the lesson in advance.				
25. My teacher makes me feel stupid when I do not answer his question.				
26. When I do not answer the teacher's question correctly, he still encourages me.				
27. My teacher yells at me a lot in class when I do something wrong.				
28. My teacher hits me when I cannot answer his question.				
29. I do a lot of good work that goes unnoticed.				
30. My teacher moves gradually from the easy examples to the more difficult ones.				

	Always	Most of the time	Sometimes	Never
31. My teacher gives enough time for each student to solve the problem.				
32. My teacher checks my homework problems.				
33. My teacher repeats his presentation to make sure that each student understands the concept.				
34. I am able to read his writing on the blackboard.				
35. My teacher builds on past experiences in introducing new concepts.				
36. My teacher explains the material very well.				
37. My teacher uses different methods to solve problems.				
38. The presentation made by my teacher attracts my attention.				

APPENDIX E

EXPLORATORY FACTOR ANALYSIS

Table E-1.--Means and standard deviations of variables used in the factor analysis.

Variable	Mean	Standard Deviation	Cases
A01	3.3305	.6946	354
A02	3.3352	.7853	352
A03	3.5294	.6640	357
A04	3.2717	.7545	357
A05	3.1938	.8147	356
A06	3.2465	.8649	357
A07	3.6704	.5784	355
A08	3.0084	.8789	357
A09	3.0310	.8840	355
A10	2.2865	1.1540	356
A11	2.9014	.9075	355
A12	3.6028	.7684	355
A13	3.1849	.9566	357
A15	3.5831	.6645	355
A15	3.4441	.8408	358
A16	3.3799	.8861	358
A17	2.9218	.9983	358
A18	3.6134	.7280	357
A19	2.7458	.9728	358
A20	3.4441	.8341	358
A21	2.0197	1.1319	356
A22	1.6732	.9449	358
A23	1.9430	1.0729	351
A24	2.8357	1.1237	353
A25	3.1770	1.1055	356
A26	1.7247	1.0140	356
A27	3.0340	1.0219	353
A28	1.6836	.9349	354
A29	1.4691	.8634	356
A30	2.0724	1.0030	359
A31	3.5527	.8431	351
A32	3.2727	.8832	352
A33	3.2670	.9072	352
A34	3.3870	.9401	354
A35	3.6742	.6633	356
A36	3.2535	.8817	355
A37	3.5014	.7605	355
A38	3.1243	.9764	354
A39	3.0761	.9957	355

Table E-2.--Correlation coefficients.

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13
A01	1.00000	.12804	.18779	.26652	.32760	.22285	.18240	.14534	.31020	-.05640	.26613	.18683	.18306
A02	.12804	1.00000	.32668	.49017	.49300	.35522	.32158	.41722	.08411	-.01007	.14424	.36459	.18723
A03	.18779	.32668	1.00000	.37632	.39323	.34136	.50257	.39553	.22572	.05025	.12949	.46632	.37885
A04	.26652	.49017	.37632	1.00000	.66368	.33246	.40775	.44541	.23907	.02705	.15558	.32359	.31414
A05	.32760	.49300	.39323	.66368	1.00000	.38540	.39837	.45384	.30924	.07559	.24394	.38693	.29400
A06	.22285	.35522	.34136	.33246	.38540	1.00000	.27633	.45228	.13145	.06987	.17181	.39693	.22670
A07	.18240	.32158	.50257	.40775	.38937	.27633	1.00000	.42660	.03944	.04208	.03186	.48852	.34630
A08	.14534	.41722	.39553	.44541	.45384	.45228	.42660	1.00000	.13693	.03385	.18652	.42108	.33237
A09	.31020	.08411	.22572	.23907	.30924	.13145	.03944	.13693	1.00000	.00840	.23054	.17029	.29220
A10	-.05640	-.01007	.05025	.02705	.07559	.06987	.04208	.03385	.00840	1.00000	-.04858	-.10767	.03422
A11	.26613	.14424	.12949	.15558	.24394	.17181	.03186	.18652	.23054	-.04858	1.00000	.15415	.13606
A12	.18683	.36459	.46632	.32359	.38693	.39693	.48852	.42108	.17029	-.10767	.15415	1.00000	.38188
A13	.18306	.18723	.37885	.31414	.29400	.22670	.34630	.33237	.29220	.03422	.13606	.38188	1.00000
A14	.12352	.05542	.14151	.05308	.18665	.12258	.00174	.15831	.19668	-.01906	.14335	.10577	.09740
A15	.10944	.03258	.22210	.03452	.12461	.09730	.10953	.08848	.13951	-.02515	.14664	.21900	.14380
A16	.17704	.20295	.28035	.25121	.26399	.18076	.29313	.32681	.12465	-.00008	.18699	.40743	.39890
A17	.21691	.27796	.30016	.33427	.39947	.35676	.24360	.42447	.21150	-.10257	.26654	.36250	.31333
A18	.12682	.25380	.34656	.35931	.36720	.24108	.47793	.33170	.13481	-.00881	.12051	.51310	.23545
A19	.15667	.12834	.10882	.09583	.08959	.16800	.05975	.14676	.10443	.03753	.32539	.14142	.03871
A20	.16194	.25079	.26227	.30092	.30236	.20220	.38144	.26015	.09099	-.02078	.08301	.38180	.23475
A21	.03634	-.01506	-.01390	.01125	-.09625	.06002	-.00883	.05947	.06587	.11402	.00477	-.09618	-.08370
A22	-.13391	-.20408	-.24820	-.23533	-.27815	-.15916	-.12683	-.28762	.02078	.06055	-.09641	-.27482	-.19092
A23	-.05439	-.11015	-.10213	-.09711	-.08556	-.03392	.00800	-.01854	-.01071	.11337	-.03821	-.11887	.00055
A24	.22212	.32606	.26347	.32536	.37543	.39121	.23911	.34179	.15439	.00508	.14336	.24319	.24370
A25	.11679	.14746	.15351	.08104	.13811	.11730	.21230	.07635	.00207	.04360	.05324	.17555	.17752
A26	-.16723	-.15659	-.22112	-.21309	-.20552	-.12961	-.15255	-.20838	-.01903	.09217	-.13815	-.33241	-.14029
A27	.11403	.33809	.25018	.37189	.40144	.42456	.30473	.43395	.10754	-.01158	.08989	.33863	.27488
A28	-.08356	-.12074	-.17351	-.18734	-.24141	-.11610	-.15739	-.21847	-.01311	.05554	-01073	-.32342	-.11990
A29	-.00280	-.08560	-.18365	-.12095	-.23314	-.07502	-.15765	-.15794	-.00946	.00766	.03738	-.18568	-.18885
A30	-.14139	-.25364	-.25899	-.21329	-.28410	-.16323	-.20062	-.22632	-.04077	.00588	-.10521	-.28359	-.23992
A31	.08337	.14792	.27681	.20870	.17416	.19037	.29440	.19347	.08528	-.00034	.08024	.16803	.10721
A32	.15682	.27129	.35548	.37345	.40126	.29914	.36688	.35787	.12250	.02681	.08653	.35559	.31087
A33	.18065	.28965	.37846	.31766	.36655	.23864	.39690	.32273	.19722	.00180	.13075	.39738	.46322
A34	.22439	.35231	.52379	.40411	.43129	.35642	.50629	.40922	.17786	.02856	.06555	.50025	.38344
A35	.03211	.26527	.33528	.18564	.25579	.21991	.30655	.27325	.03038	-.03781	.06535	.34697	.27943
A36	-.03511	.14687	.14548	.08588	.13203	.09148	.22146	.16345	.02731	.04180	.06333	.22357	.15295
A37	.15845	.33000	.48527	.38841	.36368	.28365	.53146	.42426	.19747	.04474	.03057	.50091	.38545
A38	.07523	.25585	.28329	.27522	.32126	.24296	.34976	.33051	.11475	-.03658	.11829	.37191	.32320
A39	.24049	.33893	.41475	.45105	.46946	.34753	.49809	.38381	.23200	.01639	.17888	.43863	.41441

Table E-2.--Continued.

	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26
A01	.12352	.10944	.17704	.21691	.12682	.15667	.16194	.03634	-.13391	-.05439	.22212	.11679	-.16723
A02	.05542	.03258	.20295	.27796	.25380	.12834	.25079	-.01506	-.20408	-.11015	.32606	.14746	-.15659
A03	.14151	.22210	.28035	.30016	.34656	.10882	.26227	-.01390	-.24820	-.10213	.26347	.15351	-.22112
A04	.05308	.03452	.25121	.33427	.35931	.09583	.30092	.01125	-.23533	-.09711	.32536	.08104	-.21309
A15	.18665	.12461	.26399	.39947	.36720	.08959	.30236	-.09625	-.27815	-.08556	.37543	.13811	-.20552
A06	.12258	.09730	.18076	.35676	.24108	.16800	.20220	.06002	-.15916	-.03392	.39121	.11730	-.12961
A07	.00174	.10953	.29313	.24360	.47793	.05975	.38144	-.00883	-.12683	.00800	.23911	.21230	-.15255
A08	.15831	.08848	.32681	.42447	.33170	.14676	.26015	.05947	-.28762	-.01854	.34179	.07635	-.20838
A09	.19668	.13951	.12465	.21150	.13481	.10443	.09099	.06587	.02078	-.01071	.15439	.00207	-.01903
A10	-.01906	-.02515	-.00008	-.10257	-.00881	.03753	-.02078	.11402	.06055	.11337	.00508	.04360	.09217
A11	.14335	.14664	.18699	.26654	.12051	.32539	.08301	.00477	-.09641	-.03821	.14336	.05324	-.13815
A12	.10577	.21900	.40743	.36250	.51310	.14142	.38180	-.09618	-.27482	-.11887	.24319	.17555	-.33241
A13	.09740	.14380	.39890	.31333	.23545	.03871	.23475	-.08370	-.19092	.00055	.24370	.17752	-.15029
A14	1.00000	.20522	.12267	.13157	.05090	.10496	.06669	.03884	-.03016	-.01189	.16599	.00964	.00701
A15	.20522	1.00000	.29081	.08341	.07903	.12974	.04828	.08728	.04956	.02818	.09834	.09550	-.02023
A16	.12267	.29081	1.00000	.33847	.28481	.14980	.27807	-.01863	-.13799	-.02386	.17934	.12244	-.19721
A17	.13157	.08341	.33847	1.00000	.36456	.19843	.21888	.07359	-.20247	-.11673	.27170	.08972	-.31687
A18	.05090	.07903	.28481	.36456	1.00000	.13406	.31374	-.10117	-.28273	-.16506	.28396	.16886	-.30956
A19	.10496	.12974	.14980	.19843	.13406	1.00000	.17451	.15526	.01785	-.02418	.05533	.01713	-.10717
A20	.06669	.04828	.27807	.21888	.31374	.17451	1.00000	.02951	-.24790	-.09123	.28102	.27720	-.30993
A21	.03884	.08728	-.01863	.07359	-.10117	.15526	.02951	1.00000	.29123	.13354	.02953	-.01132	.23014
A22	-.03016	.04956	-.13799	-.20247	-.28273	.01785	-.24790	.29123	1.00000	.37229	-.20293	-.09142	.58410
A23	-.01189	.02818	-.02386	-.11673	-.16506	-.02418	-.09123	.13354	.37229	1.00000	.02943	.00850	.43130
A24	.16599	.09834	.17934	.27170	.28396	.05533	.28102	.02953	-.20293	.02943	1.00000	.23610	-.21085
A25	.00964	.09550	.12244	.08972	.16886	.01713	.27720	-.01132	-.09142	.00850	.23610	1.00000	-.11322
A26	.00701	-.02023	-.19721	-.31687	-.30956	-.10717	-.30993	.23014	.58410	.43130	-.21085	-.11322	1.00000
A27	.13619	.03881	.21100	.38751	.32513	.14306	.33892	.04673	-.26327	-.08856	.41238	.22447	-.28327
A28	-.01850	-.02382	-.17073	-.17579	-.33600	-.04871	-.18776	.25406	.56126	.23515	-.15441	-.08857	.47377
A29	-.04159	.03008	-.04607	-.09098	-.18614	.06024	-.12865	.43224	.50109	.15681	-.09131	-.21242	.35312
A30	-.08359	-.05821	-.16642	-.24466	-.17633	-.10231	-.30138	.12505	.35807	.19929	-.17337	-.07603	.43745
A31	.07460	.05850	.06232	.15115	.21967	.01643	.20357	-.07826	-.16747	-.05334	.11129	.15970	-.15418
A32	.20238	.16011	.32204	.31364	.35215	.16208	.33636	-.01262	-.19990	-.06583	.28958	.22963	-.18378
A33	.15385	.26697	.42124	.28047	.38272	.12062	.31575	-.04207	-.19648	-.03118	.30049	.12197	-.16313
A34	.10519	.10658	.34502	.40996	.49527	.16719	.38705	-.05516	-.32529	-.11252	.37829	.17893	-.29827
A35	.02184	.11759	.25458	.25212	.26234	.16386	.31693	-.11775	-.20934	-.11253	.17434	.18773	-.20509
A36	.06063	.16764	.12700	.21131	.19398	.05465	.16317	-.00214	-.11560	-.04526	.10121	.18321	-.13631
A37	.07131	.11276	.39560	.33864	.52300	.13772	.50681	-.02976	-.28565	-.14646	.32608	.24153	-.34277
A38	.12423	.06289	.27162	.25934	.33575	.05307	.34476	-.04576	-.29263	-.09505	.23741	.23198	-.24604
A39	.09935	.06969	.32107	.33511	.36048	.14203	.42469	-.10182	-.27811	-.11223	.36866	.19193	-.27788

Table E-2.--Continued.

	A27	A28	A29	A30	A31	A32	A33	A34	A35	A36	A37	A38	A39
A01	.11403	-.08356	-.00280	-.14139	.08337	.15682	.18065	.22439	.03211	-.03511	.15845	.07523	.24049
A02	.33809	-.12074	-.08560	-.25364	.14792	.27129	.28965	.35231	.26527	.14687	.33000	.25585	.33893
A03	.25018	-.17351	-.18365	-.25899	.27681	.35548	.37846	.52379	.33528	.14548	.48527	.28329	.41475
A04	.37189	-.18734	-.12095	-.21329	.20870	.37345	.31766	.40411	.18564	.08588	.38841	.27522	.45105
A05	.40144	-.24141	-.23314	-.28410	.17416	.40126	.36655	.43129	.25579	.13203	.36368	.32126	.46946
A06	.42456	-.11610	-.07502	-.16323	.19037	.29914	.23864	.35642	.21991	.09148	.28365	.24296	.34753
A07	.30473	-.15739	-.15765	-.20062	.29440	.36688	.39690	.50629	.30655	.22146	.53146	.34976	.49809
A08	.43395	-.21847	-.15794	-.22632	.19347	.35787	.32273	.40922	.27325	.16345	.42426	.33051	.38381
A09	.10754	-.01311	-.00946	-.04077	.08528	.12250	.19722	.17786	.03038	.02731	.19747	.11475	.23200
A10	-.01158	.05554	.00766	.00588	-.00034	.02681	.00180	.02856	-.03781	.04180	.04474	-.03658	.01639
A11	.08989	.01073	.03738	-.10521	.08024	.08653	.13075	.06555	.06535	.06333	.03057	.11829	.17888
A12	.33863	-.32342	-.18568	-.28359	.16803	.35559	.39738	.50025	.34697	.22357	.50091	.37191	.43863
A13	.27488	-.11990	-.18885	-.23992	.10721	.31087	.46322	.38344	.27943	.15295	.38545	.32320	.41441
A14	.13619	-.01850	-.04159	-.08359	.07460	.20238	.15385	.10519	.02184	.06063	.07131	.12423	.09935
A15	.03881	-.02382	.03008	-.05821	.05850	.16011	.26697	.10658	.11759	.16764	.11276	.06289	.06969
A16	.21100	-.17073	-.04607	-.16642	.06232	.32204	.42124	.34502	.25458	.12700	.39560	.27162	.32107
A17	.38751	-.17579	-.09098	-.24466	.15115	.31364	.28047	.40996	.25212	.21131	.33864	.25934	.33511
A18	.32513	-.33600	-.18614	-.17633	.21967	.35215	.38272	.49527	.26234	.19398	.52300	.33575	.36048
A19	.14306	-.04871	.06024	-.10231	.01643	.16208	.12062	.16719	.16386	.05465	.13772	.05307	.14203
A20	.33892	-.18776	-.12865	-.30138	.20357	.33636	.31575	.38702	.31693	.16317	.50681	.34476	.42469
A21	.04673	.25406	.43224	.12505	-.07826	-.01262	-.04207	-.05516	-.11775	-.00214	-.02976	-.04576	-.10182
A22	-.26327	.56126	.50109	.35807	-.16747	-.19990	-.19648	-.32529	-.20934	-.11560	-.28565	-.29263	-.27811
A23	-.08856	.23515	.15681	.19929	-.05334	-.06583	-.03118	-.11252	-.11253	-.04526	-.14646	-.09505	-.11223
A24	.41238	-.15441	-.09131	-.17337	.11129	.28958	.30049	.37829	.17434	.10121	.32608	.23741	.36866
A25	.22447	-.08857	-.21242	-.07603	.15970	.22963	.12197	.17893	.18773	.18321	.24153	.23198	.19193
A26	-.28327	.47377	.35312	.43745	-.15418	-.18378	-.16313	-.29827	-.20509	-.13631	-.34277	-.24604	-.27788
A27	1.00000	-.22884	-.12217	-.19358	.21846	.33182	.32657	.44994	.31430	.23629	.42414	.28882	.37653
A28	-.22884	1.00000	.43521	.35306	-.14454	-.22762	-.16422	-.26916	-.21145	-.08439	-.29408	-.17176	-.25810
A29	-.12217	.43521	1.00000	.23619	-.16339	-.16733	-.06624	-.23297	-.16682	-.09528	-.18106	-.17164	-.18331
A30	-.19358	.35306	.23619	1.00000	-.08856	-.24275	-.19578	-.28821	-.26345	-.05509	-.32615	-.16469	-.32671
A31	.21846	-.14454	-.16339	-.08856	1.00000	.26026	.10642	.28150	.21904	.17962	.27434	.13164	.24630
A32	.33182	-.22762	-.16733	-.24275	.26026	1.00000	.38409	.52113	.35077	.13306	.49983	.37880	.39327
A33	.32657	-.16422	-.06624	-.19578	.10642	.38409	1.00000	.43608	.24840	.20265	.52174	.38249	.37762
A34	.44994	-.26916	-.23297	-.28821	.28150	.52113	.43608	1.00000	.40165	.29252	.66865	.44457	.58712
A35	.31430	-.21145	-.16682	-.26345	.21904	.35077	.24840	.40165	1.00000	.24710	.43722	.28530	.38804
A36	.23629	-.08439	-.09528	-.05509	.17962	.13306	.20265	.29252	.24710	1.00000	.25955	.20143	.27563
A37	.42414	-.29408	-.18106	-.32615	.27434	.49983	.52174	.66865	.43722	.25955	1.00000	.47472	.53467
A38	.28882	-.17176	-.17164	-.16469	.13164	.37880	.38249	.44457	.28530	.20143	.47472	1.00000	.46705
A39	.37653	-.25810	-.18331	-.32671	.24630	.39327	.37762	.58712	.38804	.27563	.53467	.46705	1.00000

Table E-3.--Factor matrix using principal factor with iterations.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
A01	.31414	.14439	-.33209	.08016	-.08693	-.04142	.23129	.04650	.01266	-.08355
A02	.52066	.09700	-.10162	-.28189	.05113	-.04918	-.11449	.04493	.17154	-.03348
A03	.61657	.09453	.06936	.03617	-.14281	-.07141	-.06559	.19458	-.13858	-.06054
A04	.61126	.13754	-.20055	-.34495	-.13679	-.20643	.04034	-.00137	.07709	-.08484
A05	.66883	.11557	-.29246	-.26669	-.23504	-.01053	.00682	.03030	.09173	-.09982
A06	.50557	.18964	-.14869	-.20029	.10777	.14512	-.14994	.03165	-.06840	.02465
A07	.62716	.12522	.33180	-.11451	-.09076	-.16264	-.01506	.21407	.07787	-.02257
A08	.62164	.13197	-.09120	-.17691	.05622	.01758	-.27529	-.03123	-.03280	.06163
A09	.26965	.26850	-.30068	.15399	-.26706	-.03046	.24841	-.04277	-.24074	.07274
A10	-.00487	.11450	.08528	-.11379	-.05352	.05112	.03108	.00214	-.03691	-.07131
A11	.24274	.18245	-.45206	.22659	.07223	.07432	.06005	.19760	.18029	.19286
A12	.67618	-.00190	.06601	.14332	.01050	-.10332	-.16976	.09194	.04471	.01529
A13	.53412	.11734	.05895	.17777	-.27001	.01043	-.01362	-.21055	.04746	.18508
A14	.18391	.15490	-.17205	.14415	-.06596	.20525	-.03714	-.03412	-.14084	-.10220
A15	.20006	.23431	-.01554	.41825	-.08023	.15327	-.18370	.11931	.00349	-.27835
A16	.49192	.14555	.03285	.32396	-.03257	-.08202	-.16068	-.13044	.15991	-.01571
A17	.54954	.10116	-.22057	.05204	.17369	-.01304	-.11110	-.03895	-.08787	.19300
A18	.59952	-.06366	.09790	.02112	.03952	-.13080	-.02827	.07012	-.06567	.00094
A19	.21194	.17929	-.18125	.17927	.26788	.00434	.03520	.15149	.03582	.01356
A20	.54553	-.02067	.14374	.02608	.18873	-.00430	.26467	-.03863	.17374	-.10667
A21	-.09407	.48316	-.00964	-.03443	.32051	-.04132	.04611	-.05733	-.11759	-.14772
A22	-.47369	.61059	.17947	.01616	-.00271	-.03184	.04366	.08329	.03094	.02762
A23	-.18724	.37828	.16154	-.07464	-.14311	.15991	-.04418	-.03245	.08049	.02529
A24	.49302	.12282	-.10591	-.16084	.05044	.22500	.05827	-.17662	.00925	-.09538
A25	.29104	-.01465	.18721	.00499	.02459	.34386	.20303	.04312	.18546	-.06594
A26	-.47694	.54938	.21054	-.15159	-.23516	.08640	-.07211	.02610	-.00119	.04836
A27	.58443	.04992	-.01919	-.19720	.24255	.20923	-.04200	-.15788	-.07983	.04046
A28	-.41490	.51168	.07763	-.04519	.00718	.00049	.08505	.02103	.06678	.13007
A29	-.32078	.55959	-.00876	.04412	.30696	-.25618	.03343	-.07610	.00766	-.03204
A30	-.43232	.25336	.11335	-.06046	-.05869	.06485	-.02577	.01815	-.06988	.09058
A31	.33608	-.04418	.10186	-.07920	-.00849	.11984	.08562	.27480	-.14331	.02113
A32	.59585	.08087	.10672	.01519	-.00620	.08255	.02385	-.01163	-.05326	-.09961
A33	.58815	.16990	.11208	.20485	-.12235	-.06286	-.07083	-.21317	.04956	-.06308
A34	.75572	.02032	.18535	-.01514	.02215	-.03054	.06528	.01227	-.19577	.05956
A35	.49560	-.05959	.19212	.06672	.10127	.06902	-.02947	.09982	.04972	.10159
A36	.30448	.01226	.18286	.08166	.09757	.15313	-.02907	.08459	-.02653	.11546
A37	.75740	.00190	.31054	.07292	.07890	-.13258	.14445	-.08012	-.11948	-.04527
A38	.54703	-.01045	.14738	.03797	.00404	.03454	.06415	-.12925	.04885	.10857
A39	.70108	.03462	.06311	-.03612	-.04874	-.02359	.18005	.00964	.04797	.14846

Table E-4.--Varimax rotated factor matrix after rotation with Kaiser normalization.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
A01	.07802	.20932	-.11087	.42365(e)	.06635	.18607	.09485	.09667	-.09614	.00508
A02	.27576	.56635(c)	-.08319	-.02429	.00989	.09884	-.01696	.07127	-.03650	.01053
A03	.52026(a)	.27998	-.09668	.16676	-.05957	.01423	.20526	-.05672	-.05625	.21740
A04	.30891	.65265(c)	-.10976	.25993	.00635	-.01110	-.07753	.00800	-.14362	.00340
A05	.27163	.67678(c,e)	-.12331	.31993(c,e)	-.13985	.05314	.08014	.09055	-.06992	.02788
A06	.24834	.49678(c)	-.02693	.05429	.06094	.12398	.10118	.04262	.23721	.12522
A07	.66162(b)	.30977	.02918	-.03020	-.04141	-.03341	.01236	.05709	-.21464	.17817
A08	.39707	.54294(c)	-.09207	-.00277	-.00577	.09614	.10136	-.07160	.20622	.02086
A09	.13694	.03871	.04745	.63236(e)	.00488	.10399	.09651	-.06890	.06891	.02042
A10	.01014	.06296	.13850	.01852	.02993	-.12224	.00986	.05526	-.00614	.06030
A11	.01756	.15745	-.04639	.24671	-.00395	.60605	.11452	.04745	.01164	-.00865
A12	.58806(a)	.26485	-.22287	.00110	-.05526	.15810	.19127	-.03459	-.02323	.02013
A13	.52153(a)	.14041	.01296	.26000	-.22527	.05967	.10031	.02453	.11495	-.22473
A14	.03550	.09616	.00198	.21809	.01567	.05175	.30545	.04672	.17399	.02739
A15	.16949	-.02150	.05299	.06557	.04451	.12278	.60683	.03616	-.05085	-.00337
A16	.48025(a)	.12539	-.08125	.05869	.00031	.17296	.28899	-.00224	-.01413	-.27495
A17	.35317	.31626	-.19091	.13901	.08280	.29423	.04797	-.08044	.26457	-.00646
A18	.52197(b)	.22407	-.25181	.04830	.00330	.02754	.04165	-.00780	-.01078	.10549
A19	.11429	.07503	-.06801	.06565	.24167	.36127	.12411	.05134	.02321	.06606
A20	.45803(b)	.14950	-.22082	.05372	.14410	.05359	-.03747	.38732	-.07654	-.01797
A21	-.04088	.06064	.26762	.03210	.54763(d)	.02064	.06964	.00466	.07638	.00644
A22	-.16038	-.19240	.69113(d)	-.01489	.28381	.03175	.01562	-.07216	-.11634	-.00943
A23	-.04651	.00512	.49783(d)	-.02676	-.00762	-.05966	.06709	.06177	.02290	-.05286
A24	.22338	.41256(c)	-.07812	.16188	.05179	-.02084	.08704	.28098	.22164	-.03169
A25	.22632	.05164	.00678	-.02125	-.09815	.02562	.06732	.49290	.03590	.08498
A26	-.20583	-.07586	.76521(d)	-.02577	.03631	-.14098	.02191	-.09983	-.04024	-.00093
A27	.35298	.41612(c)	-.16173	.00501	.10594	.02368	-.00366	.20739	.37352	.04850
A28	-.18474	-.12820	.59584(d)	.02425	.20704	.08705	-.09608	-.03324	-.03964	-.05106
A29	-.11760	-.07803	.39112	-.00424	.58622(d)	.11706	-.04285	-.15218	-.07226	-.15944
A30	-.23031	-.17925	.42349	-.05454	.04896	-.06689	-.04925	-.09798	.04315	.03280
A31	.26333	.11423	-.07144	.05106	-.07741	.02074	.01634	.10820	.02961	.37475
A32	.47815	.25921	-.11154	.11727	.01940	-.03337	.16750	.17290	.07612	.07921
A33	.56543(a)	.19247	-.05393	.16605	-.00471	-.01648	.24439	.04905	.02859	-.23377
A34	.68621(a)	.25043	-.19095	.16065	.01583	-.03890	.01695	.07249	.13930	.17673
A35	.48131(a)	.11076	-.13819	-.09105	-.06756	.12506	.03706	.13946	.07157	.10824
A36	.33578	.00971	-.01576	-.08019	-.03943	.10102	.06004	.11847	.04925	.12953
A37	.77084(b)	.14989	-.23785	.12670	.12218	-.11327	.01460	.14608	.03004	.05759
A38	.50798(b)	.16083	-.12291	.07453	-.07013	.03210	-.02357	.17392	.11291	-.07563
A39	.58503(a)	.28604	-.13614	.22208	-.08484	.11522	-.09263	.18244	.02839	.05196

Items for scale:
(a) Concern of the teacher
(b) Subject knowledge of the teacher
(c) Praise and encouragement from the teacher
(d) Punishment from the teacher
(e) Enjoyment of studying

APPENDIX F

RELIABILITY ANALYSIS OF SCALES

Table F-1.--Reliability analysis for Scale 1--Concern.

A03: My teacher helps me learn mathematics.
A12: My teacher wants me to know mathematics.
A13: My teacher assures me I do homework correctly.
A16: My teacher helps with mistakes in my homework.
A33: My teacher checks my homework.
A34: My teacher makes sure that all understand his assignments.
A35: I'm able to read my teacher's handwriting.
A39: My teacher attracts and holds my attention.

	Means	Std. Dev.	Cases
A03	3.569	.638	274
A12	3.639	.709	274
A13	3.219	.951	274
A16	3.409	.878	274
A33	3.307	.886	274
A34	3.438	.909	274
A35	3.715	.640	274
A39	3.099	.973	274

Correlation Matrix:

	A03	A12	A13	A16	A33	A34	A35	A39
A03	1.00000							
A12	.45632	1.00000						
A13	.31894	.34054	1.00000					
A16	.34820	.43843	.40594	1.00000				
A33	.36397	.35779	.42876	.40836	1.00000			
A34	.56644	.51940	.38880	.40859	.38317	1.00000		
A35	.38936	.32954	.24728	.24059	.16743	.37895	1.00000	
A39	.44624	.44483	.38841	.31309	.30911	.57669	.37475	1.00000

N of Cases = 274

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	27.394	20.166	4.5	8

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	3.424	3.1	3.7	.6	1.2	.045

Table F-1.--Continued.

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A03	23.825	16.629	.601	.404	.806
A12	23.755	16.215	.604	.384	.803
A13	24.175	15.325	.529	.306	.813
A16	23.985	15.692	.533	.317	.811
A33	24.088	15.824	.505	.299	.815
A34	23.956	14.613	.680	.511	.789
A35	23.679	17.472	.427	.226	.823
A39	24.296	14.780	.594	.406	.803

Reliability coefficients 8 items

Alpha = .82830 Standardized item alpha = .83272

Table F-2.--Reliability analysis for Scale 2--Knowledge.

A07: My teacher knows his subject very well.
A18: My teacher likes to teach math.
A20: My teacher's blackboard is well organized.
A37: My teacher explains material well.
A38: My teacher uses different methods to solve problems.

	Means	Std. Dev.	Cases
A07	3.679	.560	274
A18	3.628	.711	274
A20	3.478	.822	274
A37	3.540	.736	274
A38	3.139	.962	274

Correlation Matrix:

	A07	A18	A20	A37	A38
A07	1.00000				
A18	.42507	1.00000			
A20	.41418	.25555	1.00000		
A37	.55502	.51131	.44330	1.00000	
A38	.35465	.29526	.31424	.44704	1.00000

N of Cases = 274

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	17.464	7.429	2.7	5

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	3.493	3.1	3.7	.5	1.2	.045

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A07	13.785	5.554	.591	.374	.697
A18	13.836	5.347	.480	.293	.720
A20	13.985	5.040	.464	.248	.728
A37	13.923	4.723	.676	.477	.650
A38	14.325	4.586	.465	.230	.741

Reliability coefficients 5 items

Alpha = .75144 Standardized item alpha = .77038

Table F-3.--Reliability analysis for Scale 3--Praise.

A02: My teacher is friendly.
A04: I like my math teacher.
A05: I feel comfortable with my teacher.
A06: I'm praised when I do good work.
A08: My teacher cares about me.
A24: My teacher praises me for completed homework.
A27: No answer--teacher still encourages me.

	Means	Std. Dev.	Cases
A02	3.365	.745	274
A04	3.310	.707	274
A05	3.252	.779	274
A06	3.307	.817	274
A08	3.080	.821	274
A24	2.876	1.099	274
A27	3.088	.994	274

Correlation Matrix:

	A02	A04	A05	A06	A08	A24	A27
A02	1.00000						
A04	.50723	1.00000					
A05	.40388	.61553	1.00000				
A06	.36315	.31649	.37900	1.00000			
A08	.43677	.41710	.38619	.41070	1.00000		
A24	.28368	.35590	.32760	.36476	.29912	1.00000	
A27	.35725	.40907	.40182	.39517	.40842	.36528	1.00000

N of Cases = 274

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	22.277	16.963	4.1	7

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	3.182	2.9	3.4	.5	1.2	.031

Table F-3.--Continued.

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A02	18.912	13.318	.568	.372	.781
A04	18.967	13.270	.619	.468	.775
A05	19.026	12.933	.611	.459	.774
A06	18.971	13.157	.530	.297	.786
A08	19.197	13.016	.552	.325	.783
A24	19.401	12.183	.466	.230	.807
A27	19.190	12.140	.553	.311	.784

Reliability coefficients 7 items

Alpha = .80895 Standardized item alpha = .82074

Table F-4.--Reliability analysis for Scale 4--Punishment.

A21: My teacher hits me if I don't behave in class.
A29: My teacher hits me if I don't answer in class.
A22: My teacher hurts my feelings before classmates.
A23: I'm told about bad work but not good work.
A26: For no answer--teacher embarrasses me.
A28: My teacher yells when I do something wrong.

	Means	Std. Dev.	Cases
A21	1.974	1.107	274
A29	1.394	.769	274
A22	1.555	.851	274
A23	1.894	1.048	274
A26	1.668	.974	274
A28	1.631	.909	274

Correlation Matrix:

	A21	A29	A22	A23	A26	A28
A21	1.00000					
A29	.35597	1.00000				
A22	.24831	.43153	1.00000			
A23	.17122	.09285	.33712	1.00000		
A26	.20953	.27824	.55480	.42488	1.00000	
A28	.23067	.43901	.56816	.24329	.49007	1.00000

N of Cases = 274

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	10.117	14.147	3.8	6

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	1.686	1.4	2.0	.6	1.4	.046

Table F-4.--Continued.

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A21	8.142	10.533	.332	.152	.753
A29	8.723	11.205	.457	.304	.712
A22	8.562	9.991	.638	.467	.663
A23	8.223	10.569	.364	.209	.739
A26	8.449	9.677	.582	.411	.673
A28	8.485	10.031	.571	.409	.678

Reliability coefficients 6 items

Alpha = .74066 Standardized item alpha = .75422

Table F-5.--Reliability analysis for Scale 5--Enjoyment.

A01: I enjoy participating in class discussion.
A09: I like mathematics.
A05: I feel comfortable with my teacher.

	Means	Std. Dev.	Cases
A01	3.354	.676	274
A09	3.062	.856	274
A05	3.252	.779	274

Correlation Matrix:

	A01	A09	A05
A01	1.00000		
A09	.29758	1.00000	
A05	.32412	.25673	1.00000

N of Cases = 274

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	9.668	2.823	1.7	3

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	3.223	3.1	3.4	.3	1.1	.022

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A01	6.314	1.681	.391	.154	.407
A09	6.606	1.405	.338	.117	.486
A05	6.416	1.533	.354	.133	.449

Reliability coefficients 3 items

Alpha = .54597 Standardized item alpha = .55400

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