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A study of the relationship between student achievement and teacher-student interaction in secondary classrooms

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A STUDY OF THE RELATIONSHIP BETWEEN STUDENT ACHIEVEMENT AND TEACHER-STUDENT INTERACTION IN SECONDARY CLASSROOMS

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A STUDY OF THE RELATIONSHIP BETWEEN
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Dedication

This report is dedicated to my parents, Robert and Lucille Beers, who made many sacrifices for me during my life as a child and to my wife Shelley, who has sacrificed during my adult life so that I could accomplish this task.

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A debt of gratitude is expressed to the members of the committee who shared their expertise in a very positive manner. Dr. Ries and Dr. Yankovich contributed greatly to the study. Dr. Hanny chaired the committee and spent many hours guiding this study. Dr. Hanny went far beyond the "call of duty" in his efforts. His patience was greatly appreciated.

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Chapter I

Introduction

Justification for Study

"The students were great, they didn't make a sound the whole class." This statement, often heard in faculty lounges and other places where teachers gather, reflects an attitude or belief that teachers should talk and students should listen. "Education is a social process. It is not something one acquires, it is something that occurs continually as a result of interactions with other human beings. Human interaction is the single most important ingredient in education and schooling practices should be devised to enhance rather than suppress interaction." (Stanford and Roark 1974)

There is considerable support for the notion that it is important for all students to be actively participating in the learning process. Adler (1984) states that the student should be 80 percent active and 20 percent passive although in most classrooms just the opposite occurs. Beechhold (1971) suggests that the average teacher says the equivalent of all of the Shakespearian plays every few days. When the teacher does listen it is only to hear material

regurgitated that has been previously taught. Unexpected answers are usually considered to be wrong, which causes the teacher to answer the question or call on someone else.

Davis and others (1974) state that the student is more likely to learn if he or she takes an active part in practice geared to reach an instructional objective. "Most teaching involves an active instructional agent and a passive student. Activities such as lectures, films, and the use of educational television require minimal participation on the part of the learner. Class discussions often involve a small percentage of the class who volunteer to answer knowledge and comprehension questions which require little more than memorization." Anderson (1946) states, "When a teacher's integrative contacts increase, pupils show an increase in spontaneity and initiative, voluntary social contributions and acts of problem solving."

According to Sizer (1984), "In order to be motivated a student needs to be engaged in the learning process." Modern adolescents are not satisified with a passive role; however, if they are not required to be "engaged" they will assume a passive role to avoid risk. Hunter (1982) agrees that involvement increases motivation. She suggests that active participation by the students is necessary so the teacher can check student understanding and use this information to make decisions. "Too many teachers work

themselves to death while the students watch rather than the teacher working the students to death while the teacher watches" (Hunter 1982).

One reason for previous problems involving the interaction between teachers and students is the difference between the goals of the teacher versus the goals of the students. Ideally, teachers should change students. Ideally, the goal of the student is to change or be changed through learning. Students should help others learn, including the teacher. With everyone working together the individual would have many more opportunities to learn from many more people. (Stanford and Roark 1974)

Murphy et al. (1982) suggest that one way for teachers to establish "academic press" in their classroom is to interact with all students in a similar manner. "Teachers should not call on some students and leave out others. They should prompt all students to correct or improve responses." (Murphy et al. 1982) Bloom (1976) states that about 20 percent of the variation in student achievement is accounted for by their participation in the classroom learning process. He goes on to add that, "The amount of active participation in the learning (covert and overt) is an excellent index of the quality of instruction for the purpose of predicting or accounting for individual student learning" (Bloom 1976). Cummings (1983) agrees saying,

"Active participation is an index of instructional quality and student achievement. If students learn by doing we need to get students to do."

According to Edmonds (1982), "One way to discriminate between effective teachers and others is to record the proportion of students who are asked to answer questions as a function of the student's race or social class. Teachers in ineffective schools prefer to question the children they predict are most likely to know the answers. Children who sit in those classes decide the teacher doesn't expect them to know as much. As a result, they are least likely to do their homework, master lessons, etc." Bloom (1976) supports this statement by saying, "When the overall quality of instruction is poor, only a few students will be actively participating in the learning. And as active participation in learning decreases, we would expect discipline and student management problems to increase."

Rosenshine (1986) maintains that effective teachers try to ensure a high success rate of student responses to frequent questions. "Students need to actively practice and process new learning. Teachers often lead this process, during presentation and guided practice, by asking questions of individual students. Student participation should be active until all students are able to respond correctly."

Educators have long searched for ways to increase the

involvement of the students in the teaching-learning process. Previous efforts include open classrooms, flexible scheduling, non-graded classrooms and an increased emphasis on individualization. "Most of these attempts to humanize education have focused on content or structure and have ignored the process through which significant learning takes place, which is interaction with other human beings" (Stanford and Roark 1974).

Until the nineteen-sixties it was not possible to measure precisely the quality and quantity of teacher-pupil interaction. Vague terms were used to describe classroom interaction such as warm, friendly, negative or authoritarian. Without an objective measure of classroom interaction teachers were unable to study their own behavior, the climate that was established in the classroom and the effect teacher behavior had on student behavior. While much of the early research was limited to exploratory "field studies", attempts to develop taxonomies and systems for measuring classroom interaction led to a number of sophisticated descriptive studies of teacher-pupil interaction. Out of the initial studies came attempts to correlate observed teaching variables with measured pupil outcomes. (Gallagher 1970)

A limitation of early research was that most classroom observation instruments treated the class as a whole,

ignoring differences among individuals in the same classroom.

> A survey of classroom interaction data reveals that within-class group and individual differences of considerable importance are regularly found when the investigator chooses to focus on them. To answer certain research questions the individual student is the proper unit of analysis. Use of the classroom as the unit of analysis masks important data and constitutes a less powerful method of examining the relationship between selected teacher behavior variables and student performance measures.
> (Good and Brophy 1971)

According to Cohen (1972):

> There is a problem in assuming that the learning of thirty students in a classroom can be understood with the same set of ideas useful for understanding learning in a two-person tutorial situation. If I am a student and I have a teacher who explains things very well, who asks questions broadly, who makes students extend answers to questions and who frequently reinforces, it is thought that I will learn. But what if I never raise my hand, sit in the back of the room, often fail to listen and rarely engage in a question-answer interchange with my teacher? Will I receive the same benefits as the eager student who sits up front and has all the direct interaction with the teacher?

Recent studies, using the student as the unit of study rather than the class, have shown that there are inequities within the classroom in regard to pupil-teacher interaction. The inequities are usually presented according to some characteristic of the individuals included in the study. Comparisons are usually made according to one of the following three variables: 1) the teacher's perception of the student's ability (Brophy 1970, 1976, 1984; Good 1971, 1978, 1981; Firestone 1975; Carne 1973; and Kerman 1986), 2)

the sex of the student (Sadker and Sadker 1986, Klein 1985, Sikes 1972, and Stake 1982) , or 3) where the student sits in the classroom (Rist 1972, Delefes 1972, and Adams and Biddle 1970).

There are two limitations with these recent studies. First, although the student is being observed as the unit of study, comparisons are still being made between the various sub-groups of students rather than comparing the amount of interaction an individual student is involved in with the achievement of that student. Secondly, almost all studies of teacher-student interaction involve elementary school children. The relationship between the amount of interaction and achievement for the secondary school student has been relatively unexplored.

Previous research by Hunter, Roshenshine, Bloom, and others suggests that all students should interact with their teachers. Brophy, Good, Kerman, and others suggest that certain students do not interact as much with the teacher as other students. Therefore, there is a need to describe the extent to which inequities exist in teacher-pupil interaction and to determine the relationship between the quantity of teacher-pupil interaction and pupil achievement at the secondary level.

Statement of the Problem

The problem of this study was to determine the relationship between the amount of verbal interaction between a student and a teacher and that student's achievement in the class taught by that teacher. In order to explain this relationship, questions were asked about the differences between various students, various classes, and various subjects in regard to achievement, ability and the amounts of different types of interaction.

Theoretical Rationale

Because of the work of Withall (1949), Anderson (1946), and Bales (1950) it became possible to measure more precisely the interaction in classrooms. The method of recording the quantitative and qualitative data regarding the verbal behavior of the teacher and the student is generally called "interaction analysis". The puppose of interaction analysis is not to record everything that occurs in the classroom. The instrument is generally designed to measure a specific behavior between two or more people. The form of the instrument depends upon its function. Data is

recorded by trained observers. The results of the collection of data are analyzed to identify patterns of interactions or teacher behavior in regard to a variable such as race, sex, or location of the student in the room, or to correlate the quality and quantity of interaction with a dependent variable such as achievement, attitude, or self-concept.

Early research identified classrooms as integrative or dominative, authoritarian or democratic, teacher-centered or student-centered, preclusive or inclusive, direct influence or indirect influence. It was concluded by researchers that the indirect influence type of teacher behavior (similar in nature to integrative, democratic, student-centered, and inclusive) produced the most favorable results. The researchers noted that the difficulty of measuring teaching effectiveness should be considered when making conclusions about their findings. The researchers also stated that no one specific style of teaching was appropriate for all situations. (Callahan et al. 1977, p. 59)

The system of interaction analysis developed by Flanders during the sixties is one of the earliest and most established methods of categorizing classroom communication. Flanders' system has ten categories of student and teacher behavior. Flanders defines two types of verbal influence: 1) direct influence, which consists of the teacher's stating of own opinion or ideas, directing the pupil's action,

criticizing pupil behavior, or justifying the teacher's authority or use of that authority, and 2) indirect influence, which consists of the teacher's soliciting the opinions or ideas of the pupils, applying or enlarging on those opinions or ideas, praising or encouraging the participation of pupils, or clarifying and accepting their feelings. (Amidon et al. 1967, p. 109)

Following an extensive study, Flanders (1967), reported a number of characteristics that distinguished what he called the most indirect teachers from the most direct teachers in social studies and mathematics. First, indirect teachers were more alert to, more concerned with, and made greater use of statements provided by students. Second, indirect teachers tended to ask more extended questions. Third, direct teachers had more discipline problems and criticized students three times more often than indirect teachers.

In terms of achievement, Flanders (1967) concluded that superior achievement occurred in indirect classes when compared with direct classes at a level of significance beyond .01. In regard to student attitude, the most constructive and independent attitudes were found to be associated with the most indirect patterns of teacher influence. This result was especially evident in the Social Studies classes.

Lashier (1967) used the Flanders system to assess the performance of ten student-teachers teaching six-week laboratory blocks. The results show a direct correlation between "indirectness" and gains in achievement and positive attitudes of the pupils. Powell (1968) used Flanders' technique to study the effects of indirect and direct instruction. His findings showed that arithmetic achievement during the first three years of school was significantly related to the indirectness of the teacher but that reading achievement was not affected in the same manner. Similarly, Soar (1967) found that when the teacher behaved in ways that made possible maximum freedom of expression on the part of the students, students made the greatest gains in vocabulary.

Hough (1967) used a variation of the Flanders system of interaction analysis to present evidence that certain identifiable teacher and student behaviors, consistent with learning theory are related to student classroom learning. The specific principles of learning were drawn from reinforcement theory with the central thesis being that, "If a behavior emitted in the presence of a stimulus or elicited by a stimulus is continuously reinforced, it will, on later presentation of a similar or analogous stimulus, be emitted or elicited with greater probability than if it had not been reinforced" (Amidon and Hough 1967, p. 377).

Combining the results of the Observational System for Instructional Analysis (Hough's variation of the Flanders System) with principles of reinforcement theory, Hough stated that the following general principles apply: a) classrooms in which there is a large percentage of question-asking, student-responding, and teacher-reinforcing have greater achievement than classrooms in which these conditions are present to a less extent, and b) classrooms in which there is a small percentage of criticism, justification of teacher authority and sarcasm (aversive stimulation) have greater achievement than classrooms in which these conditions are present to a greater extent. (Amidon and Hough 1967, p. 384)

In another study of teacher-pupil interaction, Brophy and Good (1969) developed the Dyadic Interaction System to determine whether some students receive more or less of some behaviors from the teacher than do other students. Dyadic interaction deals with contacts made with one student about matters idiosyncratic to him or her. Because of intra-class individual differences Brophy and Good (1969) concluded that observation of dyadic teacher-child interaction is superior to other methods of observation especially in research on teacher effectiveness. "A change in research design from the class to the individual as the unit of analysis would be more appropriate conceptually, and more powerful

statistically, for evaluating the importance of these teacher behaviors." (Brophy and Good 1969)

Brophy and Good (1980) used the Dyadic Interaction System to study the effects of teacher expectations on student behavior. They reported the existence of a "self-fulfilling prophecy", which serves to change student performance, and a "sustaining expectation effect" which serves to inhibit change in student performance. Their conclusions, which included the work of Rosenthal (1974), suggested that, "In some classrooms, high and low expectation students were treated differently with regard to teaching inputs, outputs, climate, and feedback" (Cooper and Good 1983, p. 3).

Specific ways teacher actions covary with expectation are: 1) seating low-expectation students in a group or further away from the teacher than high-expectation students, 2) smiling less often and maintaining less eye contact with lows, 3) calling on lows less often in academic situations, 4) providing less time for lows to answer questions, 5) not staying with lows in failure situations by providing cues or rephrasing questions, 6) criticizing lows more frequently than highs for incorrect responses, 7) praising lows less frequently than highs for successful responses, 8) providing lows with less accurate and less detailed feedback than highs, 9) praising lows more

frequently than highs for marginal or inadequate responses, 10) failing to provide lows with feedback about their responses as often as highs, 11) demanding less work and less effort from lows than from highs, and 12) interrupting performance of lows more frequently than highs. (Cooper and Good 1983, p. 10)

"Without sufficient contact with the students the teacher is less able to make appropriate changes in his or her own behavior. Fortunately, much of the unprofitable interaction that low-achieving students receive is due to the fact that teachers are simply unaware of interaction patterns. Most teachers appear to appreciate information about the effects of low expectations, and they benefit from suggestions for improving classroom behavior." (Good 1981)

In another study, Jackson and Lahaderne (1964) collected data in four sixth-grade classrooms located in a predominately white, working-class neighborhood. A wide variety in the number of interactions each student had with the teacher was reported. Some students had fewer than one interaction with the teacher per hour while other students had one interaction with the teacher almost every five or ten minutes. The totals for the least active students were very similar for the four classrooms, however, the totals for the most active students varied from classroom to classroom. The reason for this appears to be that most

teachers have certain expectations for minimal levels of participation but the maximum levels of participation depend upon the personalities of the teacher and the students.

Adams and Biddle (1970) maintain that physical placement in the classroom affects the extent of pupil participation. "Pupils up and down the center line of the classroom are the ones who are most likely to join in the discussion, and the ones the teacher is most likely to talk to. Others, away from the center line, are much less likely to speak or be spoken to."

Rist (1972), in a longitudinal study of one class of black students, found that the quality of interactions between the teacher and each child was related to the table to which the child was assigned in kindergarten, which in turn correlated with social class factors. Rist's work suggests that interactions have a relationship to reading groups and academic performance. "What remains to be done, at this point, is to delineate more clearly the role that interactions play in the classroom--more specifically, the role that interactions may play in academic achievement" (Firestone 1975).

Kerman (1979) discovered that high achievers receive more response opportunities and are given more time to respond to questions. "When high achievers do have difficulty, teachers tend to delve, give clues, or rephrase

the question more frequently than with low achievers." According to Sadker and Sadker (1986), "The most valuable resource in a classroom is the teachers attention. If the teacher is giving more of that valuable resource to one group it should come as no suprise that that group shows greater educational gains. The only real surprise is that it has taken us so long to see the problem."

Data recorded by Sadker and Sadker (1986) revealed findings that about 25 percent of the elementary and secondary students typically did not interact with the teacher at all during class. In the same classes, 10 percent of the students participated in more than three times their fair share of interactions with the teacher. The Sadkers maintain that most inequity in classroom interaction occurs between males and females and that this bias in classroom interaction inhibits student achievement.

Sadker and Sadker (1986) concluded that: 1) male students receive more attention from teachers and are given more time to talk in classrooms, 2) educators are generally unaware of the presence or the impact of this bias, 3) brief but focused training can reduce or eliminate sex bias from classroom interaction, and 4) increasing equity in classroom interaction increases the effectiveness of the teacher as well. "Equity and effectiveness are not competing concerns, they are complementary" (Sadker and Sadker 1986).

Using a form of interaction analysis, researchers at Hofstra University found that teachers tend to call on boys far more often than on girls. The reason for this was that calling on a student is a means of keeping him "under control", according to the teachers in the study. Silberman (1970) states that, "Calling on boys so much more often than girls is undesirable; using questions as a disciplinary device is questionable pedagogy."

> Whether from paying more attention to brighter students, giving them more of a chance to respond, more praise, or more verbal cues, students perceived to be brighter have an "interactional advantage" over those perceived to be "duller". In order to ascertain the role that interactions may play in academic achievement it is essentitial to pinpoint control for the influence of IQ. It would also be desirable to conduct a longitudinal study to evaluate the predictive validity of interaction data on academic performance. (Firestone 1975)

In summary, many studies have suggested the need for students to be actively engaged in the learning process and the need for teachers to hear what students have to say in order to diagnose the progress of the class and to decide whether to reteach or move on to new material. Researchers have reported that verbally active students have better attitudes, they are more motivated and they receive higher scores on measures of achievement.

According to the research, however, not all students interact with the teacher to the same degree. Some researchers maintain that students perceived to be high

achievers receive more of the teacher's attention than low achievers. Other researchers cite the inequity of distribution of verbal interaction in terms of student gender. They claim that boys receive many more opportunities to respond than girls. In some cases researchers have found that the location of the student in the classroom determines the amount of interaction each student has with the teacher.

Regardless of the characteristics of the groups being compared it is obvious that inequities do exist in regard to teacher-pupil interaction. However, the evidence is not as conclusive as to the effect these inequities have on student achievement, especially when the secondary student is used as the unit of study. There is a general concensus among researchers that additional studies are needed in this area.

Research Design

This study investigated the relationship between teacher-pupil interaction and achievement. The sample of students in the study was drawn from a high school with an enrollment of approximately 1800 students in a small school system in Virginia. One hundred and thirty-five students and

six teachers participated in the study. The students were enrolled in three English and three mathematics courses. A variety of ability levels, socioeconomic backgrounds, and ethnic groups were represented.

Classroom interaction data were gathered using a modified seating chart. Three teachers, who had completed the Teacher Expectancy and Student Achievement workshop, along with additional training in the use of instrument, volunteered to be observers. Interobserver agreement was determined by comparing the results of the three observers recording data in the same class, at the same time. Each class was observed five times for a period of fifty minutes each session.

A multiple regression was performed to determine if a positive correlation exists in secondary classrooms between the amount of verbal interaction between a student and a teacher, and that student's achievement in the class taught by that teacher. The ability of the student (measured by the student's intelligence quotient on the S.R.A.), was also entered in the multiple regression equation to determine it's effect on achievement. In order to answer research questions which related to the test of hypothesis, frequency distributions and histograms were presented.

Limitations

One limitation of this study is the effect the observer might have had on the behavior of the teacher and the students in the classroom. To minimize this effect, teachers from the same school as the students were selected to gather the data rather than bringing administrators or strangers into the classroom who would be more likely to have an effect on the classroom activities.

Since the sample included students taking two different subjects (mathematics and English), the different characteristics of the groups may have an effect on the results. Adding more students from other subjects increases the generalizability of the study but the loss of homogeneity may be a further limitation.

Another limitation (which is an asset in regard to observer training and interobserver agreement) is the simplicity of the evaluation instrument. The quality of the verbal interaction is not identified when using this instrument. Therefore, a one-word answer was recorded in the same manner as a very detailed answer. It is possible that the quantity of interactions each student has with the teacher is not as important as the quality of the interaction.

It is also possible that the test average of each

student is not a true indicator of a student's achievement in a class. Since the tests are made by the teacher there are no standard measures of reliability or validity. Lastly, the results of this study are purely correlational. It is not known whether the amount of interaction has an effect on achievement, whether the level of achievement has an effect on the amount of interaction, or whether achievement and the amount of interaction are dependent upon a third variable which has not been identified.

Definition of Terms

Teacher-pupil interaction. For the purpose of this study teacher-pupil interaction involves the verbal exchange of words which are instructionally related, between the teacher and a student. This term is interchangable with teacher-student interaction which often appears in the literature.

Teacher-initiated interaction. The teacher specifically calls on or points to one student in order to solicit a response.

Student-initiated interaction. The student raises a hand,

calls out a response or initiates an interaction with the teacher.

Active participation. A result of a deliberate and conscious effort on the part of a teacher to cause students to participate overtly in a lesson.

Hypothesis

The hypothesis in this study concerns the relationship between teacher-student interaction and achievement. The specific hypothesis to be tested is:

1) In secondary school classrooms a positive correlation exists between the amount of teacher-student interaction and student achievement.

Summary

In chapter one, a justification for the study was presented along with a statement of the problem, a theoretical rationale, the limitations of the study, a definition of terms, and the hypothesis. In chapter two, five areas involving teacher-pupil interaction (teacher behavior, teacher expectancy, sex equity, interaction according to seating and effective teaching) will be

reviewed, in detail, along with other pertinent literature regarding teacher-pupil interaction.

Chapter II

A REVIEW OF THE RELATED LITERATURE

A review of the related literature is presented in this chapter to provide a theoretical foundation for the study. Although the body of literature involving teacher-pupil interactions includes a variety of purposes and methodologies, there are many similarities. In most studies, the goal of the researcher is to identify the behaviors of the student and the teacher which will increase the likelihood that learning will occur.

The literature is presented in six sections followed by a discussion of previous research and a summary. Section one includes research on teacher behavior. In section two, the research on teacher expectancy is presented. Sex equity research is discussed in section three. Research on interaction according to seating is presented in section four. Effective teaching research is reviewed in section five and other pertinent research is presented in section six.

Historically, research on teacher effectiveness has developed in three stages. The earliest stage focused on personality and other characteristics of the teacher. It was assumed that if the teacher was warm and friendly, then

learning would naturally take place. At first, student questionnaires were used to determine what characteristics teachers should possess. In later studies, experts in the field of education, such as principals and supervisors, determined suitable teacher characteristics. Usually, the relationship between teacher characteristics and student achievement was not determined. (Medley 1979) According to Gage (1963), "These studies have yielded disappointing results: correlations that are nonsignificant, inconsistent from one study to the next, and usually lacking in psychological and educational meaning." Another limitation of the first stage of research was that data were gathered outside of the classroom by means of lists of teaching characteristics.

A second stage of teacher effectiveness research, often referred to as process-product research, examined teacher behaviors (rather than characteristics) and their effect upon student achievement. Researchers used observational instruments to record frequencies of various teacher behaviors, which were correlated with student achievement. This research is presented in another section of this chapter in a discussion of the works of Flanders (1970) and his associates.

A third stage focused on the student as the unit of study rather than the teacher. According to Medley (1977),

one variable that was missing from the process-product research was the behavior of the individual student. The process-product research used the mean academic gain of the students in a class to determine the effectiveness of the teacher, ignoring individual differences among students. The third stage examined mastery by indivivual students and the amount of time the students were engaged an academic tasks. Carroll (1963) for example, stated that the success of the student was dependent upon five factors: 1) aptitude, 2) ability, 3) perseverance, 4) opportunity to learn, and 5) quality of instruction.

Research on Teacher Behavior

During the late 1940's and early 1950's a number of researchers focused their attention on teacher-pupil interaction in the classroom. According to Bales (1950), "Interaction results when two or more persons behave overtly toward one another so that each receives some impression or perception of the other distinct enough to incur reaction."

One of the earliest studies of teacher-pupil interaction was performed by H.H. Anderson (1946). His studies were based on the observation of "dominative" and "integrative" behavior of teachers. Anderson (1946)

discovered that, "When a teacher's integrative contacts increase, pupils show an increase in spontaneity and initiative, voluntary social contribution and acts of problem solving." His findings were based on a study of preschool, primary and elementary school classrooms. He further noted that, "The dominative and integrative contacts of the teacher set a pattern of behavior that spreads throughout the classroom; the behavior of the teacher, more than any other individual, sets the climate of the class." (p. 46)

Withall (1949) developed a system which contained seven categories for teacher statements: learner-supportive, acceptant, problem structuring, neutral, directing, reproving, and self supporting. This system produced an index of teacher behavior very similar to the integrative-dominative ratio of Anderson. Perkins (1951) used Withall's technique to show that group discussion about various topics increased learning substantially and that an integrative-dominative type of leader was most effective.

Bellack and others (1963) described how teachers and students interact by listing the rules of the "classroom game." For example, the teacher must be the most active person playing the game and it is the student's primary task to respond to the teacher's questions. Bellack, studying tape recordings of high school social studies teachers found

that 50 percent of classroom discourse involved teacher questions followed by student responses. Giammatteo (1963) studied 150 elementary school teachers during language arts and found that more than 50 percent of the talk in the classroom was by the teacher and that most student talk was in response to the teacher's questions.

The most notable studies of teacher-pupil interaction, conducted prior to the 1970's, were performed by Ned Flanders and his associates who used the Flanders Interaction Analysis Categories (F.I.A.C.). Not only did Flanders' system categorize the verbal behavior occurring in the classroom, it enabled the observer and the teacher to summarize, analyze, and draw inferences from the data collected by means of application of the system. Essentially, researchers compared classrooms in which they found teacher behavior patterns that were different from each other. These classrooms were identified as integrative or dominative, authoritarian or democratic, teacher-centered or student-centered, preclusive or inclusive, direct influence or indirect influence. Generally speaking, the researchers concluded that the indirect type of teacher behavior produced the most favorable results.

In Flanders' opinion, there was too much teacher talk in most classrooms and not enough student talk. He felt that teachers should be more "indirect" by asking more

questions and that teachers should give praise and make instructional use of the ideas and feelings expressed by students. Flanders was mainly concerned about the effect of "indirect" versus "direct" teachers on student attitudes although he did include measures of adjusted student achievement in five of his studies. (1970)

Flanders (1970) administered pupil attitude inventories and selected classes at the extremes of the distributions to be included in the 1970 study. Then, the achievement level was determined and the classes were observed using the F.I.A.C. The type of interaction was recorded every three seconds in one of ten categories. The purpose of the coding was to identify the ratio of direct teaching to indirect teaching. Lecturing, giving directions, criticizing and justifying authority are examples of direct teaching while asking questions, accepting and clarifying ideas or feelings, and praising or encouraging are examples of indirect teaching.

One result of the study was the Flanders' Rule of two-thirds: "In the average classroom someone is talking two-thirds of the time; two-thirds of this is teacher-talk; and two-thirds of teacher-talk consists of direct influence (lecture, direction giving, or criticism)" (1962, p. 315). In all five studies, however, indirect teacher-talk correlated positively with achievement and attitude. Amidon

and Flanders (1961) used the F.I.A.C. to observe fifty-four eighth grade geometry classes. The classes were taught for two hours using direct or indirect techniques. They found that dependent-prone students recorded higher gains in achievement when indirect methods were used by the teacher.

Furst, in Amidon and Flanders (1963), re-analyzed a set of tapes that had been previously used in another study using another observational instrument. Using interaction analysis, Furst found that above-average achievement was positively related to indirect teacher influence, a moderate pace of teacher-pupil interaction, and an indirect teacher response to pupil talk. Furst also found that the amount of student talk was positively related to student achievement, suggesting that high achieving classrooms would have high levels of student-talk.

Soar (1967) produced one of the largest studies prior to 1970 on interaction analysis. He concluded that indirect teaching produced greater growth in reading comprehension than direct teaching with elementary school pupils. He also found that students taught by indirect teachers had greater gains over the summer than the students taught by direct teachers.

Lashier (1967) obtained similar results working with student teachers in biological science. Over a six-week period, the students of the indirect teachers showed higher

gains in achievement than those in classes of direct teachers. The indirect teachers used praise twice as much, and accepted feelings four times as much, as the direct teachers, following student-initiated ideas.

Teacher Expectation Research

In "Pygmalion in the Classroom", Rosenthal and Jacobson (1968) excited the educational world by examining the ways in which teachers interact with low-achieving students compared to the way they interact with high-achieving students. Their hypothesis was that by elevating the expectations of teachers regarding certain students, significant gains in achievement would result. To test the hypothesis, teachers were told that certain "blooming" students would show large gains in achievement throughout the year.

Although the identified students were not unlike the other students, in actuality, they did show greater gains in achievement than their peers. Some questions arose following this study, however, because it was limited to the first two grades and the interpretability of an achievement test at that level is questionable. It is not possible to tell if the teachers varied their behavior because Rosenthal

and Jacobson did not observe in classrooms. (Good 1981)

Good (1968) followed up on this study because he wanted to observe how teachers interacted with students believed to be high achievers or low achievers. In his doctoral dissertation (1970) he asked four first-grade teachers to rank their students according to their academic achievement. Good then observed teachers' interaction patterns with several students who were either high or low on teacher ranking lists. He concluded at that time that particular teachers provided more response opportunities to high achieving students than to low achieving students. Good assumed that this differential teacher behavior would have an adverse effect on the performance of low achievers.

Brophy and Good (1981) developed a coding system that not only recorded specific teacher behaviors, but also student-initiated behaviors. The initial coding system focused on teacher-pupil verbal interactions during instructional activities. Brophy and Good studied verbal behavior because: "1) teachers' verbal statements are mediators of student learning, 2) restrictions in time and human resources necessitated studying one area intensively rather than many areas and 3) the backgrounds of the two researchers made instructional interaction more salient" (1981, p. 416).

The model presented by Brophy and Good made the

following assumptions: 1) the teacher expects specific behavior and achievement from certain students, 2) because of these expectations teachers treat some students differently from others, 3) the students are aware of the expectations of the teacher which effects their achievement motivation, self-concept and level of aspiration, 4) the reaction of the student guides their achievement and behavior, and 5) the behavior and the achievement of the student will assimilate the expectations of the teacher (Good 1981).

Brophy and Good measured the effect of teacher expectation by asking teachers to rank their students in order of achievement. Six children high on the list and six children low on the list were selected for observation in each classroom. A balance between males and females was maintained. The students were selected from schools where tracking was practiced, which increased the homogeneity of the group. The types of interactions coded were response opportunities, teacher-afforded communications and contacts initiated by the child.

After pilot studies were performed the system was applied for about ten hours of observation for four different days in each of four first-grade classrooms. According to Good and Brophy (1971) it was clear that huge differences existed in the ways that the teachers interacted

with the two groups of students. These differences were listed in detail in chapter I.

Firestone and Brody (1975) conducted a longitudinal investigation to study the role that interactions play in predicting academic performance. Seventy-nine kindergarten children (forty-four female and thirty-five male) from a Northeast elementary school were used as subjects. The majority of the students were black and eligible for welfare assistance. The teachers in the study were white females with one to ten years of experience. The students were observed over a period of a year and a half using the F.I.A.C. system. The observations occurred during a two-hour session in each class, approximately once every three weeks.

Firestone and Brody (1975) reached conclusions similar to the results of Brophy and Good, suggesting that, "The interactions that occurred between teachers and children do provide a significant increase in one's ability to predict academic performance. In addition, the total number of times students were chosen to demonstrate something in class significantly and positively related to their subscores on word knowledge and total reading" (p. 548). "Students internalize expectations and perform in a manner congruent with the teacher's image. Being more frequently chosen to demonstrate for the class may communicate to the child that

he or she is special and increase his or her motivation or interest in a class or in school in general. In addition, being chosen to demonstrate constitutes extra practice which might increase performance" (p. 549).

In order to determine the relationship of teacher-pupil interaction to achievement at the Junior High level (seventh and eighth grade), Evertson and others (1980) observed thirty-nine English and twenty-nine mathematics teachers for a total of twenty times in each of two class sections (total N=136 classes). Subtests in English and mathematics from the California Achievement Test were given to all students during the previous spring. Achievement was measured throughout the school year by specially designed content tests. Students were also asked to state how likable and how accessible their teachers were.

Evertson and others (1980) found that the major differences in questioning between successful and nonsuccessful teachers were quantitative:

> The most successful teachers asked many more questions. Most of these were product rather than process questions, although in contrast to the findings from the early grades, the percentage of total questions asked that were process questions correlated positively with achievement in these junior high mathematics classes. About twenty-four questions were asked per fifty-minute period in the high-gain classes, and 25% of these were process questions. In contrast only about 8.5 questions were asked per period in the low-gain classes, and only about 15% of these were process questions. (Brophy and Good 1980, p. 343)

Students failure to make any response (in contrast to responding substantively but incorrectly) correlated negatively with achievement, again indicating the importance of teachers getting some kind of response to each question asked. Evertson also reported that, "Response opportunities were usually created by calling on nonvolunteers (45%), calling on volunteers (25%), or accepting call-outs (25%). Only calling on volunteers correlated positively with achievement." (p. 343)

The data from the Junior High study show how relationships vary in the classroom with grade level. "The primary grades stress instruction in basic skills, and it is important to see that each student participates actively in lessons and gets opportunities to practice and receive feedback. In the higher grades, more time is spent learning subject matter content and students are more able to learn efficiently from listening to the teacher's presentations or to exchanges between the teacher and other students. There is less need for small-group instruction and for overt involvement of each student." (Brophy and Good 1980, p. 344)

Good and Grouws (1983) observed nine, fourth-grade mathematics teachers who taught the same students all year and whose classes were in the top third in adjusted

achievement. They also observed nine parallel teachers whose classes were in the lower third in adjusted achievement. In the fall of 1984 these eighteen teachers were observed seven times. The Iowa Tests of Basic Skills was administered in the fall and spring to measure achievement in mathematics. Both groups maintained their rank in achievement gains.

The students in the higher-achieving classroom called out more answers, asked more questions, and initiated more private academic contacts with teachers. However, the high-achieving teachers asked fewer questions, especially questions that yielded incorrect answers or no answer at all. The high-achieving teachers averaged only three teacher-initiated work contacts but twenty-three student-initiated work contacts per hour, compared to an average of six and twelve respectively, for the low-achieving teachers. Good and Grouws summarized that high-achieving classes showed more frequent student-initiation of academic interaction than low-achieving classes. (1977)

According to Kerman, extensive research shows that students perceived to be high achievers are involved with teachers in interactions that are more motivating and more supportive than students perceived to be low achievers. Perceived high achievers also receive more response opportunities and are given more time to respond to

questions. Kerman does not place the blame for this fact on teachers alone, however, because the biases of teachers are usually unconscious. He agrees with Good and Brophy (1969) that giving students opportunities to respond is a useful teaching strategy, although students perceived as high achievers are given response opportunities three to four times more frequently than those perceived as low achievers. (Kerman 1979)

In 1971, Kerman and Martin began a three-year study to determine if teachers, trained in specific motivating and supporting techniques, used these techniques more frequently with low achievers, statistically significant gains in achievement would be made. The project was titled, "Equal Opportunity in the Classroom" (E.O.C.). Fifteen separate interactions were identified which were recognized by educators to be motivating and supportive. The interactions were grouped in three different strands with five interactions in each strand. A total of 742 teachers from over thirty school districts in Los Angeles County were included in the study. Teachers were selected from all levels; elementary, middle school, and secondary. An experimental and a control group were identified. In both groups observers discovered that the fifteen interactions were practiced more frequently with perceived high achievers than low achievers.

The teachers in the experimental group were trained to practice the fifteen interactions with all students in an equitable manner. Following the training, the teachers in the experimental group, observed each other four times during a thirty-minute session, over a three week-period. The results of the observation were given to the teachers for their analysis. The purpose of the observation was to report what was happening, not to evaluate.

> At the conclusion of the three-year study, approximately 2,000 identified low achievers in experimental classes showed statistically significant academic gains over their counterparts in the control classes. Not only were academic gains noted; also, a significant reduction in absenteeism and a significant reduction in discipline referrals occurred. Although project emphasis was directed to perceived low achievers, all students in the experimental classes, not just the lows, showed statistically significant gains over those in the control classes. (Kerman 1979)

Sex Equity

"Classrooms at all levels are characterized by a general environment of inequity, and bias in classroom interaction inhibits student achievement (Sadker and Sadker 1986)." For six years the Sadkers conducted research in elementary, secondary and post-secondary schools. Their first study of classroom interaction was from 1980 to 1984. Researchers, trained in the use of the Intersect Observation System, visited more than 100 classrooms of fourth, sixth, and eighth-graders in the District of Columbia and four

states. Students from a variety of socioeconomic and cultural backgrounds were included in the sample.

The teachers in the study taught language arts, social studies, and mathematics. The teacher sample included both males and females, whites and non-whites. One finding of the study was that male students were involved in more interactions than female students regardless of the race or gender of the teacher. In fact, "Classrooms at all levels were characterized by a more general environment of inequity; there were the `haves' and `have nots' of teacher attention. Students in the same classroom with the same teacher, studying the same material, were experiencing very different educational environments" (Sadker and Sadker 1986).

> About a quarter of the elementary and secondary students typically did not interact with the teacher at all during class. These were the silent ones, spectators of classroom interaction. A second group was involved in a nominal level of interaction - typically one interaction per class section. The majority of students fell within this group. The final category consisted of interacting students who participated in more than three times their fair share of interactions with the teacher. Only a few students (typically less than 10%) fell into this category; these were the stars, the salient students. (Sadker and Sadker 1986)

The Sadkers (1986) also reported inequities in the quality of classroom interactions. They discovered that precise feedback was more likely to be given to males. Precise feedback was defined as praise, criticism, or

remediation. Also, the Sadkers found that boys were eight times as likely to call out as girls. When boys called out teachers accepted their answers but when girls called out they were informed that such behavior was unacceptable.

The frequency of interactions at the postsecondary level has also been recorded. "Although decades of research indicate that active student participation in the classroom is related to higher achievement and more positive attitudes toward school, studies document the following pattern: As grade level increases, classrooms become less interactive. Elementary classrooms are more interactive than high school classes. High school classes are more interactive than college classes" (Sadker and Sadker 1982). The Sadkers conducted an experiment which investigated the effects of teacher training on several factors, including the equity in teacher-pupil interaction, but unfortunately the effect upon student achievement was not examined.

Martin (1972, p. 339) stated that, "An ever-growing body of evidence suggests that within elementary classrooms there are large differences in the frequency with which students interact with their teachers on a one-to-one basis." He explained the differences as a function of the gender of the student, suggesting that boys were involved in teacher-pupil interactions much more frequently than girls. According to Martin (p. 340), however, "It has never been

demonstrated whether their high mean rate of student-teacher interaction is characteristic of boys in general or is caused by very high rates of problem behavior boys." For this reason, Martin conducted a study to investigate the effects of student gender and behavior on the frequency and type of teacher-pupil interaction.

Eight boys and eight girls were selected from each of five classrooms of the second grade. Due to absences, the final total of students in the sample was seventy-six. Approximately 75 percent of the students were black. Teachers were asked to rank their students according to behavior and select four boys and four girls from the top and from the bottom of the class. Each class was observed for a total of four hours, three to five different times, over a six-week period. Observations were performed by Martin and an assistant. Observer bias was guarded against by periodic checks of interrater reliability. The observation system utilized (Brophy and Good) was designed to treat the student as the unit of study, not the class.(Martin 1972)

The data gathered by Martin (1972) suggest that boys perceived to be behavior problems were engaged in many more contacts than boys who were not behavior problems. Further, males had considerably more contacts with their teachers than females, which replicates previous research, such as

the findings of Brophy and Good. Interestingly, the difference in contacts occurred when the teacher initiated the contact rather than the student. Student initiated contacts were the same for boys and girls. However, teachers initiated contacts with boys 33 percent more often than with girls.

Jackson and Lahaderne (1967) conducted a study to describe and discuss the activities of four sixth-grade classrooms. The major focus of the study involved teacher-pupil interactions. Approximately 125 students from a predominantly white, working-class neighborhood were observed for a total of thirty-six hours. The observation instrument recorded; a) which student was involved, b) whether the teacher or the student was the initiator, and c) what type of interaction was observed (instructional, prohibitory or managerial). The authors admitted that, although the simplicity of the instrument gave it some advantages, there was a considerable amount of information not identified by the instrument. (Jackson and Lahaderne 1967)

They discovered that large inequities were evident in regard to teacher-pupil interaction. The difference becomes more noticable when one considers multiplying the hourly rates times 1,000, which is approximately the number of hours in the school year. "Although the initiation rates

are roughly equal for the four teachers, the rates for the students are not" (Jackson and Lahaderne 1967, p. 206). In one classroom the pupils initiated four times as many instructional contacts with the teacher as another classroom.

According to Jackson and Lahaderne the amount of teacher-pupil interaction is determined by not only the classroom where the students are placed, but also the sex of the student. In three of the classrooms, boys received more than their fair share of interactions with the teacher. "Within each room and within each sex group there remain wide differences in the pattern of teacher-pupil interactions. Such differences only become discernible when the descriptive unit of study is the individual student and his experience. In each of the four clasrrooms, one or two students have fewer than one interchange per hour with their teacher. At the other extreme a few students in each class have so many communications that if the interactions were distributed equally throughout the day, these students would be in contact with their teacher every five or ten minutes" (Jackson and Lahaderne 1967, p. 209).

Seating

Walberg (1969) was one of the first researchers to

suggest that a relationship exists between the physical and psychological distance in a classroom. He stated that pupils who choose the front row and center row of the classroom have better attitudes towards learning and take a more active part in learning. Adams and Biddle (1970) studied videotapes of thirty-six lessons in sixteen classrooms. They discovered that classroom interaction is dominated by teacher-talk. They also discovered that, "Seventy-five percent of the time the classrooms were organized so that only one central communication group existed with the teacher as the most frequent emitter and target in that central group. Of those 1,176 occasions when there was a pupil emitter, that pupil was located in three seats, one behind the other, down the center of the room, sixty-three percent of the time."

Adams and Biddle also reported that adding the first two seats on either side of the center row, forming a "T" would include almost all pupil emitters. They presented two implications of their study. First, something other than a theoretical explanation might be the reason for differences in levels of learning. Secondly, if the level of participation is related to the level of achievement then changes in classroom organization and teaching strategies need to be examined.

Delefes and Jackson (1977) conducted a study to examine the relationship between physical placement in the classroom and the total number of teacher-pupil interactions. The sample consisted of twenty-six students in grade five language arts classes and twenty-seven students in grade eight social studies classes. Two female teachers, who were unaware of the hypothesis, agreed to participate in the study. After five training sessions, the two observers obtained 87 percent interrater reliability.

Five sets of behavior categories were devised including teacher location, pupil emitter, pupil target, diffuse emitter (a group of students) and diffuse target. Three additional categories identified the response of the teacher to the student as, a) a positive response, b) a negative response, or c) no response at all. The classes were observed on twenty separate occasions, over a six-week period. The observations were recorded in each category for ten minutes each session on a tally sheet that included a seating chart. Recording occurred for one minute followed by a fifteen second pause followed by another minute of recording.

The "action zone" reported by Adams and Biddle was not substantiated. In each classroom, a different area of the room provided a majority of the interactions. However, the inequity of contacts with the teacher was evident. "One

quarter of the students in classes A and B received forty-seven percent and sixty-one percent of the teachers' positive verbalizations, respectively. Clearly, the findings of the present study support the reported inequality of teacher-pupil contacts but because of the small size and selection of the sample and possible limitations by the observers who gathered the data, generalizations from their results are restricted." (Delefes and Jackson 1977)

Effective Teaching

In 1967, Simon and Boyer reported that, "Prior to the 1960's, almost all research on effective teaching concentrated on seeking links between characteristics of teachers or of teaching settings (input) and various kinds of pupil growth (output). Inclusion of process measures of teacher behavior in studies of teacher effectiveness has constituted a major change in research in this field. Data from these measures of what teachers and pupils "do" in the classroom, as contrasted with what they "have" or what they "are" have contributed both to encouraging research results and a feeling of cautious optimism among writers in the field about the potential for building a viable theory of instruction with potential for implementation in practice.

This is a major shift from the pessimism expressed prior to the present decade." (p. 17)

"The research on effective teaching conducted since 1974 has yielded a pattern of instruction that is particularly useful for teaching a body of content or well-defined skills. This pattern is a systematic method for presenting material in small steps, pausing to check for student understanding, and eliciting active and successful participation from all students" (Rosenshine 1986).

One finding of Rosenshine (1986) is that one has to process new material in order to transfer it from their working memory to their longterm memory. That is, one has to elaborate, review, rehearse, summarize, or enhance the material. Students can do this through active practice, which is facilitated if the teacher asks questions, requires students to summarize main points, asks students to tutor each other, and supervises students as they practice new steps in a skill.

> A number of correlational studies have shown that teachers who effectively obtained larger gains in student achievement asked many questions (Stallings and Kaskowitz 1974; Stallings et al. 1977, 1979; Soar 1973; Coker et al. 1980). In a correlational study of junior high school mathematics instructors (Evertson, Anderson, and Anderson, 1980) the most effective teachers asked an average of twenty-four questions during the fifty minute period, whereas the least effective teachers asked only 8.6 questions. In two experimental studies (Anderson et al. 1979, Good and Grouws 1979), teachers in the experimental group were taught to follow the

> presentation of new material with guided practice, using a high frequency of questions. In each study, students in the experimental groups had higher achievement than did students in the control groups.
> (Rosenshine 1986, p. 66)

Rosenshine further states that:

> There are additionally, two related factors teachers need to consider when providing guided practice: the percentage of answers students give correctly and students' active participation. Student participation should be active until all students are able to respond correctly. Students need to actively practice and process new learning. Teachers often lead this process, during presentation and guided practice, by asking questions of individual students. Students can repeat directions, procedures, or main points, or answer questions on facts and procedures." Instead of calling on one student at a time, imaginative teachers increase the amount of active participation by using techniques to involve all students. (1986, p. 67)

Cummings (1983, p. 141) states, "If we want our kids to learn, we just have to make sure we use every way we possibly can to get each student actively involved. Active participation is an index of instructional quality and student achievement and that's right up our alley as teachers."

In addition to increasing active participation, high levels of teacher-pupil interaction can assist the teacher in checking students' understanding. Hunter (1983, p. 59), in a book that presents her theory of teaching, suggests that teachers often commit three common errors. The first error is to assume, because students are quiet or nod their heads up and down, that they understand. A second error is

to say, "You all understand, don't you?" This question implies that students who do not understand either were not paying attention or they are not very intelligent. A third error is to ask the class if anyone has a question. Although determining which students do not understand is one of the most important pieces of information a teacher can have; it is the hardest to obtain. Students will rarely volunteer their inability to comprehend.

"All three of these dysfunctional methods for checking students' understanding can result in a teacher proceeding, blissfully unaware that students are lost (Hunter 1983, p. 59)." A fourth problem becomes apparent when the research of Brophy and Good is considered. If the high achieving students interact more frequently than low achievers and teachers use student answers to monitor progress, then incorrect diagnosis could lead to a large portion of the class being left behind.

Other Research

Hoehn (1954) conducted a study to determine whether third-grade teachers tend to have different amounts and kinds of classroom contacts with high than with low status pupils. Five hours of observations in each of nineteen, third-grade classrooms were completed over a period of two

school days. The findings of their study reveal that some teachers give more attention to middle than lower class pupils, while some give more to lower than to middle class pupils; and that there is considerable variation from teacher to teacher as to which status group is favored. "These results fail to support the hypothesis that teachers tend to give more attention to their high than to their low status pupils. The status of the pupil appears to provide no basis for predicting whether the pupil receives more or less attention than pupils who are in the same classroom but who are at other status levels." (p. 286)

Cobb (1972) performed an investigation to determine if a child's overt classroom behavior could be observed to predict academic achievement. "This technique is promising, since results provide an empirical basis for theoretical formulation concerning academic achievement correlates as well as suggesting possible intervention strategies to increase achievement levels." (p. 74)

Seven observers were professionally trained in four, one-hour sessions using videotapes of children working. In the final session 85 percent interrater reliability was obtained. Three arithmetic classes in school A and three arithmetic classes in school B were included in the study. Each child was observed individually for ten seconds until all students had been observed; then the sequence started

over. The behaviors were coded for the entire period for nine days in a row. Tally marks were entered in one of fourteen different categories depending upon the behavior of the student being observed. The Stanford Achievement Test was then administered to all students.

"These findings suggest that specifying more discrete behaviors, of the general response class of work-oriented behaviors, provide stronger relationships to achievement than those obtained in previous studies. Thus, the child who talks about academic material to his peer as well as attends to his work, is more likely to succeed than the child who attends without interacting with his peers." (Cobb 1972, p. 79)

Pratton and Hales (1986) investigated the theoretical veiwpoint that active participation enhances student learning. An experimental, two-group posttest design was used. The dependent variable was student achievement of the lesson objectives as measured by a teacher prepared criterion test. "The treatment consisted of a thirty-minute lesson on probability taught by five teachers selected and trained for this project. Twenty intact groups (heterogeneous fifth-grade homeroom classes) were randomly assigned to treatment. Within treatment levels, teachers were randomly assigned to classes. Each teacher taught four classes, two using active participation and two not using active

participation."

The research hypothesis was that the class taught using active participation would have a higher mean achievement score than the class taught without active participation. Although the class means were used as the measurement unit, the within-treatment differences among classes were expected to be small because teachers were not to know the students and all of the teachers had knowledge of Hunter's (1976) elements of instruction.

According to Pratton and Hales (1986), "The class means for the active participation group on the dependent variable criterion test ranged from 11.76 (78.4%) to 13.08 (87.2%), whereas the class means for the non-active participation group ranged from 10.69 (71.3%) to 11.55 (77%). In all cases, the class means were higher for the active participation group. The research hypothesis that the mean of the classes taught with active participation was greater than the mean of the classes taught without active participation was accepted." Therefore, the authors concluded that active participation does have an effect on student learning as measured by an immediate posttest.

In a study by Travers and others (1964), groups of eight students learned sixty German words under four different feedback conditions. In each group, four of the students interacted with the experimenter (who acted as the

teacher) and received feedback and verbal reinforcement. The other four students in the group did not interact at all with the experimenter. The subjects (N=288) were fourth, fifth and sixth graders enrolled in three public elementary schools in Salt Lake City, Utah.

The learning sessions were conducted on Monday, Tuesday and Wednesday followed by a recognition test on Friday. The groups were selected so that each group would be as homogeneous as possible. Results of the recognition test showed that, "Subjects who interacted with the experimenter performed better, not only on the items on which they interacted, but also on the items which they learned by observation. The data suggest the interpretation that the direct interaction procedure raises the level of arousal of the direct subjects which in turn, influences acquisition of the items which they learn by observation." (Travers and others 1964, p. 173)

Thompson and others (1982) studied the teacher-student interaction patterns of four groups of third-grade mainstreamed classrooms. Three classes were in each of the following groups: 1) nonhandicapped high achievers, 2) nonhandicapped low achievers, 3) learning disabled, and 4) behaviorally handicapped. The Brophy-Good observation system was used to record the teacher-student interactions. Six questions were developed to determine if teacher-student

interactions varied from one group to the next. A total of 480 hours of observational data was collected over a nine-week period.

> This study's overall conclusion is that although there is substantial evidence that teacher-student interaction varies among the four groups of students observed, there is no strong evidence that general preferential treatment or treatment likely to result in better educational gains, or a more effective learning environment, is consistently provided to any single group of students. Although general preferential treatment is not provided to any one group of students, there is evidence that behaviorally handicapped students in mainstreamed settings received a larger proportion of the teacher's time than did other students. From 60 to 90 percent more teacher and student initiations were directed toward or received from the behaviorally handicapped students as was the case with the high-achieving, nonhandicapped students. (Thompson and others 1982, p. 233)

In order to determine the value of discussion to improve vocabulary learning, Stahl and Clark (1987) observed two classes, divided into three subgroups, which were taught science vocabulary on three successive days. One subgroup was told that they would have to learn by listening only, they would not be called on by the teacher. The other two subgroups were told they would be called on. However, only one of these groups did get called on; the other group was ignored.

> The study tested the relative effects on vocabulary learning of anticipating participation in a classroom discussion of new vocabulary. It was hypothesized that anticipation, whether paired with

> actual participation or not, would facilitate learning when compared to simply listening without anticipation. It was found that children in the discussion class performed better on two measures of concept and vocabulary learning than students who simply read the target passages and took the test. There were no significant differences between the three treatment conditions on an immediate sentence anomaly test. On the delayed multiple-choice test, however, both groups that anticipated being called on did significantly better than the group that simply listened to the discussion. Therefore, it appears that the anticipation of being called on has an effect on the level of achievement but overt participation in discussion may not be necessary. (Stahl and Clark 1987, p.551)

Hughes (1973) selected two variables from observational studies of teaching and laboratory research and experimentally manipulated them to determine their effect on pupil achievement as measured by a comprehensive posttest. The two variables were pupil responding and teacher reacting. "These variables were chosen because: 1) they are directly under the control of the teacher and are relatively easy to manipulate, 2) they are common behaviors in the normal classroom (e.g. Bellack et al. 1966) and, as such, are likely to be influential in facilitating learning, other things being equal, 3) there is widespread theoretical support for the claim that pupil responding and appropriate feedback and reinforcement are conducive to pupil learning, 4) research evidence from both laboratory and classroom studies suggests that pupil responding and appropriate feedback and reinforcement may be important in

facilitating learning (e.g. Flanders 1970, Travers et al. 1964), 5) they are anchored directly in observable and specific teacher behavior (Flanders 1967)." (Hughes 1973)

The subjects for the study were enrolled in intermediate schools (grade seven) in Christchurch, New Zealand. Thirteen classes, in five different schools were taught three, forty minute experimental lessons dealing with exotic animals. Three separate experiments were conducted. In the first experiment, three treatments were developed, each designed to allow students to predict or control to a greater or lesser degree when they would be called on to answer a question. The three treatments were called random responding (respondents picked randomly, voluntary or not), systematic responding (respondents picked by seating arrangement voluntary or not), and self-selected responding (respondents volunteer to be called upon). All other characteristics of the three treatments were the same. The teachers did not give positive or negative reinforcement to the students.

It was assumed that the students who were not sure when they would be questioned (random responding) would show the highest gains in achievement. The analysis of variance summary showed that there was not a significant difference between treatments and schools. The only significant difference was between boys and girls; boys having a higher

mean residual score in achievement than girls. (Hughes 1973)

A second experiment involved the two extremes of the interaction continuum. The hypothesis of the researchers was that students who had to respond in a random sequence would score higher on achievement tests than students who did not respond at all. The sample consisted of two classes divided in half. One half of the class was asked questions while the other half was not. The students were told this would happen but they did not know ahead of time which group they were in. Again, no significant difference was found between the treatment groups.

A third experiment involved one group who received teacher reactions following responses and another group which received no teacher reactions. In this experiment, the group who received the reactions of the teacher showed significantly higher gains in achievement than the group who received no reaction from the teacher.

"The results presented above indicate that pupil participation, in the form of overt pupil responses to teacher solicitation, has very little effect on achievement under the conditions of the present study. The possibility that the "artificial" conditions of the study made the pupils pay unusually close attention, irrespective of the requirements of overt responding, cannot be ruled out (Hughes 1973, p. 33)." The results of the third experiment

suggest, however, that postive reactions from the teacher, following a response, facilitate pupil achievement more than minimal teacher reactions.

Summary

The purpose of Chapter II was to review the related literature regarding teacher-pupil interaction to provide a theoretical foundation for the study. The section on teacher behavior examined early research (prior to 1970) and the work of Flanders and other researchers who used the Flanders Interaction Analysis Categories to examine specific teacher behaviors. The second section reviewed the literature in regard to teacher expectancy and student achievement. The studies performed by Brophy and Good were reviewed along with the more recent findings of Kerman. The next section presented the various studies which reported inequities in teacher-pupil interaction depending upon the gender of the student. The fourth section reviewed studies performed by Adams and Biddle, among others, which suggested that the location of the student in the classroom has an effect on the quantity of verbal interactions with the teacher. Next, the recent research on effective teaching

was presented, followed by a review of other pertinent research which was not included in any of the previous sections.

The majority of the early research treated the class as the unit of study, ignoring differences between individual students. The previous studies which used the student as the unit of study concentrated on various comparisons between various groups of students such as high achievers versus low achievers, males versus females, or students seated in the front of the class versus students seated in other areas of the classroom. Also, almost all of the previous studies dealt with elementary students. The work performed by Hughes included students from the seventh grade but his work had some very serious limitations. And lastly, many of the studies were performed under artificial conditions rather than the naturalistic conditions of the everyday classroom.

In the third chapter, a description of the methods and procedures used to test the research hypotheses will be presented, along with a description of the sample, instruments used, experimental design, data collection procedures, and statistical analysis.

Chapter III

Methods and Procedures

Chapters I and II established a theoretical framework for the study. This framework provides the theoretical base for the hypothesis stated below. Included are the research questions which fall within this theoretical framework, although they are not stated as hypotheses. It was determined that these questions needed to be answered before the hypothesis was tested to respond to other explanations or causes for the observed effects, i.e., plausible alternative hypotheses.

Chapter III is divided into five sections. In section one, a description of the setting for the study is provided. Next, the sample included in the study is described. In the third, section the method for classroom observation is explained. The statistical analysis is described in the fourth section and a summary is provided in the fifth section.

Hypothesis 1: In secondary school classrooms a positive correlation exists between the amount of teacher-student interaction and student achievement.

Specific Null Hypothesis

In secondary school classrooms a positive correlation does not exist between the amount of teacher-student interaction and student achievement.

Question 1a: Are some students engaged in teacher-student interactions more than others?

Question 1b: Are some students engaged in student-initiated interactions more than others?

Question 1c: Are some students engaged in teacher-initiated interactions more than others?

Question 2: Do verbally active students achieve at higher levels than verbally non-active students?

Question 3: Is there a significant difference between classes in regard to total teacher-pupil interaction?

Question 4: Is there a significant difference between classes in regard to student-initiated teacher-pupil interaction?

Question 5: Is there a significant difference between classes in regard to teacher-initiated teacher-pupil interaction?

Question 6: Is there a significant difference between mathematics and English classes in regard to total teacher-pupil interaction?

Question 7: Is there a significant difference between mathematics and English classes in regard to student-initiated teacher-pupil interaction?

Question 8: Is there a significant difference between mathematics and English classes in regard to teacher-initiated teacher-pupil interaction?

Description of the Setting for the Study

The high school where the study was conducted enrolled approximately 1,800 students in grades nine through twelve. Seventy-two percent of the students were white and twenty-eight percent of the students were black. Approximately seventy-five percent of the graduates in this school go on to either two-year or four-year colleges. The

school is the only high school in a school division of five thousand students. The community is made up of a city of 10,000 persons and a county of 23,000 persons and is located in southeast Virginia.

Sample Selection

Three intact Algebra II mathematics classes and three intact eleventh grade English classes were selected for this study. These classes were selected because the three teachers in each subject area used similar teaching techniques, used the same tests and taught to the same objectives. An effort was made to select teachers who planned together and were similar in as age, experience and skill. This was done to reduce the effect of the teacher as a variable.

The total number of students enrolled in these six classes was 135 at the beginning of the study, however, two students withdrew from school and five other students were absent three of the five days when observations took place. As a result, 128 students were included in the study. The majority of the students in the six classes were juniors and seniors. A variety of socioeconomic and ethnic groups was represented in the sample and there was a fairly even

balance of males and females.

Classroom Observation

Three teachers, who had completed training in a T.E.S.A. (Teacher Expectation and Student Achievement) Workshop were asked to participate as observers in this study. The observers were given additional training in the use of an observation instrument developed for the purpose of this study. In order to obtain interrater reliability, the three teacher-observers observed in the same classroom, at the same time, and compared results of their data collection. This practice was continued until interobserver agreement ratios were consistantly higher than 80 percent.

The three observers were unaware of the purpose of the study as were the teachers and students in the sample. The three observers were from three different subject areas; Biology, English and mathematics. Each observer was assigned to record data in a subject area other than his or her own. The teachers in the sample provided daily lesson plans for the observers so that recording of data would not occur on days when tests were being given or during other situations that would provide minimal amounts of interaction.

The instrument used to collect data was simply a seating chart, provided by the teacher, which had two squares beneath each student's name. Teacher-initiated interactions were recorded in the left square and student-initiated interactions were recorded in the right square. (Appendix A)

Each observer visited the same two classrooms five times for a period of one hour each visit. It was decided that by staying with the same two classes for all five observations the observers would have less of an effect on the behavior of the teacher and the students. Also, the observers would become more familiar with the students and the teacher which could increase the accuracy of coding. Neither the students nor the teacher were aware of the purpose of the visitation except that the observers were gathering data for a doctoral dissertation.

The rules for coding the teacher-pupil interactions were as follows :

1) the interaction may be extended or brief
2) the interaction must be verbal
3) the interaction must be between the teacher and the student
4) group responses are not coded unless fewer than three students respond and the observer can identify the students
5) if the question is directed toward getting one

particular response, only one interaction is coded

6) only instructional interactions are coded
7) interactions are coded as teacher-initiated if the teacher specifically solicits a response; all others are student-initiated.

The total interactions each student had for the five observations were recorded, along with the total student-initiated interactions and total teacher-initiated interactions. If the student was absent, an "a" was placed on the tally sheet for that day. In order to account for student absences, the average interaction per day was determined for total interactions, student-initiated interactions and teacher-initiated interactions.

Criterion Measures

In order to determine the ability of each student the student's national percentile score on the Science Research Associates test was recorded. In cases where the student had not taken the S.R.A. (usually transfer students) or the student had only partially completed the test, a blank replaced a percentile score.

In order to determine the criterion of achievement, the

second nine-weeks grade average was recorded for each student. In the three mathematics classes, the average of approximately fifteen grades was used. In the three English classes, the average of approximately ten grades was used. In the mathematics classes, the grades were entirely from tests and quizzes. However, in the English classes, grades for oral and written reports were also averaged in with the test and quiz grades. Participation grades were not included in the achievement scores. The second nine-weeks grade average was used because: a) the second nine weeks marking period was when the observations took place, b) an exam grade could not be used because students with "B" averages or better were exempt from taking the exam, c) the final grade might include participation in class, and d) the first nine-weeks performance of the student was not observed.

Each student was given an individual code and a class code so that it would be possible to compare the students with one another, each of the six classes with each other, and the mathematics classes with the English classes.

Statistical Analysis

In order to test the hypothesis and answer the research questions, the computer program, Statistical Package for the

Social Sciences X (SPSSX), was utilized. A frequencies procedure was selected to produce tables of frequency counts and percentages for the value of individual variables. Each of the five variables (achievement, ability, total interaction, student-initiated interaction and teacher-initiated interaction) was selected individually in this procedure. The various samples included: all students, students in English classes, students in mathematics classes and students in each of the six classes.

The frequency distribution listed the value, frequency, percent, valid percent and cumulative percent for each sample listed above (see table 1). The SPSSX subcommand specified the following univariate statistics for all variables: mean, mode, kurtosis, S E SKEW, maximum, standard error, standard deviation, S E KURT, range, sum median, variance, skewness, and minimum. A histogram for each sample was also specified.

Table 1

Numbers of Students in Various Groups

	ACH	AB	ToI	SII	TII
All	128	117	128	128	128
English	66	60	66	66	66
Math	62	57	62	62	62
Class 1	24	22	24	24	24
Class 2	20	17	20	20	20
Class 3	18	18	18	18	18
Class 4	21	19	21	21	21
Class 5	20	19	20	20	20
Class 6	25	22	25	25	25

ACH=Achievement

AB=Ability

ToI=Total Interaction

SII=Student-Initiated Interaction

TII=Teacher-Initiated Interaction

Table 2 displays the variables used in the multiple regression analysis. A multiple regression was used to determine the correlation between the achievement of the student (the dependent variable) and the combination of the student's ability and the student's interaction with the teacher (the independent variables). Nine separate tests were conducted. The first sample included all students; the second sample included students enrolled in English classes; and the third sample included students enrolled in mathematics classes.

For each of the three samples, three separate tests of multiple regression were conducted. All three tests used the student's achievement as the dependent variable and the student's ability as one of the two independent variables. In the first test, the second independent variable was teacher-pupil interaction. In the second test, the second independent variable was student-initiated interaction. In the third test, the second independent variable was teacher-initiated interaction.

Table 2

Tests of Multiple Regression

All Students	English Students	Math Students
(1) V3 x V4 x V5	(4) V3 x V4 x V5	(7) V3 x V4 x V5
(2) V3 x V4 x V6	(5) V3 x V4 x V6	(8) V3 x V4 x V6
(3) V3 x V4 x V7	(6) V3 x V4 x V7	(9) V3 x V4 x V7

Variables

V3 = Achievement (Grade Average)

V4 = Ability (I.Q. Percentile)

V5 = Total Interaction

V6 = Student-Initiated Interaction

V7 = Teacher-Initiated Interaction

( ) = Test Number

The stepwise selection method was used in the multiple regression equation. The default value of 0.05 for the

probability of F-to-enter was selected along with the default value of 0.10 for the probability of F-to-remove. The statistics included in the multiple regression equation were R (multiple R, R2, adjusted R2, and standard error of the estimate), Anova and CHA (change in R2). The statistics selected for the independent variable were COEFF (regression coefficients), OUTS (coefficients and statistics for statistics and variables not yet in the equation) and ZPP (correlation, part and partial correlation). A histogram and a normal probability plot were also selected as part of the multiple regression equation.

A one-way analysis of variance was used to determine if the six classes differed significantly among themselves (more specifically, whether the between-groups variance was significantly greater than the within-groups variance). Comparisons between the six groups included all five variables (achievement, ability, total interaction, student-initiated interaction, and teacher-initiated interaction). The one-way analysis of variance produced the degrees of freedom, sum of squares, and mean squares, for between-groups and within-groups in addition to the F ratio and F probability.

In addition, a contrast subcommand was used to compare the combination of the three English classes with the combination of the three mathematics classes on all five

variables. Each contrast included the value of the contrast, the standard error, the t-statistic, the degrees of freedom for t, and the two-tailed probability of t. Pooled- and separate-variance estimates were also provided.

The Student-Newman-Keuls range test was specified at the .05 level and the Scheffe range test was specified at the .01 level. Matrices were produced by these tests which identified pairs of groups with significantly different means. Also, three tests for homogeneity of variance were specified: Cochrans C, the Bartlett-Box F, and Hartley's F max.

Summary of Methods and Procedures

This study tested the hypothesis that a positive correlation existed between the amount of teacher-student interaction and student achievement. Teacher-student interaction, as an independent variable, was examined in three separate categories: total interaction, student-initiated interaction and teacher-initiated interaction. Ability (as measured by the national percentile of the student's intelligence quotient on the S.R.A.) was another independent variable. Achievement (measured by the average of grades received in a nine-week

period) was the dependent variable.

The variables were examined by means of a frequency distribution, one-way analysis of variance and multiple regression. The frequency distribution was used to answer questions regarding the distribution of teacher-pupil interactions and of the multiple regression was used to determine the correlation between teacher-pupil interaction and achievement. Analysis of variance was used to compare the variance between classes with the variance within classes.

Chapter IV

Results

This chapter presents the results of the test of interobserver agreement, a summation of class-by-class and course- by-course interaction data, the results of the test of the hypothesis and the answers to the research questions. The hypothesis was tested by using a multiple regression. The research questions were answered by using frequency distributions and analyses of variance.

Interobserver Agreement

In order to determine interobserver agreement the three observers recorded data in the same class, at the same time. The classrooms where the observers practiced recording data were similar to the classrooms that were used in the research. To determine the level of agreement, the tallies for each student were checked to see if the observers agreed or disagreed in the recording of the behavior. The number of agreements was then divided by the total number of agreements and disagreements. (Borg and Gall 1983, p.479)

At first, the percentage of agreement between of the three observers was below 50 percent. After many practice sessions, and subsequent meetings to discuss the results of the practice sessions, the agreement between the three observers was consistently over 80 percent. (See Table 3)

Table 3

AVERAGE PERCENTS OF INTEROBSERVER AGREEMENT

Observer	A	B	C
A	100	82	88
B	82	100	85
C	88	85	100

Summary of Data

Table 4 summarizes the data relating to student grades in English and mathematics classes. One hundred and twenty-eight students were included in the study. Sixty-two of these students were enrolled in mathematics classes and sixty-six were enrolled in English classes. The average grade for the combined groups of students was 72.6 percent. The students in the English classes had a mean grade average of 74.9 percent which was 5.1 points higher than the mean

grade average of 69.8 percent of the students in the mathematics classes.

Table 4

STUDENT GRADES IN ENGLISH AND MATHEMATICS CLASSES

Class	N	Mean Grade	St. Dev.
Math 1	24	72.2	13.4
Math 2	20	75.1	16.9
Math 3	18	62.1	15.7
Eng 4	21	74.4	14.1
Eng 5	20	76.1	6.5
Eng 6	25	74.1	7.7

Total N=128 Average Grade=72.6

Total Mathematics=62 Average Mathematics Grade=69.8

Total English=66 Average English Grade=74.9

Table 5 summarizes data relating to student ability percentiles. Ability scores (I.Q. percentiles) were not available for eleven of the students (N=117). The average ability percentile for the combined group of students was 69.4. The mathematics students had an average ability

percentile of 76.3 which was 13.8 points higher than the average ability percentile of the students in English classes which was 62.5.

Table 5

STUDENT ABILITY PERCENTILES

IN ENGLISH AND MATHEMATICS CLASSES

Class	N	Mean Ability	St. Dev.
Math 1	22	77.7	14
Math 2	17	77.2	14
Math 3	18	74	17.8
Eng 4	19	59.7	24.9
Eng 5	19	59.6	22.5
Eng 6	22	68.3	14.4

Average Ability Percentile=69.4

Average Mathematics Ability Percentile.=76.3

Average English Ability Percentile=62.5

An analysis of variance was performed with student grades as the dependent variable and then with ability as the dependent variable. The results of the first analysis of variance (Table 6) showed that the mean grade for group

(class) three was significantly different from the other six groups (classes) at the .05 level of significance. The results of the analysis of variance, using ability as the dependent variable (Table 7), showed that the ability of groups (classes) one and two were significantly different from the ability of groups four and five.

Table 6

A COMPARISON OF MEAN GRADES PER CLASS

Mean	Group	3	1	6	4	2	5
62.1	3						
72.2	1		x				
74.1	6		x				
74.4	4		x				
75.1	2		x				
76.1	5		x				

(x) Denotes pairs of groups significantly different at the .05 level

Table 7

A COMPARISON OF MEAN ABILITY PERCENTILES PER CLASS

Mean	Group	5	4	6	3	2	1
59.6	5						
59.7	4						
68.3	6						
74	3						
77.2	2			x	x		
77.7	1			x	x		

(x) Denotes pairs of groups significantly different at the .05 level

Table 8 presents the results of an analysis of variance comparing grades in mathematics classes with grades in English classes. A "T" value of 2.213 was produced which is not significant at the .05 level of significance with 122 degrees of freedom. However, a similar contrast, using ability as the dependent variable, produced a "T" value of -4.057 which is significant at .05 with 111 degrees of freedom. Therefore, the mathematics classes were significantly different from the English classes in regard to ability but not in regard to achievement.

Table 8

A COMPARISON OF GRADES IN MATHEMATICS CLASSES WITH GRADES IN ENGLISH CLASSES

Math and English	T value	D.F.
	2.213*	122

*not significant at .05

A COMPARISON OF ABILITY IN MATHEMATICS CLASSES WITH ABILITY IN ENGLISH CLASSES

Math and English	T value	D.F.
	-4.057*	111

*significant at .05

Test of Hypothesis

Null Hypothesis. In secondary classrooms a positive correlation does not exist between the amount of teacher-student interaction and student achievement.

A multiple regression was computed to test for the correlation of student achievement with the total amount of teacher-pupil interaction and the ability of the student. A stepwise selection procedure was included in the multiple regression equation. Table 9 illustrates the results of the

test of multiple regression. This computation resulted in a correlation coefficient between achievement and interactions of .183, significant at $p<.05$ level of confidence.

Multiple R = .183

R Square = .033

Ability as a variable did not enter into the equation because the probability of F-to-enter was beyond the limit of .05.

This correlation coefficient indicated that a positive correlation did exist between the amount of teacher-student interactions and student achievement. However, there was not a significant correlation between the ability of the student and the achievement of the student.

Table 9
MULTIPLE REGRESSION OF ACHIEVEMENT
BY STUDENT INTERACTION AND ABILITY

Variable	Mean	Std. Dev
Grade	71.863	13.535
Ability	69.427	19.446
AV. Int.	2.512	2.418

No. of Cases = 117

Correlation

Variable	Grade	Ability	Av. Int.
Grade	1.000	-.011	.183
Ability	-.011	1.000	.025
Av. Int.	.183	.025	1.000

Multiple R	.18252	R Square Change	.03331
R Square	.03331	F Change	3.96316
Adjusted R Square	.02491	Signif F	.0489
Standard Error	13.36507		

Research Questions

The following questions were asked to aid in the interpretation of the data arising from the test of the hypothesis:

Question 1a: Are some students engaged in teacher-pupil interactions more than others?

The amount of daily, teacher-pupil interactions, per student, per class, ranged from 0 to 13.2 percent, as shown in table 10. The mean for all students was 2.55 interactions per class period. The most frequent amount (mode) of daily interaction during a class period was 1.00. The frequency distribution revealed the fact that 13.3 of the students in the sample had an average of fewer than one interaction per class. Also, 44.5 percent of the students in the sample had an average of fewer than two interactions per class period. However, 8.6 percent of the students had five or more interactions per class and 2.3 percent of the students had over 9 interactions per class.

Approximately 1,630 teacher-pupil interactions were coded during the thirty hours of observation (five hours for each of the six classes), for an average of 326 interactions per day. Only 10 percent of the students were involved with almost a third of the total amount of interactions. More than one-half of the class was involved with only 16 percent

of the interactions.

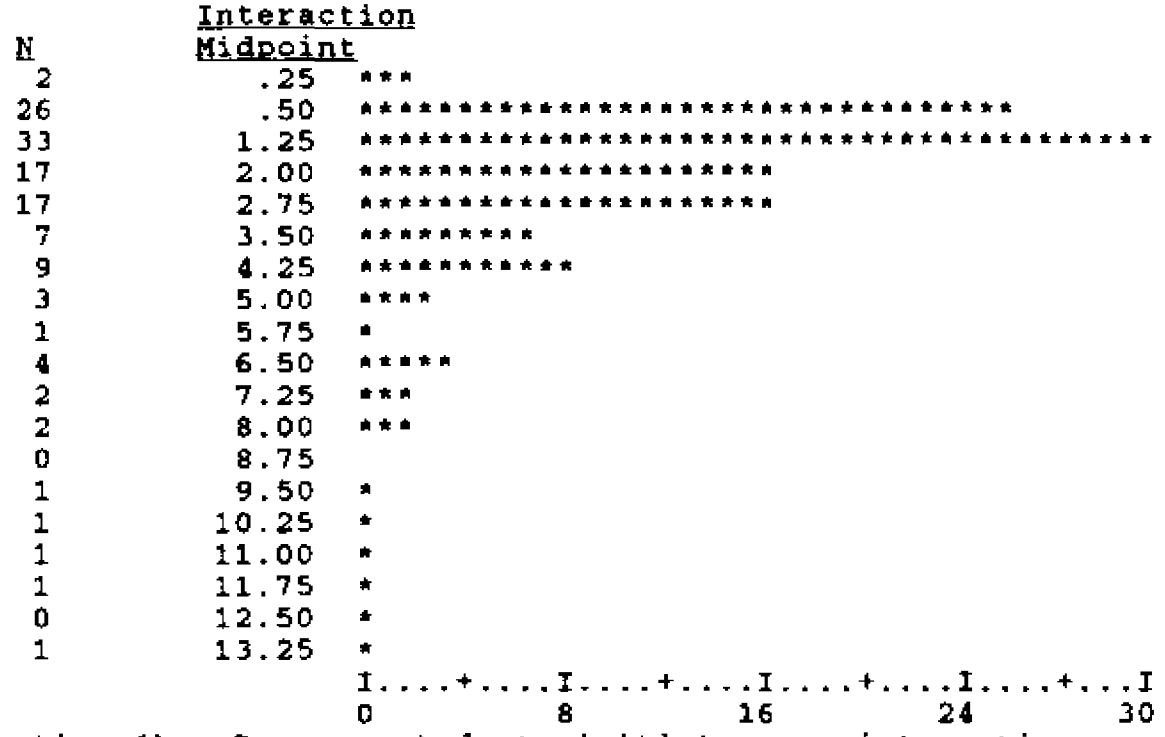
Therefore, almost one-half of the class was involved in teacher-pupil interactions only once during the class period or not at all. On the other hand, a small group of students, less than 25 percent, contributed the majority of the interactions, ranging anywhere from two to five times the average. Figure 1 shows the high frequency of students in the low levels of interaction and the low frequency of students in the high levels of interaction.

Table 10
A FREQUENCY DISTRIBUTION OF TEACHER-STUDENT INTERACTION

Interaction	Frequency	Percent	Cumulative Percent
0	17	13.3	13.3
1	40	31.2	44.5
2	22	17.2	61.7
3	22	17.2	78.9
4	10	7.8	86.7
5	3	2.4	89.1
6	4	2.9	92.2
7	3	2.3	94.5
8	2	1.6	96.1
9	1	.8	96.6
10	1	.8	97.7
11	1	.8	98.4
12	1	.8	99.2
13	1	.8	100.0

MEAN	2.550	STD ERR	.220	MEDIAN	1.775
MODE	1.000	STD DEV	2.485	VARIANCE	6.177
MINIMUM	.000	MAXIMUM	13.200	RANGE	13.200
		SUM	326.400		

Figure 1
A HISTOGRAM OF TEACHER-STUDENT INTERACTION



Question 1b: Do some students initiate more interactions with the teacher than others?

The difference between students, in regard to student-initiated interactions, was even more dramatic. Table 11 presents the frequency distribution of student-initiated interaction. The range of student-initiated interactions was from 0 to 12.2 average interactions per class. The most frequent average (mode) was 0. The mean for all student-initiated interactions was 1.6. Therefore, more than one-third of the students (37.5 percent) initiated less than one interaction. Two-thirds of the students (65.5 percent) initiated an average of less than two interactions with the

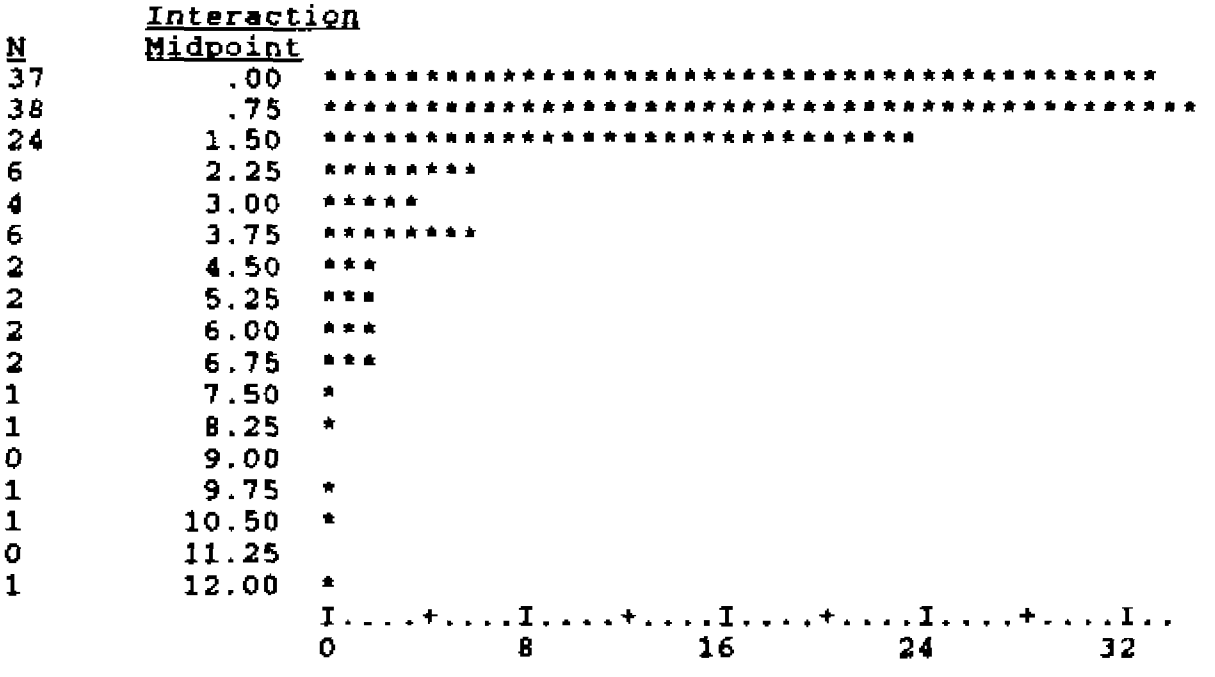
teacher per class period. Figure 2 shows the high frequency of students in the low levels of student-initiated interaction and the low frequency of students in the high levels of interaction. Therefore, a small group of students (approximately 10 percent) contributed the majority of the student-initiated interaction.

Table 11
A FREQUENCY DISTRIBUTION OF STUDENT-INITIATED INTERACTION

Interaction	Frequency	Percent	Cumulative Percent
0	48	37.5	37.5
1	33	28.1	65.6
2	21	16.4	82.0
3	6	4.7	86.7
4	5	3.9	90.6
5	3	2.4	93.0
6	2	1.5	94.5
7	3	2.4	96.9
9	1	.8	97.7
10	2	1.6	99.2
12	1	.8	100.0

MEAN	1.605	STD ERR	.197	MEDIAN	.800
MODE	.000	STD DEV	2.230	VARIANCE	4.971
MINUMUM	.000	MAXIMUM	12.000	RANGE	12.200

Figure 2
A HISTOGRAM OF STUDENT-INITIATED INTERACTION



Question 1c: Are some students called upon by the teacher more than others?

Table 12 presents data regarding teacher-initiated interaction. In regard to teacher-initiated interactions, the disparity of student involvement was less evident than with student-initiated interaction. The range of teacher-initiated interactions was from 0 to 3.6. The mode was .6 and the mean was .93. Approximately 30 percent of the students were called on less than once per class period. Approximately 50 percent of the students were called on between one and two times per class. The remaining 20 percent of the students were called on two to three times

per class period. Figure 3 shows that the distribution of teacher-initiated interactions was more equitable than the distribution of student-initiated interactions.

Table 12
A FREQUENCY DISTRIBUTION OF TEACHER-INITIATED INTERACTION

Interaction	Frequency	Percent	Cumulative Percent
0	35	27.3	27.3
1	68	53.2	80.5
2	22	17.2	97.7
3	2	1.5	99.2
4	1	.8	100.0

MEAN	.930	STD ERR	.061	MEDIAN	.800
MODE	.600	STD DEV	.693	VARIANCE	.400
MAXIMUM	3.600	RANGE	3.600	MINIMUM	.000
		SUM 119.060			

Figure 3
A HISTOGRAM OF TEACHER-INITIATED INTERACTION

```
         Interaction
N         Midpoint
8            .0    ********************
15           .2    ***************************************
12           .4    ********************************
20           .6    *********************************************
19           .8    ********************************************
14          1.0    *************************************
9           1.2    *************************
6           1.4    ****************
6           1.6    ****************
7           1.8    *******************
3           2.0    ********
2           2.2    *****
4           2.4    **********
1           2.6    ***
0           2.8
0           3.0
1           3.2    ***
0           3.4
1           3.6    ***
                   I....+....I....+....I....+....I....+....I....+
                   0         4         8         12        16
```

Question 2: Do verbally active students achieve at higher levels than verbally non-active students?

Table 13 presents average grades of students in the various groups. The average grade of the least active 10 percent of the students was 67.7. The average grade of the most active 10 percent of the students was 78.8. Therefore, the top 10 percent of the students in verbal interaction scored 11.1 points higher in achievement than the lowest 10 percent of the students in verbal interaction. When including the top 25 percent of the students, in regard to verbal interaction, those students scored approximately 9 points higher than the lowest 25 percent of students in regard to verbal interaction.

In regard to student-initiated interaction, the top 10 percent of the students scored appoximately 7 points higher than the lowest 10 percent and the top 25 percent scored 6 points higher than the lowest 25 percent.

In regard to teacher-initiated interaction, the top 10 percent of the students scored only one and a half points higher than the lowest 10 percent and the top 25 percent scored only 2.6 points higher than the lowest 25 percent.

Table 13
AVERAGE GRADES OF STUDENTS IN VARIOUS GROUPS

Level of Interaction	Total Interaction	Student-Initiated Interaction	Teacher-Initiated Interaction
Top 10%	78.8	73.0	75.0
Bottom 10%	67.7	66.3	73.5
Top 25%	78.0	74.3	73.0
Bottom 25%	69.3	68.2	70.4

Question 3: Is there a significant difference between classes in regard to total teacher-pupil interaction?

A Oneway Analysis of Variance was performed to determine if there was a significant difference between classes in regard to total teacher-pupil interaction. Table 14 shows that a significant F-ratio (4.92) resulted from the analysis of variance which indicated that the between-groups variance was significantly greater than the within-groups variance.

Table 14
ANALYSIS OF VARIANCE BETWEEN CLASSES
IN REGARD TO TEACHER-STUDENT INTERACTION

Group	N	Mean	Standard Deviation	Standard Error
M1	24	1.3333	1.5228	.3108
M2	20	1.7000	1.3018	.2911
M3	18	2.3333	1.3720	.3234
E4	21	2.5714	2.8208	.6156
E5	20	2.5000	2.0391	.4560
E6	25	4.3600	3.5459	.7092
Total	128	2.5078	2.4941	.2204

	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	5	1.3256	2.6511	4.920	.0004
Within Groups	122	657.436	5.3888		
Total	127	789.9922			

Two multiple range tests were performed to determine which classes differed significantly in regard to total teacher-pupil interaction. Table 15 shows the results of the Student-Newman-Keuls test which was used to denote pairs of groups (classes) significantly different at the .05 level. It was determined that group six was significantly different from the other five groups. As seen in Table 16, the results of the Scheffe test indicate that only group six and group one were found to be significantly different at the .01 level of significance.

A comparison of group means shows that classes one through five have means between 1.3 and 2.5 while group six has a mean of 4.4. A closer examination of the observational data reveals the fact that five students in class six were involved in eight, nine, ten, twelve, and thirteen interactions respectively per class period on an average daily basis. In fact, those five students (20 percent of the students in that class) were involved in almost one-half of the teacher-pupil interactions. Although small percentages of interaction in the other five classes, class six is an extreme in this respect.

Table 15
STUDENT-NEWMAN-KEULS MULTIPLE RANGE TEST
REGARDING TEACHER-STUDENT INTERACTION

Mean	Group	1 2 3 5 4 6
1.3333	1	
1.7000	2	
2.3333	3	
2.5000	5	
2.5714	4	
4.3600	6	* * * * *

(*)Denotes pairs of groups significantly different at the 0.050 level

Table 16
SCHEFFE MULTIPLE RANGE TEST
REGARDING TEACHER-STUDENT INTERACTION

Mean	Group	1 2 3 5 4 6
1.3333	1	
1.7000	2	
2.3333	3	
2.5000	5	
2.5714	4	
4.3600	6	*

(*)Denotes pairs of groups significantly different at the 0.010 level

Question 4: Is there a significant difference between classes in regard to student-initiated interactions?

A Oneway Analysis of Variance was performed to determine if there was a significant difference between classes in regard to student-initiated interaction. Table 17 shows that a significant F-ratio (4.99) resulted from the analysis of variance which indicates that the between-groups variance was significantly greater than the within-groups variance.

Two multiple range tests were performed to determine which classes differed significantly in regard to student-initiated interaction. The Student-Newman-Keuls procedure was used to denote pairs of groups (classes) significantly different at the .05 level (Table 18). It was determined that group six was significantly different from the other five groups in regard to student-initiated interaction.

Using the Scheffe procedure at the .01 level of significance, only group six and group one were found to be significantly different (Table 19). A comparison of group means in Table 17 shows that groups one through five have means between .92 and 1.7 while group six has a mean of 3.4. In group six, one-fifth of the class initiated over 55 percent of the interactions with the teacher.

Table 17
ANALYSIS OF VARIANCE BETWEEN CLASSES
IN REGARD TO STUDENT-INITIATED INTERACTIONS

Group	Count	Mean	Standard Deviation	Standard Error
1	24	.9167	1.4116	.2882
2	20	.9500	.9987	.2233
3	18	1.0000	1.0847	.2557
4	21	1.2857	1.0911	.4149
5	20	1.7000	1.8946	.4236
6	25	3.4000	3.5940	.7188
Total	128	1.6016	2.2530	.1991

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	5	1.041	2.1882	4.987	.0003
Within Groups	122	535.269	4.3875		
Total	127	644.6797			

Table 18
STUDENT-NEWMAN-KEULS MULTIPLE RANGE TEST
IN REGARD TO STUDENT-INITIATED INTERACTIONS

Mean	Group	1 2 3 4 5 6
.9167	1	
.9500	2	
1.0000	3	
1.2857	4	
1.7000	5	
3.4000	6	* * * * *

(*) Denotes pairs of groups significantly different at the 0.050 level

Table 19
SCHEFFE MULTIPLE RANGE TEST
REGARDING STUDENT-INITIATED INTERACTIONS

Mean	Group	1 2 3 4 5 6
.9167	1	
.9500	2	
1.000	3	
1.2857	4	
1.7000	5	
3.4000	6	*

(*) Denotes pairs of groups significantly different at the 0.010 level

Question 5: Is there a significant difference between classes in regard to teacher-initiated teacher-pupil interactions?

A Oneway Analysis of Variance was performed to determine if there was a significant difference between classes in regard to teacher-initiated interactions. Table 20 shows that a significant F-ratio (5.78) resulted from the analysis of variance which indicated that the between-groups variance was significantly greater than the within-groups variance.

Table 20
ANALYSIS OF VARIANCE BETWEEN CLASSES
IN REGARD TO TEACHER-INITIATED INTERACTION

Group	Count	Mean	Standard Deviation
1	24	.3333	.4815
2	20	.9000	.5525
3	18	1.3889	.8498
4	21	1.1905	1.1670
5	20	1.0000	.3244
6	25	1.0400	.5385
Total	128	.9531	.7619

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	5	1.4110E+01	2.8219E+00	5.775E+00	.0001
Within Groups	122	59.6092	.4886		
Total	127	73.7187			

Two multiple range tests were performed to determine which classes differed significantly in regard to teacher-initiated interaction. The Student-Newman-Keuls test was used to denote pairs of groups (classes) significantly different at the .05 level (Table 21). It was determined that group one was significantly different than the other five groups. The results of the Scheffe test presented in Table 22 indicate that group one was only different from groups three and four in regard to teacher-initiated interaction.

A comparison of group means shows that groups two through six have means that range from .9 to 1.4 while the mean for group one is .33. A close examination of the observational data reveals the fact that, in group one, only one student was called on more than once during the average class period. The majority of interactions in that class were student-initiated rather than teacher-initiated.

Table 21
STUDENT-NEWMAN-KEULS MULTIPLE RANGE TEST
REGARDING TEACHER-INITIATED INTERACTION

Mean	Group	1 2 5 6 4 3
.3333	1	
.9000	2	*
1.0000	5	*
1.0400	6	*
1.1905	4	*
1.3889	3	*

(*) Denotes pairs of groups significantly different at the 0.050 level

Table 22
SCHEFFE MULTIPLE RANGE TEST
REGARDING TEACHER-INITIATED INTERACTION

Mean	Group	1 2 5 6 4 3
.3333	1	
.9000	2	
1.0000	5	
1.0400	6	
1.1905	4	*
1.3889	3	*

(*) Denotes pairs of groups significantly different at the 0.010 level

Question 6: Is there a significant difference between English and mathematics classes in regard to total teacher-pupil interactions?

Table 23 shows the results of a test which was performed as part of an analysis of variance between groups one through three (mathematics classes) and groups four through six (English classes). A T value of 3.28 indicates that there was a significant difference between English and mathematics classes in regard to total teacher-pupil interaction. The average teacher- pupil interaction in the three mathematics classes was 1.76 interactions, per class period, for each student. The average teacher-pupil interaction in English classes was 3.29 interactions, per class period, for each student. The range of interactions, per class period, was from zero to seven in mathematics classes, and from zero to thirteen in English classes. The standard deviation for mathematics classes was 1.45 while the standard deviation for English classes was 3.0.

Table 23
AN ANALYSIS OF VARIANCE BETWEEN ENGLISH AND MATHEMATICS CLASSES IN REGARD TO TEACHER-STUDENT INTERACTION

				Pooled Variance Estimate		
		VALUE	S.ERROR	T VALUE	D.F.	T Prob.
Contrast	1	4.0648	1.2389	3.281	122.0	0.001

				Separate Variance Estimate		
		VALUE	S.ERROR	T VALUE	D.F.	T PROB.
CONTRAST	1	4.0648	1.1729	3.466	88.4	0.001

Question 7: Is there a significant difference between English and mathematics classes in regard to student-initiated interaction?

Table 24 shows the results of a test performed as part of an analysis of variance between groups one through three (mathematics classes) and groups four through six (English classes). A significant T value (pooled variance estimate) of 3.14 showed that there was a significant difference between English and mathematics classes in regard to student-initiated interactions. The average amount of student-initiated interactions in mathematics classes was .84 interactions, per class period, for each student, while the average amount of student-initiated interactions in English classes was 2.27.

The range of student-initiated interactions per class period was from zero to six in mathematics classes and from zero to twelve in English classes.

Table 24
AN ANALYSIS OF VARIANCE BETWEEN ENGLISH AND MATHEMATICS CLASSES IN REGARD TO STUDENT-INITIATED INTERACTION

			Pooled Variance Estimate		
	VALUE	S.ERROR	T VALUE	D.F.	T PROB.
CONTRAST 1	3.5190	1.1179	3.148	122.0	0.002
			Separate Variance Estimate		
	VALUE	S.ERROR	T VALUE	D.F.	T PROB.
CONTRAST 1	3.5190	1.0327	3.408	75.9	0.001

Question 8: Is there a significant difference between English and mathematics classes in regard to teacher-initiated interactions?

Table 25 shows the results of a test which was performed as part of an analysis of variance between groups one through three (mathematics classes) and groups four through six (English classes). A non-significant T value (pooled variance estimate) of 1.63 (with 122 degrees of freedom at .01 level) indicated that there was not a significant difference between English and mathematics classes in regard to teacher-initiated interactions.

The average amount of teacher-initiated interactions in mathematics classes was .82 interactions, per class period, for each student, while the average amount of teacher-initiated interactions in English classes was 1.03. The range of interactions, per class period, was from zero to two in mathematics classes, and from zero to four in English classes.

Table 25
AN ANALYSIS OF VARIANCE BETWEEN ENGLISH AND MATHEMATICS CLASSES IN REGARD TO STUDENT-INITIATED INTERACTION

			Pooled Variance Estimate		
	VALUE	S.ERROR	T VALUE	D.F.	T PROB.
CONTRAST 1	0.6083	0.3731	1.630	122.0	0.106
			Separate Variance Estimate		
	VALUE	S.ERROR	T VALUE	D.F.	T PROB.
CONTRAST 1	0.6083	0.3831	1.588	65.6	0.117

Summary

In this chapter the results of the test of the hypothesis were provided along with the answers to the research questions. The results of the multiple regression showed that a positive correlation did exist between the amount of verbal interaction between a student and a teacher and that student's achievement in the class taught by that teacher. Therefore, the null hypothesis was rejected at $p<.05$.

In each class, some students had few, if any, interactions with the teacher, while other students dominated the attention of the teacher. A small percentage of students in each class was involved in a large percentage of the interactions with the teacher. The disparity in the amount of interaction was in regard to student-initiated interactions, not teacher-initiated interactions.

The verbally active students achieved at higher levels than the verbally non-active students. In fact, the top 10 percent of the students in verbal activity scored approximately ten points higher in achievement than the lower 10 percent, even though there was not a significant difference in the ability of the two groups. Overall, the classes were not significantly different from one another. The main difference was that one class (six) had a high

level of interaction and another class (one) had a low level of interaction causing those classes to be significantly different from each other. There was also a significant difference between the English and the mathematics classes in regard to the amount of interaction. More student-initiated interaction was recorded in the English classes than the mathematics classes. In the fifth chapter, the summary, conclusions, and recommendations of the study will be presented.

Chapter V

Summary, Conclusions and Recommendations

This chapter discusses the relationship between teacher-student interaction and achievement in secondary school classrooms. The problem of the study is presented in the first section. In section two, a summary of the literature review is provided. In section three, the limitations of the study are discussed. A summary of the methodology and results is presented in section four. In the fifth section, the conclusions are presented, and in the sixth section, a discussion of the study is presented.

Statement of the Problem

The problem of this study was to determine the relationship between the amount of verbal interaction between a student and a teacher and that student's achievement in the class taught by that teacher. In order to explain this relationship, questions were answered about the differences between various students, various classes, and various courses, in regard to the following variables: 1) achievement, 2) ability, 3) total teacher-pupil

interaction, 4) student-initiated interaction, and 5) teacher-initiated, interaction.

Review of the Literature

The most notable studies of teacher-pupil interaction were performed by Ned Flanders and his associates during the 1960's when they compared classrooms in which they found teacher verbal behavior patterns that were different from one classroom to another. Flanders was mainly concerned with the effects of certain teacher behaviors upon student attitudes, although he did include measures of adjusted student achievement in five of his studies. Flanders and his associates found that students had the highest gains in achievement when the teachers used indirect methods of interaction such as asking questions, accepting and clarifying ideas and praising or encouraging students.(Flanders 1970) Furst, in Amidon and Flanders (1963), Soar (1967), and Lashier (1967) found similar results using the Flanders system.

Brophy and Good (1981) speculated that teachers expect specific behavior from certain students. These expectations cause the teachers to treat some students differently than others. The students become aware of the differential treatment which, according to Brophy and Good, effects their

achievement motivation. Brophy and Good reported the existence of a "self-fulfilling prophecy," which serves to change student performance, and a "sustaining expectation effect" which serves to inhibit change in student performance. Their conclusions, which included the work of Rosenthal (1974), suggested that, "In some classrooms, high and low expectation students were treated differently with regard to teaching imputs, outputs, climate and feedback" (Cooper and Good 1983, p. 3).

The inequities in quantity and quality of teacher-pupil interaction are explained by researchers by factors other than teacher expectations. According to Sadker and Sadker (1986) the gender of the student has a powerful impact on the quantity and quality of the pattern of teacher-pupil interaction. The Sadkers found that teachers tend to provide more precise feedback for males than females, and male students are encouraged by the teacher to call out more than female students. Jackson and Lahadern (1967) and Martin (1972) presented similar conclusions from the findings of their research.

According to Walberg (1969), Adams and Biddle (1970), and Delefes and Jackson (1977), the quantity of interaction with the teacher depends upon the location of the student in the classroom. A "T" was described by Adams and Biddle which was the location of the majority of teacher-pupil

interactions in a classroom.

The most common opinion among theorists in the field of education regarding teacher-pupil interactions, has been that verbal interaction between students and teachers is an important aspect of effective teaching. Bloom (1976) and Cummings (1983) suggested that the amount of active participation (which includes verbal interactions) is an excellent index of the quality of instruction in a classroom. Hunter (1982) posits that active participation is necessary so the teacher can check understanding and use student responses to make important decisions. According to Sizer (1984), "In order to be motivated, a student needs to be engaged in the learning process."

An opposing view is provided by Hughes (1973). In the first of three experiments, Hughes compared the achievement gains of students involved in three separate treatments. The first set of students was called upon at random whether they volunteered or not. The second group of students was called upon according to the seating arrangement whether they volunteered or not. The third group of students was called upon only if they volunteered. An analysis of variance summary showed no significant difference between the various treatments.

The second experiment conducted by Hughes (1973), compared classes in which half of the students were called

upon and the other was not. Again, no significant relationship was found between the two treatments. In a third experiment, the presence or absence of teacher feedback was analyzed. As in the first two experiments, no significant difference between treatment was found. Therefore, Hughes reported that, "The results ... indicate that pupil participation, in the form of overt pupil responses to teacher solicitation, has very little effect on achievement under the conditions of the present study." (p. 33)

Hypothesis

In secondary school classrooms a positive correlation exists between the amount of teacher-student interaction and student achievement.

Research Questions

Question 1a: Are some students engaged in teacher-student interactions more than others?
Question 1b: Are some students engaged in student-initiated interactions more than others?
Question 1c: Are some students engaged in teacher-initiated interactions more than others?

Question 2: Do verbally active students achieve at higher levels than verbally non-active students?

Question 3: Is there a significant difference between classes in regard to total teacher-student interaction?

Question 4: Is there a significant difference between classes in regard to student-initiated interaction?

Question 5: Is there a significant difference between classes in regard to teacher-initiated interaction?

Question 6: Is there a significant difference between mathematics and English classes in regard to total teacher-student interactions.

Question 7: Is there a significant difference between mathematics and English classes in regard to student-initiated interaction?

Question 8: Is there a significant difference between mathematics and English classes in regard to teacher-initiated interaction.

Limitations

The following limitations need to be taken into account when interpreting the results of this study. One limitation of this study was the effect the observer might have had on the behavior of the teacher and the students in

the classroom. To minimize this effect, teachers, from the same school as the students, were selected to gather the data, rather than bringing administrators or strangers into the classroom, who would be more likely to have an effect on the classroom activities. A second limitation is that the sample only included secondary students from selected classrooms, mathematics and English.

Another limitation (which is an asset in regard to observer training and interrater reliability) was the simplicity of the evaluation instrument. The quality of the verbal interaction was not identified when using this instrument. Therefore, a one-word answer was recorded in the same manner as a very detailed answer. It is possible that the quantity of interactions each student has with the teacher is not as important as the quality of the interaction.

A further limitation relates to the method used to measure student achievement. It is possible that the test average of each student was not a true indicator of the student's achievement in a class. Since the tests were made by the teacher there were no standard measures of reliability or validity. Finally, the results of this study were purely correlational. It is not known whether the amount of interaction had an effect on achievement, whether the level of achievement had an effect on the amount of

interaction, or whether achievement and the amount of interaction were dependent upon a third variable, or other variables, which have not been identified.

Methodology and Results

Interobserver Agreement

In order to determine interobserver agreement the three observers who participated in the study recorded data in the same class, at the same time. To determine the level of agreement, the tallies by each observer, for each student behavior, were compared. The number of agreements was divided by the total number of agreements and disagreements. The agreement between the three observers was consistently over 80 percent.

Hypothesis Testing

A multiple regression was computed to determine if a positive correlation exists, in secondary classrooms, between the amount of verbal interaction between a student and a teacher, and that student's achievement in the class taught by that teacher. This computation resulted in a correlation coefficient of .183 which was statistically significant at $p<.05$ level of significance. Ability, as a variable, did not enter into the equation because the

probability of F-to-enter was beyond the limit of .05. Therefore, a positive correlation did exist between the amount of verbal interaction between a student and a teacher and that student's achievement in the class taught by that teacher.

Answers to the Research Questions

In each class, some students had few, if any, interactions with the teacher, while other students dominated the attention of the teacher. A small percentage of students in each class was involved in a large percentage of the interactions with the teacher.

In regard to student-initiated interaction, while 10 percent of the students initiated interactions with the teacher an average of 6.4 times per class period, 66 percent of the students initiated only one interaction or less. Therefore, some students initiated many more teacher-pupil interactions than others. In regard to teacher-initiated interaction the disparity of involvement was not as great. Approximately one-fourth of the students were not called on, one-half of the students were called on once, and the remaining one-fourth was called on twice during the class period.

The students who were the most verbally active (top 10 percent) averaged eleven points higher in achievement than

the verbally non-active students (bottom 10 percent) although the average abilities of the two groups were almost identical. The students who initiated the most interactions (top 10 percent) averaged approximately seven points higher than the students who initiated few, if any, interactions (bottom 10 percent). The average of the students frequently called upon by the teachers was only 1.5 points higher than the average of the students the teacher did not call on.

A Oneway analysis of variance was computed to determine if there was a significant difference between classes in regard to teacher-pupil interaction. It was determined that class six was significantly different from all the other classes at the .05 level. An analysis of variance regarding student-initiated interaction revealed the fact that class six was significantly different from the other classes at the .05 level. In regard to teacher-initiated interaction, class one was significantly different from the other classes at the .05 level.

When a contrast was computed between the verbal interaction in mathematics classes and English classes a significant difference was found in regard to total teacher-pupil interactions and student-initiated interaction. A significant difference was not found in regard to teacher-initiated interaction.

Conclusions

The null hypothesis, that a positive correlation did not exist between the amount of teacher-student interaction and student achievement was rejected. This hypothesis was tested for significance at $p<.05$. Although the amount of teacher-pupil interaction did not have a strong correlation with achievement, it was statistically significant. It is possible that by examining the quality of interaction, along with the quantity, a stronger relationship would exist.

It was predicted that the ability of each student would have a strong effect upon the student's achievement. However, in this study, ability did not correlate significantly with achievement. Possible explanations for this are: a) the method of determining the achievement of the student (average of teacher-made test scores) may not be reliable, or b) the national ability percentile score may not be a true measure of ability, or c) factors other than ability may have a significant effect upon achievement, such as the motivation of the student or the quantity and quality of teacher-pupil interaction.

When students were separated by the course they were in, it was determined that the correlation between interaction and achievement in English classes was

significant, but the correlation in mathematics courses was not significant. A possible explanation for this occurrance could be related to the nature of the specific course or the ability of the student. The amount of interaction in English classes was almost twice the amount in mathematics classes. Also, the range of interaction (average per pupil, per class) in English classes was from zero to thirteen, compared to a range of zero to seven in mathematics classes. In regard to ability, the students in English classes had a mean ability percentile of 62.8, while the students in the mathematics classes had a mean ability percentile of 76.4. It is possible that the relationship between interaction and achievement is stronger for students of lower ability than students of higher ability.

The biggest difference between English and mathematics classes was in regard to student-initiated interaction. Students in English classes initiated interactions almost three times as much as students in mathematics classes. When only student-initiated interactions were studied, the relationship was significant in English classes but not in mathematics classes. A significant relationship did not exist with any sample in regard to teacher-initiated interactions. The strongest relationship existed between achievement and student-initiated interactions in English classes.

The findings of teacher expectation studies (i.e. Brophy and Good and Kerman) were supported by this study. The high achievers were involved in many more interactions than the low achievers. The reason for this was not because teachers initiated more interactions with some students than others, but because some students initiated more interactions with the teacher than others. Comparing the two variables in another way: the students who initiated interactions the most with the teacher averaged ten points higher in achievement than the students who initiated interactions the least.

Class six (English) was significantly different (higher) from the other classes in regard to total interactions and student-initiated interactions. Also, class one (mathematics) was significantly different (lower) from the other classes in regard to teacher-initiated interaction.

Discussion

The implications of this study concern the relationship between the amount of verbal interaction between a student and a teacher and that student's achievement in the class taught by that teacher. Based on a review of the literature it was concluded that it is important that

students become verbally active with their teacher. It was also determined that not all students interact with the teacher to the same degree. However, much of the early research treated the class as a whole, ignoring differences between individual students.

The studies, using the student as the unit of study, compared high achievers and low achievers, as perceived by the teacher, but few relationship were reported between the the amount of interaction that a student had with the teacher and the achievement of that student. Also, almost all studies dealt with elementary students rather than secondary students. The work performed by Hughes was a rare exception since secondary students were included in the sample, however, one of the limitations of that study was the artificial conditions in which the study was conducted.

This study differed from the Hughes study because: a) students from grades eleven and twelve were included in the sample rather than seventh graders, b) the individual student was the unit of study rather than the whole class, and c) the conditions of this study were naturalistic rather than artificial. It is possible that these design differences caused the results of this study and the Hughes study to differ.

The implications for the training of teachers are obvious. Although the amount of interaction each student has

with the teacher is important, the quality of the interaction must be considered. Evidently, emphasis needs to be placed upon balancing the amounts of verbal interaction among students in the class, followed by efforts to improve the quality of interactions. In order to check the understanding of the students, keep them motivated by being actively engaged and to make decisions about reteaching or moving on to new material, the teacher should practice questioning techniques which will involve all students equitably. These techniques should be introduced to teachers early in the training process. Once the quantity of interactions is balanced, the quality of interactions can be emphasized. Teachers using techniques such as wait time, praise and immediate feedback will have limited success if only a few students interact with the teacher.

As a part of staff development efforts teachers can observe each other to see if they are involving students equitably in teacher-student interactions. The simplicity of the instrument used in this study allows an observer to become proficient in its use with a minimal amount of training and practice. Since the instrument is low-inference and non-judgemental an observer can provide objective information in a non-threatening manner.

As part of the clinical supervision process an

administrator or supervisor could use an instrument such as the one used in this study as a means of obtaining data during the observation of a teacher. This data could identify important patterns which could have a bearing on the achievement of the students. If the teacher is using student responses to determine if specific objectives have been met, a need exists to determine the number of students contributing to that conclusion. The administrator could provide that information and suggest techniques which would balance the distribution of interactions.

Recommendations for Future Research

The following recommendations are made for future research which concern the limitations of this study and the relationship between teacher-student interaction and achievement:

1. Conduct an experiment to determine the effect of balancing teacher-pupil interaction on achievement in classes where there is an obvious disparity in the amount of teacher-student interaction. Will achievement be significantly increased in classes where the distribution of interactions has been balanced?

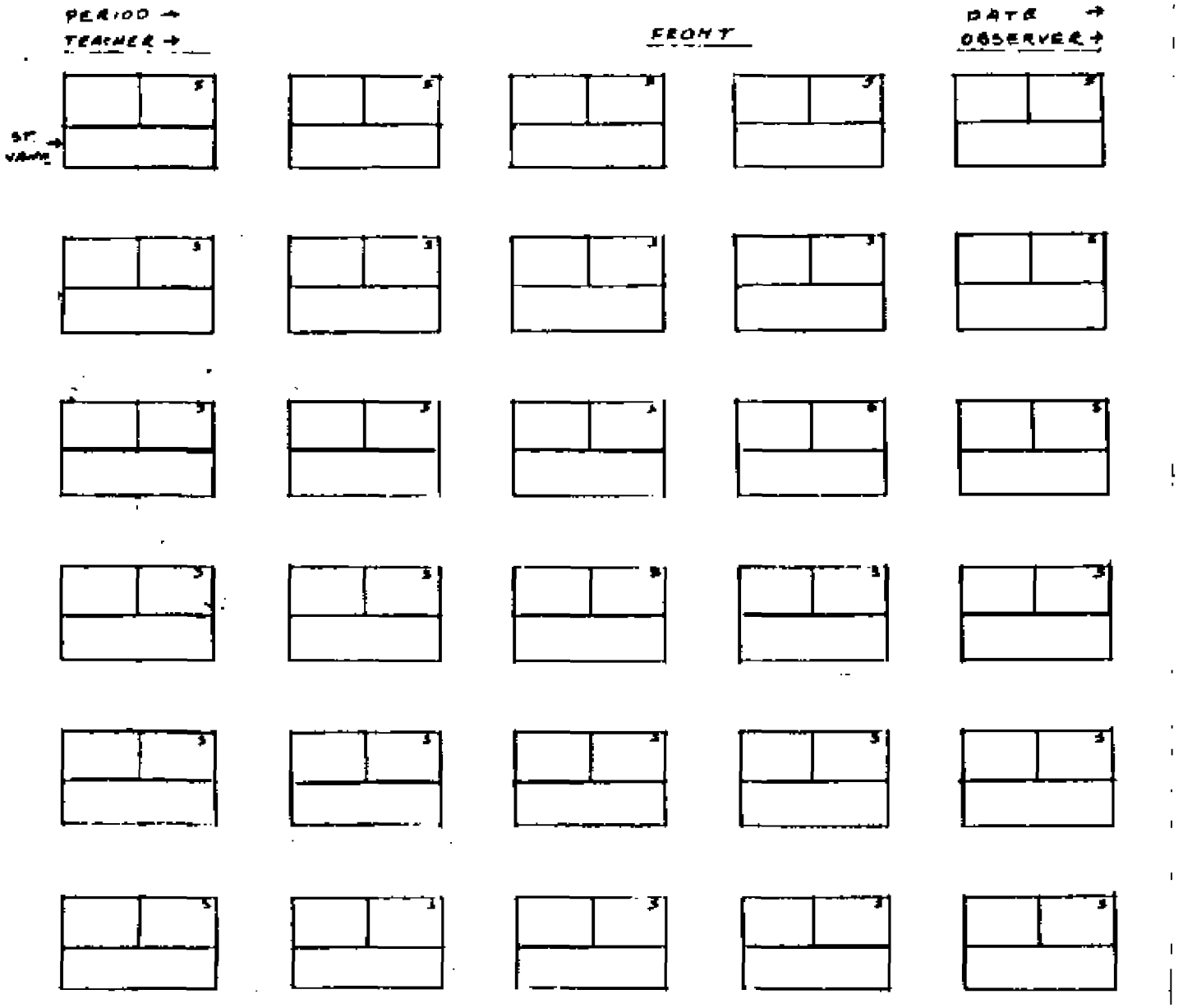
2. Conduct an experiment to determine the relationship between the quality of interaction and achievement in classes where there is an equitable distribution of teacher-student interaction. What effect does the quality of interaction have, once the quantity of interaction becomes equitably distributed?

3. Study the relationship between teacher-student interaction and achievement in various subject areas. Why was the relationship between interaction and achievement significant in English classes but not in mathematics classes?

4. Study the relationship between ability and achievement at the secondary level. Although most studies show a strong relationship between ability and achievement, why was the relationship between those two variables not significant in this study?

APPENDIX A

Observation Instrument



APPENDIX B

Permission Form for Participation in a Research Project

I, the undersigned, agree to allow an observer to record data in my classroom. I understand that my name will not be used in any was and that I am not being observed nor evaluated in this process. I also understand that I may terminate these observations at any time I choose.

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Abstract

A STUDY OF THE RELATIONSHIP BETWEEN STUDENT ACHIEVEMENT AND TEACHER-STUDENT INTERACTION IN SECONDARY CLASSROOMS

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The College of William and Mary in Virginia, April 1988
Chairman: Professor Robert J. Hanny

The purpose of this study was to investigate the relationship between the amount of verbal interaction between a student and a teacher and that student's achievement in the class taught by that teacher at the secondary school level. The student was used as the unit of study.

The sample was selected from a secondary school (9-12) in southeast Virginia with an enrollment of approximately 1800 students. One hundred and twenty-eight students from three intact Algebra II classes and three intact English 11 classes were included in the study.

All data were collected by three trained observers who coded the frequency of student-initiated and teacher-initiated interactions. Only instructional interactions between the teacher and the student were coded.

It was hypothesized that a positive correlation existed between the amount of teacher-student interactions and student achievement. It was assumed that a positive correlation between ability and achievement existed.

It was concluded that a positive correlation did exist between the amount of teacher-student interaction and student achievement in the English classes but not in the mathematics classes. The correlation between ability and achievement was not significant.

It was also discovered that a few students in each classroom were involved in the majority of the teacher-student interactions while the rest of the class sat quietly.

Further study is needed to determine the effect of balancing the amount of teacher-student interaction on achievement in classes where there is an obvious disparity in the involvement of the students. In addition, the relationship between the quality of interaction and achievement should be studied in classrooms where the quantity of interactions has been balanced. And lastly, the relationship between ability and achievement should be examined in secondary classrooms.