A STUDY OF A PROCESS TO MODIFY VERBAL INTERACTION PATTERNS OF HIGH SCHOOL GEOMETRY TEACHERS

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ABSTRACT

A STUDY OF A PROCESS TO MODIFY
VERBAL INTERACTION PATTERNS OF
HIGH SCHOOL GEOMETRY TEACHERS

By

Willie Elbert Williams

Purpose

The purpose of this study was to investigate attempts to modify teachers' verbal behavior in a large inner city high school in Cleveland, Ohio, characterized by direct or indirect using Flanders' ten category system of interaction analysis.

Much of the research on teacher effectiveness has found that indirect teacher influence produced more achievement gain, while direct teacher influence has produced less. The study was designed to determine if teachers of direct influence patterns could be encouraged toward a more indirect or flexible pattern of influence.

Procedure

Twelve instructional staff members, teaching geometry, were the subjects of this study. The study used all the geometry teachers in one senior inner city high school, containing grades 9-12.

During the first week of school, all teachers were introduced to Flanders' method of interaction analysis. Two weeks later, each of the twelve geometry teachers was observed (their initial observation taped), using Flanders' ten category system of interaction analysis. The initial observation was taped so that an adequate characterization of their influence could be made as to direct or indirect. Also, four of the tapes were analyzed a second time to determine the consistency of the observational techniques.

The results of the initial observation revealed three indirect and nine were direct. Five direct teachers were randomly selected from the nine. The geometry students of all teachers were automatically selected for each classroom by computer assignment. Three groups were determined: Group I, three indirect teachers (control); Group II, four direct teachers (control); and Group III, five randomly selected direct teachers (experimental). Only one observer was used, and he had been trained in interaction analysis through a program learning approach. The investigator was this observer.

During the next two weeks a conference was held (Treatment #1 for Group III) with each of the five teachers of Group III. All conferences were designed for thirty minutes of a forty minute period. Each teacher was given a copy of the results of the initial observation to form a basis for the discussion in the first conference. Each

teacher was given his tape to play back on his own, a brief explanation of Flanders' ten category method of interaction, an explanation of acceptable limits for indirect influence patterns, and details of how to become more indirect in his teaching. The five teachers were observed again (observation # 1), and a conference was held (Treatment #2) within a week. Each teacher was given a copy of the results of the initial observation and observation #1 to form a basis for discussion and comparison in the second conference. Again, each teacher was given a brief explanation of Flanders' ten category method of interaction, an explanation of acceptable limits for indirect influence patterns, and details of how to become more indirect in his teaching. No taping was made of any other observation. At the end of six weeks from observation #1, the five teachers were observed again (observation #2) and a conference was held (Treatment #3) within a week. Each teacher was given a copy of the results of the initial observation, observation #1, and observation #2 to form a basis for discussion and comparison in the third conference. Again, each teacher was given a brief explanation of Flanders' ten category method of interaction, an explanation of acceptable limits for indirect influence patterns, and details of how to become more indirect in his teaching. At the end of twelve weeks from observation #1, the final observation (observation #3) of the five teachers selected for treatment was made.

The treatment was the three conferences which preceded the three observations of the five teachers selected at random from the original twelve.

The paired t-test was used to measure significant differences, at the .05 level, of the mean I/D scores between Groups I, II, and III.

Findings

1. On a continuum from .56 to 2.50, the teachers in Group III moved up so that their mean I/D ratio did not differ significantly with those in Group I.

2. Group III became more indirect in their influence pattern.

3. Group III failed to move up the continuum so that there was a measurable significant difference between them and the teachers of Group II.

4. Group III became more indirect with time, but failed to reach the point of indirectness of Group I.

5. The mean percent of teacher-talk was 67.6.

6. The mean percent of student-talk was 19.1.

On the bases of the findings of this study, and within its limitations, the following conclusions seem justified:

1. Teachers can be encouraged toward a more indirect influence pattern of teaching.

2. Direct teachers can be encouraged to a more indirect influence pattern using Flanders method of interaction analysis.

3. Students appeared to achieve more in teacher's classes where the influence pattern is indirect.

4. Teacher's behavior in the classroom can be affected by a conference using Flanders' method as a basis.

Discussion

In this study, the observational evidence that was obtained does indicate that the teachers' behavior was modified in the experimentally desired direction. However, the hypotheses suggest that maybe a longer period should be used across time, with more observations being made, if there is to be a more appreciable change in teacher behavior toward indirectness.

Samph found in his study (65), that teachers became more indirect when an observer was present in their classroom, whether they were informed of an observation prior to its occurrence or not. This may be true, but the writer believes that by also training teachers in the use of Flanders' method of interaction, one can eliminate much of the observer effect.

The findings that the mean percent of student-talk was 19.1 is in accord with Stilwell's findings (66), teacher-talk consumes approximately three times as much time as student-talk.

The achievement scores in the teachers' geometry classes who became more indirect in their influence (Group III) was higher than either of the other groups, but since no pre-test was given, no statistical inference can be made about the differences.

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Willie Elbert Williams

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CHAPTER I

A DESCRIPTION OF THE PROBLEM AND THE STUDY

Introduction

The cost of education is increasing and will increase more. In recent years, there has been a lot of talk about accountability and performance contracting, and parents are taking a harder look at what they are getting for their money--increases in taxes. Hence, there will be a greater effort in the future made by subject area supervisors and department chairmen to up-grade teaching and make teachers more responsible for the kinds of products they are producing.

The general purpose of this study is to see if by using Flanders' interaction analysis, one can improve the role of the teacher in guiding his pupils learning. The relationship between teacher characteristics and student behavior has been studied for many years. This research is generally denoted as "teacher effectiveness". It appears to be axiomatic, on the part of many educators, that the teacher has some effect on his students. Students appear to achieve better under one teacher than another teacher even if all other aspects of the learning situation are

held constant. It is also realized that the teacher may affect many aspects of student behavior other than achievement. However, achievement is an important goal of instruction, and this study will confine itself to the discussion of achievement in terms of scores on standardized achievement tests.

Background of the Problem

As a department chairman in a large inner-city high school in Cleveland, Ohio, one of the writer's main functions is to evaluate teachers and instruction. This is being done, as in many school systems, with instruments based on value judgments. Much of this evaluation lacks systematic methods of inquiry. In recent years, researchers have examined classroom verbal behavior--the sine qua non of teaching--by systematic methods of inquiry. Several systems have been constructed which tend to categorize this behavior. Since it appears, by many educators, that it is axiomatic that the teacher is the most influential person in the classroom, and since talk is such a vital part of teaching, and since the teacher's verbal behavior has a direct influence on the pupil's verbal behavior, it follows that teacher talk is very important to education. It is further believed that teachers can control their verbal behavior in order to make their teaching less accidental, haphazard, and routine; and consequently improve their teaching styles.

Statement of the Problem

The purpose of this study was to investigate the influence of teachers verbal behavior in a large inner-city high school in Cleveland, Ohio, where the teachers were characterized as direct or indirect by using Flanders ten category system of interaction analysis. Further, its purpose was to investigate, through the case study technique, the effects that these influences induced on student's achievement in geometry at the school.

Since much of the research on teacher effectiveness has found that indirect teacher influence produced more achievement gains while direct teacher influence has produced less, the purpose was, also, to determine if the influence of the teacher was directed toward a more indirect point of view in geometry; would students achieve more than those under a more direct influence. Also, the purpose of this study was to determine if teachers of direct influence patterns could be directed toward a more indirect or flexible influence.

Significance of the Problem

A more scientific method for evaluating teacher effectiveness is a very important need in education today. Educational systems are in a continuous search for ways to improve teaching and create better conditions by which children can learn more and better. Amidon (3) said,

> "There is general agreement among educators that teaching needs considerable improvement. Why with all the effort put into the preparation of teachers, into in-service education of teachers, and into teacher's individual efforts to modify and improve their work with youngsters, is not teaching far more effective than it is? Why do researchers engaged in classroom observation find that teachers are so controlling, restrictive and inhibiting? Why is it that teachers tend to do most of the talking (about 70 percent in one average classroom, according to Flanders)? Teachers would undoubtedly like to involve pupils more creatively in the teaching process, would like pupils to participate more, ask more imaginative and thoughtful questions, engage in more creative thinking. Why, then, do they tend to teach as they themselves were taught as youngsters, or as they see others teach in the schools, rather than in ways they read about and talk about in professional education courses? Why is it true today, as it was in 1903 when John Dewey prepared this statement, that 'The student adjusts his actual methods of teaching, not to the principles which he is acquiring, but to what he sees succeed and fail in an empirical way from moment to moment. . . ." (3:p. 2-3)

This study was designed to affect a teacher's verbal behavior at this school in such a way that they would improve and grow, and their students would learn more, and better.

For the purpose of this study the following assumptions are deemed necessary:

1. Most teacher influence is expressed through verbal statements.

2. Most nonverbal influence is positively correlated with the verbal influence.

3. Since the investigator was the only observer, it was assumed that there was no observer effect.

4. Teaching can be submitted to systematic inquiry.

5. Teaching involves behavior which can be identified, and which teachers can systematically acquire.

6. Teachers want to improve their teaching.

Perhaps the best known system for analyzing interaction is attributed to Ned Flanders. Flanders' interaction analysis is an instrument designed to observe instruction in the classroom (10, p.1).

Flanders' basic interaction analysis contains ten categories that are used to classify the statements of the pupils and the teacher.* The ten categories include seven assigned to teacher talk, two to student talk, and one to silence or confusion. When the teacher is talking, the observer must decide if the statement is: (1) accepting student's feelings; (2) giving praise; (3) accepting, clarifying, or making use of a student's ideas; (4) asking a question; (5) lecturing, giving facts or opinions; (6) giving directions; or (7) giving criticism. When a student is talking, the observer must classify what was said into one of two categories: (8) student response or (9) student initiation. Silence and confusion is assigned to category (10). All categories are mutually exclusive, yet totally inclusive of all verbal interaction occurring in the classroom (10, p. 33-35).

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*Several modifications and extensions of Flanders basic categories have been adapted, such as the Observational System for Instructional Analysis (Hough, 1967).

An indirect (category 1-4) - direct (category 5-7), denoted by I/D ratio, focuses on the relative number of indirect and direct teacher statements.

The hypotheses are given in testable form in Chapter III, and stated briefly below:

First, is there a mean difference of the final I/D ratio of the five direct teachers and the initial I/D ratio of the three indirect teachers.

Second, is there a mean difference in the mean I/D ratio of the initial observation of the total group and the mean of the observations of the five selected teachers.

Third, is there a mean difference in the final I/D ratio of the selected teachers and the initial I/D ratio of the four teachers who were not selected.

Limitations of the Study

The purposes of this study have been clearly outlined in the statement of the problem. However, there are some important limitations the writer wishes to mention here.

1. The study is limited in its application to geometry teachers at one senior high school in Cleveland, Ohio.

2. This study is limited to the verbal behavior of students and teachers in geometry classes at this school.

3. Only two outcome variables, teacher influence and student achievement, were evaluated in this study.

The limitations in this study are restricted to the scope of the problem. This seems to be justified, because in order to investigate any problem thoroughly, it is necessary to focus ones attention upon as few factors as possible.

However, the investigator feels that with the limitations, and the information that can be obtained from this study, it can be valuable, especially when this information is correlated with similar studies.

Operating Procedure

At the beginning of the first semester, 1971-72, the investigator introduced Flanders' method of interaction analysis to the thirteen teachers of the department of mathematics at the school, but only twelve of these teachers taught geometry. Two weeks after the opening of school, each of the twelve geometry teachers were observed (their initial observation taped) using Flanders' ten category system of interaction analysis. The initial observation was taped so that an adequate characterization of their influence could be made as to direct or indirect. Also, four of the tapes were analyzed a second time to determine the consistency of the observational techniques.

From the initial observation, three teachers were classified as indirect and nine were classified as direct, using the classification direct if I/D ratio was less than 1.00, and indirect if I/D ratio was greater than or equal to 1.00. The geometry students of all teachers are automatically selected by a computer.

During the next two weeks a conference was held with each of the five teachers of Group III. All conferences were designed for thirty minutes of a forty minute period. Each teacher was given a copy of the results of the initial observation to form a basis for the discussion in the first conference. Each teacher was given his tape to play back on his own, a brief explanation of Flanders' ten category method of interaction, an explanation of acceptable limits for indirect influence patterns, and details of how to become more indirect in his teaching. The five teachers were observed again, and a conference was held within a week. Each teacher was given a copy of the results of the initial observation and observation 1 to form a basis for discussion and comparison in the second conference. Again, each teacher was given a brief explanation of Flanders' ten category method of interaction, an explanation of acceptable limits for indirect influence patterns, and details of how to become more indirect in his teaching. No taping was made of any other observation. At the end of six weeks from observation 1, the five teachers were

observed again and a conference was held within a week. Each teacher was given a copy of the results of the initial observation, observation 1, and observation 2 to form a basis for discussion and comparison in the third conference. Again, each teacher was given a brief explanation of Flanders' ten category method of interaction, an explanation of acceptable limits for indirect influence patterns, and details of how to become more indirect in his teaching. At the end of twelve weeks from observation 1, the final observation (observation 3) of the five teachers selected for treatment was made.

The treatment was the three conferences which preceded the three observations of the five teachers selected at random from the original twelve.

Overview of the Study

Chapter I included an introduction, background of the problem, a statement of the problem, significance of the problem, limitations of the study, and operating procedure. Chapter II includes a review of the literature relevant to the present study.

Chapter III contains the experimental procedure and design. A discussion and explanations of the variables, and the techniques involved in measuring them is included in the chapter also. Chapter IV contains an analysis of the results of the statistical treatment of the study. It,

also, contains some non-verbal aspects of the teachers, and case analysis of each of the teachers in Group III. Chapter V contains a summary, findings, conclusions, and recommendations for further study.

CHAPTER II

A REVIEW OF PERTINENT LITERATURE

Introduction

One of the most difficult problems in measuring teacher effectiveness and student achievement in the classroom is that of arriving at a satisfactory objective measuring instrument that will objectively evaluate the teacher's influence and how this influence relates to the achievement of his students. Until about the last sixteen years, the usual approach of this problem was to use rating scales by supervisors or specially trained observers, but despite of all these attempts to improve them, many such ratings were based on value judgement, are still biased, very subjective, and in many instances they are uninterpretable by anyone--sometimes even the rater himself.

However disappointing these findings, several promising trends seem to be emerging. Fey (9:p. 535-551), who recently compiled a review of related research in classroom teaching in mathematics, concluded in his summary:

> ". . . Recent research in mathematics teaching has produced no major breakthrough in the search for personal characteristics, education or classroom behavior of effective teachers. However, several promising trends are emerging in the focus and techniques of research."

The chief purpose of the present study was to use Flanders' ten category system of interaction analysis to analyze the verbal behavior in geometry classrooms, and determine its effects on the achievement of the students in these classes. Flanders' system was selected because it appears to be one of the most objective methods developed in the past twelve years, and geometry because of its highly structural aspect. Further, it seemed most appropriate for my design. This method seems to have great research possibilities, and seems to be relatively independent of qualitative judgement, and can be used reliably by trained observers. The successful pursuit of the main objective of this study involves six other basic problems:

1. Can the verbal behavior of teachers and their students reliably and systematically be observed?

2. Does the verbal behavior of teachers observed lend itself to any typical consistency?

3. After determining the relationship between the teacher and student behavior, how does this attribute to the amount of learning, or what manner would the teacher be graded by his supervisor to determine his accountability?

4. Can Flanders' ten category method of interaction analysis be used successfully in the classroom as a scientific approach to measuring teacher effectiveness?

5. Can the level of instruction be raised through the use of interaction analysis?

6. Can a teacher's behavior be affected by a conference?

There has been a lot of research in the past on measuring the effectiveness of a teacher in the classroom, but recently there is greater emphasis on a more scientific approach to this research. The research indicates that effective mathematics teaching must move beyond the measures of ability, prior teaching experience, background, attitudes, age, or knowledge of subject matter. Fey pointed out (what seems to be the present trend in research):

> ". . . there is a growing realization that effective teaching is a result of a complex interaction between teacher ability, attitudes, and behavior; student aptitudes and attitudes, and the structure inherent in mathematical topics. The traditional search for a simple profile of a composite "good teacher" is giving way to investigations that ask what kinds of teaching style and subject matter organizations are most effective for teaching a particular topic to some particular student population". (8:p. 82)

Much of the previous research assumed that teacher effectiveness is determined by one variable in the teacher-learning situation--the teacher. However, Biddle and Ellena states that:

> "Unlike the factory worker, the teacher does not operate upon the pupil in isolation from other agents. . . . . . it is clear that competence involves a complex interaction between properties and contextual factors in the community, school and classroom". (7:p. 4-5)

However, the findings of Morsh, Burgess, and Smith revealed that:

> "Student gains can be reliably measured and that student's ratings of their instructors' verbal facility are correlated significantly with student gains". (24:p. 1)

Many of these statements and the results of much of the research on teacher effectiveness led to this study.

Review of the Literature

This review is concerned with teacher verbal behavior over the past twenty years, and how this behavior affects the achievement of students. However, none of the research reviewed concludes that any one pattern of teacher behavior is superior to another under all conditions, but many do conclude that students taught by teachers with a more indirect approach achieve more; while those taught by a more direct approach achieve less. The present study came about, basically, as the result of the latter statements.

Also, this study deals with a more recent scientific approach in analyzing the verbal behavior in the classroom--Interaction Analysis--with the idea that interaction is one of the best reflections of classroom climate.

The earliest systematic studies of spontaneous pupil and teacher behavior were those of H. H. Anderson (5) as early as 1939. These studies were based on the observation of "dominative" and "integrative" behavior of teachers.

The findings of Anderson, et al, are based on the study of preschool, primary, and elementary school classrooms involving five different teachers and extending over several years. Taken altogether, their imaginative research

has produced a series of significant findings. Those important here are that if one type of contact predominates, domination stimulates further domination, and integration stimulates further integration. It is the teacher's principal behavior pattern that spreads among pupils, and is taken over by them even when the teacher is no longer in the room.

About a year after Anderson started his work, Lippitt and White (18) in 1940 working with Kurt Lewin carried out laboratory experiments to analyze the effects of adult leaders influence on boy's groups.

The pattern Lippitt and White named "authoritarian leadership" is similar to Anderson's dominative contacts; "democratic leadership" was similar to integrative contacts; while "laissez-faire leadership" consisted of irregular and infrequent integrative contacts with a lack of adult initiative that is seldom found in a classroom and was not present in the Anderson studies.

Most of the conclusions of the Lippitt and White study confirmed or extended the general conclusions of Anderson, et al.

These two studies aroused considerable interest in the analysis of teacher behavior. Additional research revealed minor variations of the central theme. Withall (44) in 1949 showed that a simple classification of the teacher's verbal statements into seven categories produced

an index of teacher behavior almost identical to the integrative-dominative I/D ratio of Anderson. He spoke of the classroom as teacher-centered vs. learner-centered.

Perkins (37) in 1964, using Withall's technique, studied groups who were studying child growth and development occurred when group discussions were free to focus on that topic; groups with an integrative type of leader were able to do this more frequently than were pupils led by a dominative type of leader.

In a large sectional study, which did not use observation of spontaneous teacher behavior, Cogan (33) in 1963 administered a single paper-and-pencil instrument of 987 eighth-grade students in 33 classrooms. The instruments contained three scales; a) a scale assessing student perceptions of the teacher, b) a scale on which students reported how often they did extra required school work, and c) a scale on which students reported how often they did extra non-required school work. Cogan's first scale assessed traits that he developed in terms of Murray's list of major personality needs. There were two patterns of teachers on his scale. The items of one pattern were grouped as "dominative", and "affiliative", and "hurturant". These are close to Anderson's dominative and integrative patterns. Cogan found that students reported doing more assigned, and extra schoolwork when they perceived the teacher's behavior as falling into the integrative pattern rather than the dominative pattern.

One earlier research project does supply evidence that teachers are flexible in their use of integrative and dominative contacts. Mitzel and Rabinowitz (36) in 1953 observed four teachers using Withall's technique, and organized their data to permit an analysis of variation among teachers, visits, and observers. This concluded that teachers adapt their influence to the immediate situation. They classified the influence of the teachers as hostile or supportive, which also, follows Anderson's pattern of dominative-integrative.

In a laboratory type experiment Amidon and Flanders (11) have shown that dependent prone junior high school students are more sensitive than average students to differences in patterns of teacher influence, and that dependent prone students learned less geometry when exposed to a more rigid, direct pattern of influence compared with a more indirect pattern.

There is no doubt in the mind of the writer that all of these investigators are referring to highly similar, even identical, dimensions of behavior, reliably measurable, and important in educational theory. However, the important question is left unanswered by the studies reviewed thus far. Namely, since both integrative and dominative types of statements are used by all teachers, including the most excellent teachers, what are the consequences of these different types of statements used under different conditions:

This question introduces the idea of flexibility of teacher behavior--that a teacher may need to vary his behavior under different conditions in order to achieve the desired consequences.

In some recent research, a number of other studies have investigated the relationship between patterns of teacher influence and pupil achievement. The findings of recent studies which parallel Flanders' study (11) in 1960 are consistent with his findings. However, some of this research has been done in other subject matter areas and grade levels.

Nelson (25) in 1966, in a study carried out at the elementary school level, found that indirect teacher influence was positively correlated to pupil achievement on written language tests. She also found that direct teacher influence patterns appeared to inhibit pupils' development of written language skills.

LaShier (54) in 1966, obtained similar results when working with student teachers who were teaching a six-week unit in biological science. LaShier found that pupils of indirect student teachers achieved more than pupils of direct student teachers.

Two of the more significant of the recent studies were completed at Temple University by Furst (13) in 1966, and Soar (42) in 1967. Furst was perhaps the first person to attempt the replication of a study by re-analyzing a set

of audio tapes that had been analyzed earlier in a study using another observational system. In this study, she used the tapes of a cognitive study of the classroom by Bellack (6) in 1967, analyzing them in terms of the interaction analysis categories. In using interaction analysis, she was able to identify certain relationships between teacher patterns and student achievement. Furst found that above-average student achievement was positively correlated to indirect teacher influence. She also found that the amount of student talk was positively correlated to student achievement.

Soar (42) in 1966, in one of the largest studies yet conducted on interaction analysis found that indirect teaching produced greater growth in reading comprehension in elementary school pupils than direct teaching. He found that children who had been in classes taught by indirect teachers also advanced an average of five and one-half months in reading comprehension during the summer vacation; while children who had been in direct teachers' classes advanced three months in the same period. These results further seem to support the fact that the influence of the teacher on learning persists even after the formal classroom experience is completed.

Weber (69) in 1967 studied pupils' creativity levels after a three year experience with either an indirect or direct teacher, and he found that indirect teaching

produced higher pupil creativity scores than direct teaching. This study was conducted in a unique situation in which children spent the first, second, and third grades with the same teacher. The Torrance creativity test was used to measure the children's growth in creativity.

Powell (60) in 1968, using a design similar to Weber's found that children who had an indirect teacher scored significantly higher on arithmetic tests than children who had a direct teacher for the same period of time.

Urbach (68) in 1966, studied the recurring patterns of teaching using Flanders ten category interaction observation techniques did exist for each teacher.

Stilwell (66) in 1967 studied, developed and analyzed a category system for systematic observation of teacher-pupil interaction during a geometry problem-solving activity. He found that teacher talk consumes approximately three times as much time as student talk, and also, that this system is able to differentiate between teachers.

Samph (65) in 1968 studied observer effects on teacher behavior. He used Flanders' system of interaction analysis to record teacher verbal behaviors. He found that teachers became more "indirect" when an observer was present in their classroom, whether they were informed of an observation prior to its occurrence or not.

Kysilka (53) in 1969 studied the verbal teaching behaviors of mathematics and social studies teachers in eight and eleventh grades. The instrument she used was OScAR,5V developed by Medley, et al, (36) in 1968. She found that mathematics teachers talked significantly more than social studies teachers ($p<.05$).

Geeslin (49) in 1971 reported on an investigation of the relationship between characteristics of mathematics teachers and student achievement. He found that there was very little correlation in the teacher's characteristics, and his effectiveness. He used the National Longitudinal study of mathematical abilities data bank as a data source. However, in using this data, there were more factors considered than basically those of the verbal characteristic.

Roland (63) in 1971, found that when teachers and pupils had had training in classroom analysis, the teachers would exhibit more indirect teaching behaviors and students more participation in class than those classrooms with only teachers taking the training.

Gabehart (48) in 1971 found that an intensive in-service training program designed to develop a positive social-emotional climate was partially successful using Flanders system of Interaction Analysis.

Reed (61), in 1970 found that a four week verbal and written feedback program was not effective in bringing about measurable teacher flexibility change when measured

10 weeks after the program was completed. This measurement was made by the students who had been trained to use Flanders Interaction Analysis.

Relationship of Review of Literature to the Present Study

An adequate measurement of teacher effectiveness will certainly lead to more effective means of accountability, more positive directions toward improvement of instruction, and consequently to explicit ways by which students may learn more and better.

Keeping these ideas in mind, and considering the fact that this study deals with the modification of teacher's verbal behavior and the achievement of high school students in geometry, one could ask, "Can you modify a teacher's behavior, and what effect does this have on students achievement?", "Can systematic inquiry and experimentation be used effectively in changing a teacher's verbal behavior?", or "Can a teacher adequately produce patterns of influence that will successfully increase his students learning?" These questions have not been answered by previous research. The research was primarily concerned with the classification of teacher influence and how this influence affected the achievement of students in the classroom.

Most of the studies reviewed were helpful in carrying out this study, because they contributed to the

conceptualization of teacher verbal behavior and the effects of this behavior on the achievement of students.

Summary

These studies indicate that there seems to be some relationship between the verbal behavior of the teacher and the achievement of students in the classroom. The literature was also reviewed in the area of analyzing the teacher's verbal behavior using Flanders and other methods of interaction analysis. Some conclusions from the literature which are considered important to this study are:

1. According to Anderson (1939), Withall (1949), Mitzel and Rabinowitz (1953), Flanders (1960), and others, the research on teacher effectiveness during the last twenty years has lent itself toward a more scientific approach to evaluation of teaching.

2. A vital factor affecting learning in the classroom is talk--by the student or by the teacher. Amidon & Hunter (3: p. 1,9), Biddle & Ellena (7: p. 129), Hughes (14: p. 91), and Amidon & Giammatteo (14: p. 187).

3. There appears to be evidence that teachers recognize the need for more student involvement in the classroom as revealed by Amidon & Hunter (3: p. 2,103).

4. There appears to be a need for a more viable objective measuring device than a rating scale if teachers are to be held accountable.

5. Patterns of verbal behavior do exist for each teacher according to the findings of Urbach (68) and Moskowitz (14: p. 275).

6. Students tend to achieve more under teachers who are more indirect in their approach; while tending to achieve less when the approach is more direct. According to: Nelson (25), LaShier (54), Soar (42), Weber (69), Powell (60), and Amidon & Flanders (30).

7. Further, the review of the literature gives much support to the fact that the extent to which the teacher challenges students to support ideas, and the amount of spontaneous student discussion may be related to student gains, according to the findings of: Nelson (25), Amidon & Flanders (11), Morsh and Burgess (24), Furst (13), and Soar (42).

8. Students appear to achieve better under one teacher than another teacher even if all other aspects of the learning situation remain constant according to Amidon and Flanders (1a).

9. Interaction analysis has highlighted the possibility of the importance of teacher influence of pupil behavior, learning and attitudes by associating influence with the teacher's verbal behavior.

10. Achievement appears to be a vital goal of instruction.

CHAPTER III

DESIGN OF THE STUDY

Introduction

As chairman of the mathematics department in the largest high school in Cleveland, Ohio, the writer was interested in a more scientific approach in teacher evaluation. Therefore, this study was designed to determine if a teacher's verbal behavior could be changed toward a more indirect influence; thus resulting in better achievement scores on a geometry test of students in that school. The teacher's verbal behavior was measured by observations of teacher's classroom interaction by the department chairman who was trained to use Flanders Interaction Analysis technique.

The Population

The population for this study consists of twelve instructional staff members (all geometry teachers), teaching geometry in a large inner-city high school of Cleveland, Ohio. All twelve of the teachers were used in the study.

All 12 teachers were observed and characterized as having direct or indirect influence. Three teachers were

classified as indirect and nine were classified as direct. Then five teachers were selected at random from the nine direct teachers and were provided with the treatment.

This was the final division of the twelve teachers into three distinct groups:

Group I, the three teachers who were indirect already; Group II, the four direct teachers who were not selected for the treatment group; and Group III, the five direct teachers who were selected at random from the original nine direct, and provided the treatment.

Interaction Analysis

Flanders' interaction analysis was the instrument used to categorize teacher verbal behavior. This system is concerned with analyzing the influence pattern of the teacher. The purpose is to record a series of acts in terms of pre-determined concepts. The concepts in this case refer to the teacher's control of the student's freedom of action. The system of categories are designed to enable an observer, using the instrument, to distinguish acts of the teacher that encourage the student's freedom of action from those that restrict them. Both those acts that encourage, and restrict the student's freedom are recorded (11).

There are ten behavior categories designed in the Flanders' Interaction analysis system. Seven of the

categories are assigned to teacher talk and two to student talk. The tenth category covers pauses, short periods of silence and talk that is confusing or noisy (Appendix C).

Of the seven categories assigned to teacher talk, categories one through four represent indirect influence:

1. Acceptance of feeling
2. Praise or encouragement
3. Accepting ideas
4. Asking questions

Direct influence is categorized under five through seven:

5. Lecture
6. Giving directions
7. Criticizing or justifying authority (1: p. 6-11)

The system of categories is designed for situations in which the teachers and the students are actively discussing (12: p. 21).

Teacher flexibility is a measure of of Indirect/ Direct verbal influence ratio. A measurement of teacher influence can be calculated in either of two ways: The I/d ratio consists of dividing the total of categories 1,2,3, and 4 by the totals of categories 5,6, and 7 (12: p. 35).

The second way is using the i/d ratio, which merely excludes categories 4 and 5 and becomes categories 1+2+3 divided by 6+7. By eliminating categories 4 and 5, lecture

and asking questions, it gives evidence as to the direct or indirect approach a teacher uses for motivation and control.

Only I/D ratio was used in making comparisons of the mean teacher flexibility score of the three groups. The I/D ratio is more inclusive because it makes use of all teacher statements (12: p. 74).

Measures

During each observation, some non-verbal characteristics of teachers and students were recorded to determine if any relationships existed that would reflect any significant difference in the calculation of the verbal behavior (see Appendix B).

Methodology

The writer was the observer, and he learned observation and recording techniques of the Flanders' interaction analysis by taking a programmed learning course of Educational Consulting Associates, Inc. (19). The writer spent the summer of 1971 learning the technique. The training design may also be found in Appendix C, concerning the categories, their numbers, and meaning were given to each teacher prior to the initial observations. This occurred during the first week of school. During the second week of the next two weeks, the initial observation was made on

all twelve geometry teachers within a three-day period. These twelve observations were taped in order that reliable characterizations could be made. These tapes were analyzed, the results recorded on data matrices; then the computations were made on I/D, i/d, teacher talk, student talk, and silence and confusion. Four of the tapes were analyzed again to determine the reliability and consistency of the observational techniques. These twelve teachers were characterized according to their I/D ratio--indirect if I/D was greater than or equal to 1.00, and direct if I/D was less than 1.00. This characterization resulted in three teachers being classified as indirect, and nine being classified as direct. A random sample of five direct teachers were selected from the nine. This divided the teachers into three groups: Group I, the three indirect teachers (control); Group II, the four direct teachers who were not selected (control); and Group III, the five randomly selected direct teachers (experimental). The teachers in Group III were provided the treatment. The results of the first observations provided information for the first treatment of Group III.

The treatments were designed for a thirty minute conference of a forty minute period with each teacher of Group III.

Treatment #1.

At the beginning of the conference, each teacher was given a brief description of Flanders' Interaction Analysis System (Appendix A-2), a copy of their data matrix with the results (Appendix D), and a conference sheet (Appendix A-4). The conference followed the format of conference sheet III (Appendix A-4). It began by discussing the percent of teacher talk, student talk, percent of silence and confusion, and the I/D ratio (interpreting each score using Flanders' guide lines in (1a: p. 31-65). Also, questions that could be useful to the teacher in interpreting his own results were discussed from the sheet with emphasis being placed on the fact that the questions represented average percentages, and they reflected current practice--not the best or most desired practice.

The last part of the discussion delt with showing the teachers how their I/D ratio was computed, and how they, using the seven categories of teacher influence, could increase (looking at their data matrices, and Appendix C-1) their I/D ratio. Finally, the teachers were given a copy of their initial observation on tape to play back in addition to keeping the results of the initial observation for their own follow-up.

Treatment number one used the analysis of the initial observation.

Treatment #2.

The beginning of the second set of conferences began by answering questions that teachers had about the last conference. Then each teacher was given a brief description of Flanders' Interaction Analysis System (Appendix A-2), a copy of their data matrix for observation 1 (Appendix D), and a conference sheet (Appendix A-4). This sheet listed the results of the initial observation and observation 1. Using the format of conference sheet III (Appendix A-4), the observer discussed (comparing results of last two observations) teacher talk, student talk, percent of silence and confusion, and the I/D ratio. The scores of observation 1 were interpreted using Flanders' guide lines in (1a: p. 31-65). Also, questions that could be useful to the teacher in interpreting his own results were discussed from the sheet with emphasis being placed on the results being average percentages, and reflecting current practice--not the best or most desired practice.

The last part of the conference delt with discussing how the I/D ratio of observation 1 related to the data matrix of observation 1, and the seven teacher categories of Appendix C-1. Also, how his I/D ratio could be increased.

Finally, teachers were given a copy of the results of observation 1--with comparisons to initial observation--for their own follow-up.

Treatment number two used the analysis of initial observation, and observation 1.

Treatment #3.

The beginning of the third set of conferences began by answering questions that teachers had from the results of the last two conferences. Then each teacher was given a brief description of Flanders' Interaction Analysis System (Appendix A-2), a copy of their data matrix of observation 2 (Appendix D), and a conference sheet (Appendix A-4). This sheet listed the results of the initial observation, observation 1, and observation 2. Using the format of conference sheet III (Appendix A-4), the observer discussed (comparing results of the last three observations) teacher talk, student talk, percent of silence and confusion, and the I/D ratio. The scores of observation 2 were interpreted using Flanders' guide lines in (1a: p. 31-65). Also, questions that could be useful to the teacher in interpreting his own results were discussed from the sheet. Emphasis was, again, placed on the results being average percentages, and reflecting current practice--not the best or most desired practice.

The last part of the conference delt with discussing how the I/D ratio of observation 2 related to the data matrix of observation 2, and the seven teacher categories of Appendix C-1. Also, how his I/D ratio could be increased.

Finally, teachers were given a copy of the results of observation 2--with comparisons to initial observation, observation 1, and observation 2--for their own follow-up.

Treatment number three used the analysis of initial observation, observation 1, and observation 2.

Observation 3 (final) was made after treatment number three.

A paired t-test was used to measure significant difference of the mean I/D ratios between the groups.

Statistical Hypotheses

The problem of assessing the verbal influence of teachers characterized as having direct or indirect influence was approached through the testing of three basic hypotheses. For the purpose of data analysis the hypotheses are stated in the null form.

Hypothesis 1

H_{o_1} The mean I/D ratio of Group I, indirect at the beginning, shall not be significantly different from final I/D ratio of Group III.

H_o: $M_1 - M_3 = 0$

Legend: M_1 = Indirect teachers mean; M_3 = Five randomly selected teachers mean.

Hypothesis 2

H_{o_2} The mean pre I/D ratio of Group III, five randomly selected, shall not be significantly different from the mean post I/D ratio of Group III.

H_o: Pr - Po = 0

Legend: Pr = Pre-I/D ratio mean; Po = Post-I/D ratio mean.

Hypothesis 3

H_{o_3} The mean I/D ratio of Group II, the four direct teachers who were not selected, shall not be significantly different from the final I/D ratio of Group III.

H_o: $M_2 - M_3 = 0$

Legend: M_2 = four direct teachers not chosen mean; M_3 = five direct teachers chosen mean.

Summary

This study was designed to determine if a teacher's verbal behavior could be changed toward a more indirect influence resulting in better achievement scores on a geometry test of students in an inner city high school in Cleveland, Ohio. Twelve geometry teachers of this school were the subjects of this study. Teacher flexibility was measured by I/D ratio of the Flanders' Interaction Analysis instrument.

Teachers were characterized by their I/D ratios and placed in three groups. Group I, three teachers who were indirect at the beginning; Group II, four teachers who were direct at the beginning, but not selected to provide treatment; Group III, five direct teachers selected at random from the nine direct teachers, the experimental group to be studied over a five month period.

The observer was trained to use Flanders' Interaction Analysis by a programmed learning approach. Each of the five teachers selected to study were observed three times (besides the initial observation) with a conference preceding each observation.

The group's mean I/D ratio were compared in a paired t-test to determine the significant difference, if any, in the change of teacher verbal behavior resulting from the treatment.

CHAPTER IV

ANALYSIS OF DATA

The problem of assessing the verbal influence of teachers characterized as having direct or indirect influence was approached by means of three basic hypotheses. For the purpose of data analysis, all hypotheses were stated in the null form. The initial characterization of the twelve teachers is found in Table 4.1.

Table 4.1 Characteristics of the twelve teachers after initial observation.

Teacher	I/D	i/d	Percent Teacher-talk	Percent Student-talk
A	.59	16.02	72	16
B	.50	12.25	69	18
C	.49	14.12	68	15
D	.69	15.13	71	20
E	2.43	6.35	65	30
F	.61	12.02	69	19
G	.61	13.82	71	14
H	2.17	4.18	61	29
I	.59	10.04	71	17
J	.48	15.26	60	12
K	.63	11.00	68	16
L	2.89	5.91	70	24

After the twelve teachers were characterized and a random sample of five from the nine direct teachers were made, the groups (for the purpose of group I/D comparison) were as follows:

Group I

	I/D Ratio
S_1	2.43
S_2	2.17
S_3	2.89

Group II

	I/D Ratio
S_4	.79
S_5	.91
S_6	.69
S_7	.48

Group III

	I/D Ratio
S_8	.59
S_9	.50
S_{10}	.49
S_{11}	.61
S_{12}	.63

Observe that each of the teachers in Group III (below) increased their I/D ratio over time except teachers S_{11} and S_{12} in the last observation. S_{11}'s failure to be consistent was probably due to an unexpected ringing of the fire bell--the class never regained its composure, and teacher S_{12} had a discipline problem which upset the class very much. The I/D ratios for Group III for the three observations after each of the three treatments were as follows:

Observations

	O_1	O_2	O_3
S_8	.57	1.14	1.39
S_9	.64	.69	1.01
S_{10}	.50	.58	2.39
S_{11}	1.04	1.19	.76
S_{12}	.56	1.03	.67

To test the validity of the characterization of Group I, II, and III at the beginning, the t-test at $\alpha = .05$ was applied, and found that the mean of Group I was significantly higher than the mean of either Group II or Group III. It was also found that there existed no significant difference in the means of Group II or Group III at the beginning.

The test statistic was the paired t-test:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{Sp^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \qquad \text{where} \quad Sp^2 = \frac{(n_1-1)\hat{S}_1^2 + (n_2-1)\hat{S}_2^2}{n_1+n_2-2}$$

Decision Rule: At $\alpha = .05$ and $n_1 + n_2 - 2$ degrees of freedom, reject H_o if $t \geq t_{(\alpha, n_1+n_2-2)}$

or if $t \leq -t_{(\alpha,\ n_1+n_2-2)}$

Hypothesis 1

H_{o_1} The mean I/D ratio of Group I, indirect at the beginning, shall not be significantly different from the mean of the final I/D ratio of Group III.

The mean I/D score of Group I is 2.50 and the final mean I/D score of Group III is 1.23. The computed t value of this analysis is 2.442. This value is less than the tabular value of t with 6 degrees of freedom (2.447), $\alpha = .05$. The null hypothesis is not rejected on the basis of this evidence. There exist no measurable significant

difference in the mean I/D scores between Group I and Group III. The summary data for the paired t-test is found in Table 4.2.

Table 4.2 Summary Data for the Paired t-test.

Group	Mean
I	2.50
III	1.23

Hypothesis 2

H_{O2} The mean post I/D ratio of Group III, five randomly selected, shall not be significantly different from the pre I/D ratio of Group III.

The mean pre I/D score of Group III is .56, and the mean post I/D score of Group III is 1.23. The computed t value of this analysis is 2.61. This value is greater than the tabular value of t with 8 degrees of freedom (2.306), $\alpha = .05$. The null hypothesis is rejected on the basis of this evidence. There exist a measurable significant difference between the mean post I/D scores of Group III, and the mean pre I/D scores of Group III. The summary data for the paired t-test is found in Table 4.3

Table 4.3 Summary Data for paired t-test.

Group III	Mean
Pre	.56
Post	1.23

Hypothesis 3

H_{O3} The final mean I/D ratio of Group III, randomly selected, shall not be significantly different from the mean I/D ratio of Group II, the four direct teachers who were not selected.

The final mean I/D score of Group III is 1.23, and the mean I/D score of Group II is .59. The computed t value of this analysis is 1.98. This value is less than the tabular value of t with 7 degrees of freedom (2.365), $\alpha = .05$. The null hypothesis is not rejected on the basis of this evidence. There exist no measurable significant difference between the final mean I/D score of Group III, and the mean I/D score of Group II. The summary data for the paired t-test is found in Table 4.4.

Table 4.4 Summary Data for paired t-test.

Group	Mean
II	.59
III	1.23

Sub-Hypothesis I

Sub H_{O1} The overall mean I/D score of Group III shall not be significantly different from the mean I/D score of Group I.

The overall mean I/D score of Group III is .94, and the mean I/D score of Group I is 2.50. The computed t value of this analysis is 10.4. This value is greater than the

tabular value of t with 6 degrees of freedom (2.447), $\alpha = .05$. The null hypothesis is rejected on the basis of this evidence. There exist a measurable significant difference between the overall mean I/D score of Group III, and the mean I/D score of Group I.

Sub-Hypothesis 2

Sub H_{o_2} The overall mean I/D score of Group III shall not be significantly different from the mean I/D score of Group II.

The overall mean I/D score of Group III is .94, and the mean I/D score of Group II is .59. The computed t value of this analysis is .41. This value is less than the tabular value of t with 7 degrees of freedom (2.365), $\alpha = .05$. The null hypothesis is not rejected on the basis of this evidence. There exist no measurable significant difference between the overall mean I/D score of Group III, and the mean I/D score of Group II. The summary data for sub hypotheses 1 and 2 is found in Table 4.5.

Table 4.5 Summary data for paired t-test

Group	Mean
I	2.50
II	.52
III	.94

Additional Comparisons

The percentage of teacher-talk was recorded and analyzed. The results of the teacher-talk at the beginning was:

Group	Mean
I	65.3
II	67.8
III	69.6

The mean teacher-talk of all the teachers at the beginning was 67.6. The mean teacher-talk of Group III for the final observation was 67.6. There was no measurable significant difference between the means of teacher-talk. For purposes of percent of teacher-talk comparisons, the data for the groups were as follows: (Table 4.6, Table 4.7, and Table 4.8).

Table 4.6 Comparison of percent of teacher-talk.

Pre-Percent of teacher-talk					
Group I		Group II		Group III	
S_1	65	S_4	71	S_8	72
S_2	61	S_5	69	S_9	69
S_3	70	S_6	71	S_{10}	68
		S_7	60	S_{11}	71
				S_{12}	68

Table 4.7 Post-Percent of teacher-talk for Group III.

Subjects	Percent of Teacher-Talk
S_8	70
S_9	58
S_{10}	71
S_{11}	71
S_{12}	68

Table 4.8 Summary data for mean percent of teacher-talk

Group	Mean	
	Pre	Post
I	65.3	
II	67.8	
III	69.6	67.6

Recall that the results of the three observations of each of the five teachers in Group III appeared on page 31. The summary data for comparing the pre I/D scores, and post I/D scores of each teacher in Group III are found in Table 4.9. The summary data for comparing the pre and post percent of teacher-talk of each teacher in Group III are found in Table 4.10.

Table 4.9 Summary of pre and post I/D scores of Group III.

Subjects	Pre	Post
S_8	.59	1.39
S_9	.50	1.01
S_{10}	.49	2.39
S_{11}	.61	.76
S_{12}	.63	.67

Table 4.10 Summary of pre and post percent of teacher-talk of Group III.

Subjects	Pre	Post
S_8	72	70
S_9	69	58
S_{10}	68	71
S_{11}	71	71
S_{12}	68	68

The summary data for comparing the pre and post percent of student-talk in each of the classes of the teachers of Group III are found in Table 4.11. The mean student-talk of students of teachers in Group III at the beginning was 15.8; while the mean student-talk at the end was 21.4. There was a measurable significant difference between the pre and post means of student-talk of the teachers of Group III.

Table 4.11 Summary of pre and post percent of student-talk in each class of teachers of Group III.

Subjects	pre	post
S_8	16	22
S_9	18	21
S_{10}	15	22
S_{11}	14	18
S_{12}	16	24

Since interaction analysis is a specialized research procedure which provides information about a few of the many aspects of teaching, some non-verbal characteristics were recorded during each observation (see Appendix B). These characteristics would not be revealed by the verbal communication, and the investigator feels that they may be important to the total complex called teaching. A composite of the results is recorded below:

Non-Verbal Behavior

Teachers were teaching basically the same kind of material during the observations:

Observation, Initial	The Introduction to polygons
Observation #1	Relationships of polygons and Drawing conclusions
Observation #2	Proofs
Observation #3	Proving triangles congruent

Class Formation	Taught as a unit
Preparation of Teachers	Generally Good
Content Presentation	Generally Good

Other Behavior

Teacher		Student	
Stands	Behind desk, at chalkboard	Answered most of time	Right
Moves about	Most of time	Looks around (unattentively)	Some
Looks at Plans	Sometime	Ignores Instructor	Very Little
Smiles or Laughs	Most of time	Slumps	Very Little
Demonstrates	At chalkboard	Yawns, stretches	Very Little
Uses Chalk-board	To illustrate key ideas	Sleeps or dozes	Very Little
		Group answers	Some

Cases For Group III

The following is a discussion of the cases of each teacher in Group III throughout the study:

Teacher S_8 became more indirect with an increase of .80 in I/D ratio. Teacher-talk was decreased by 2%; while student-talk increased 6%. She was very interested and enthusiastic about the study. She could not wait to have the opportunity to discuss her observations in the conference and see her results. She studied the Flanders' information thoroughly. She worked hard at involving her students more. The observer felt that this teacher really

wanted to have her students learn more. She was very dynamic and constantly used techniques to get her students to talk and become involved with the class discussion. Her students' average score on the achievement test was the same as the mean.

Teacher S_9 became more indirect with an increase of .51 in I/D ratio. Teacher-talk decreased by 11%; while student-talk increased by 3%. He had heard about Flanders' method, and thought he knew it. The flow in his class was kind of slow, and it took students longer to react to his questions, but after they became involved, it was hard to stop them. He was always on the defensive in his conferences. He could not seem to accept some of the results. This was due to the fact that he was trying to work in the frame work of Flanders--and thought he was doing a good job. He would come back invariably to check something. He had several discipline problems that got the class out of order on several occasions, but he recovered quite well. His students' average score on the achievement test was the same as the mean.

Teacher S_{10} became more indirect with an increase of 1.90 in I/D ratio. Teacher-talk increased by 3%; while student-talk increased by 7%. There was a very small percentage of silence and confusion. He was more responsive to the conferences and was concerned with specific things that he could do to involve his students more. This

teacher checked his tape with his students--they discussed it afterwards. He worked hard at becoming more indirect in his influence. He was very cooperative--much better than the others. His students appeared ready to get involved. It was evident that he had gotten his students worked up. They scored as well on the achievement test as any class in this group. His students' average score on the achievement test was 2 above the mean.

Teacher S_{11} became more indirect with an increase of .15 in I/D ratio. Teacher-talk remained the same; while student-talk increased by 4%. She was very responsive to the study and was very concerned about the results. She was more indirect on her first two observations involving the treatment than any of the other teachers in Group III (1.04 and 1.19 respectively). The result of the last observation does not justify her hard work, interest and enthusiasm. Someone rang the fire gong on the last observation and it took a lot out of her, beacuse she wanted so bad to have a good performance. She wanted me to nullify the last and come again--I did not. Her students' average score on the achievement test was 2 points above the mean.

Teacher S_{12} became more indirect with an increase of .04 in I/D ratio. Teacher-talk remained the same; while student-talk increased by 8%. There was less percentage of silence and confusion from pre to post. He was very interested in the results of the observations. However,

the observer did not feel he worked very hard at getting more involvement from his students - he believed he was a good teacher. He talked quite a bit and many times students questions could shake him up. He had a little something in his voice that at times students questions and answers seemed to have a personal attack toward him. There was a large percentage of silence and confusion in his class at times, but he was able to eliminate some in the last observation and increase student involvement. His low score on the last observation probably attributed to the discipline problem he had, that broke the class up, and it never came back together that period. His students' average score on the achievement test was 3 points above the mean.

Each of the five teachers in Group III became more indirect in their influence pattern from pre to post--some more than others. In cases where the I/D ratio remained the same, the change in talk is reflected in a change in the amount of silence and confusion. Each of the five teachers talked more than the average teacher (61% of the time).

Achievement

The investigator was more interested in modifying teacher behavior than how this behavior attributed to changes in students. However, he will discuss the (more

or less) inconsequential aspects of the students' achievement scores in Geometry.

At the end of the course, all geometry students were administered a standardized test--The Cooperative Mathematics Test in Geometry, Form A. These tests were scored by a computer, and the results recorded. The mean of all geometry students in the school was 135. The summary data for comparing the mean scores of the classes in each group are found in Table 4.12.

Table 4.12 Summary of Mean Achievement Scores in each class in each group.

	Student Mean Scores					
	Group I		Group II		Group III	
S_1	131	S_4	131	S_8	135	
S_2	134	S_5	133	S_9	135	
S_3	138	S_6	134	S_{10}	137	
		S_7	135	S_{11}	137	
				S_{12}	138	

The mean achievement score of the students of teachers in Group I is 134.3; this is .7 below the overall mean. The mean achievement score of students of teachers in Group II is 133.3; this is 1.7 below the overall mean. The mean achievement score of students of teachers in Group III is

136.4; this is 1.4 higher than the overall mean. The summary data for comparing the means of each group with the overall mean is found in Table 4.13.

Table 4.13 Summary of Means of each group and overall mean.

Group	Mean Student Achievement
I	134.3
II	133.3
III	136.4
Overall	135.0

Because of the consistent relationship that appears to exist between patterns of classroom interaction and pupil achievement, an interest has developed in its use as a tool in teacher education. The results of this study do indicate that the teacher's behavior in Group III was modified, and the results of the achievement scores indicate a higher achievement in Group III than in either Group I or Group II. However, since no pre-test was administered or any adjustments made on initial ability, the investigator is unable to statistically or experimentally determine what these differences are attributed to--nor can the determination of the significance of these differences be made. The indication of this study that the teacher's behavior was modified gives support to the findings of Gunnison's experiment in 1968 (50).

The investigator believes that studies of natural teaching do suggest promising variables, but it is only through careful controlled experimental studies that we can determine which teaching variables (if any) enhance student achievement.

Summary

The hypotheses of this chapter were analyzed by using the paired t-test. The first two hypotheses were divided into subhypotheses, each testing the overall I/D score of Group III with the pre I/D score of Group I and II.

H_{o_1}	The mean I/D ratio of Group I, indirect at the beginning, shall not be significantly different from the final I/D ratio of Group III.	(Failed to Reject)
H_{o_2}	The mean post I/D ratio of Group III, five randomly selected, shall not be significantly different from the pre I/D ratio of Group III.	(Rejected)
H_{o_3}	The final mean I/D ratio of Group III, randomly selected, shall not be significantly different from the mean I/D ratio of Group II,	(Failed to Reject)

the four direct teachers who were not selected.

Sub H_{o_1} The overall mean I/D score of Group III shall not be significantly different from the mean I/D score of Group I. (Rejected)

Sub H_{o_2} The overall mean I/D score of Group III shall not be significantly different from the mean I/D score of Group II. (Failed to Reject)

Some additional comparisons were made, and it was found that there was no significant difference in the percent of teacher-talk of the twelve teachers in the beginning and the final observations of Group III. However, there was less teacher-talk among teachers of Group III at the end than there was at the beginning. Also, the students participated more in the classes of the teachers of Group III at the end than at the beginning.

The average achievement score was higher in Group III than in either Group I or Group II, but since no pre-test was given no statistical inferences could be made about the differences.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

This chapter draws from the preceding chapters the central elements of the study. A summary of the study will be presented along with the findings based upon the data obtained. Some general conclusions are noted along with recommendations for further study.

Summary

It was the purpose of this study to determine if a teacher's verbal behavior could be changed toward a more indirect influence resulting in better achievement scores on geometry tests of students in a large inner-city high school in Cleveland, Ohio. The study used a case study approach, and Flanders' method of interaction analysis to analyze the teachers verbal behavior.

The review of the literature revealed that students taught by teachers who use an indirect influence in their classrooms, achieved more; while those in classrooms of direct influence achieved less (10).

All of the geometry teachers in the school were involved in the study. They were divided into two groups at the start by using Flanders' method of interaction analysis (11). This division resulted into three teachers with indirect influence, and nine teachers with direct influence. This was done on the basis of the teacher's I/D ratio score, i.e., if a teachers' I/D ratio was less than 1, they were characterized as direct, and if the I/D ratio was greater than or equal to 1, they were characterized as indirect. Five direct teachers were selected from the nine direct teachers to form three final groups. Group I, three indirect teachers; Group II, four direct teachers not selected for treatment; and Group III, five direct teachers who would receive the treatment. The treatment involved a conference about Flanders' method of interaction analysis, with the idea of trying to direct the five direct teachers toward a more indirect influence.

The achievement of the students was measured by Cooperative Mathematics Tests, Form A, Geometry of the Educational Testing Service (see Appendix E).

The results were analyzed by using a paired t-test with an alpha level of .05.

Findings

Within the parameters of this study, the following findings are presented.

1. On a continuum from .56 to 2.50 the five direct teachers moved up so that their I/D ratios did not differ significantly with those of the indirect teachers.

2. The five direct teachers became more indirect in their influence pattern.

3. The five direct teachers failed to move up the continuum so that there was a measurable significant difference between them and the four direct teachers who did not receive the treatment.

4. The five teachers in Group III became more indirect with time, but failed to reach the point of indirectness of Group I, those teachers who were indirect at the beginning.

5. The mean percent of teacher talk was 67.6.

6. The mean percent of student talk was 19.1.

On the basis of the findings of this study and within its limitations, the following conclusions seem justified.

1. Teachers can be directed toward a more indirect influence pattern of teaching.

2. Direct teachers can be made more indirect using Flanders' method of Interaction analysis.

3. Students appeared to achieve more in teachers' classes who possess an indirect influence pattern of teaching.

4. Teacher's behavior in the classroom can be affected by using Flanders' method of interaction analysis.

Discussion

In this study, the observational evidence that was obtained does indicate that the teachers' behavior was modified in the experimentally desired direction. However, the hypotheses suggest that maybe a longer period should be used across time, with more observations being made, if there is to be a more appreciable change in teacher behavior toward indirectness.

Samph found in his study (65), that teachers became more indirect when an observer was present in their classroom, whether they were informed of an observation prior to its occurrence or not. This may be true, but the writer believes that by also training teachers in the use of Flanders' method of interaction, one can eliminate much of the observer effect.

The findings that the mean percent of student-talk was 19.1 is in accord with Stilwell's findings (66), teacher-talk consumes approximately three times as much time as student-talk.

The achievement scores in the teachers' geometry classes who became more indirect in their influence (Group III) was higher than either of the other groups, but since no pre-test was given, no statistical inference can be made about the differences.

Recommendations for Future Research

The following recommendations are a direct result of the findings of this study and as a result of working as a department chairman with all of the teachers involved in this study.

1. One can learn interaction analysis through a program approach well enough to implement it in the classroom.

2. The observations should be spread over a longer interval of time and with more frequency.

3. This study should be replicated with certain modifications using the idea of #2, and by considering some non-verbal characteristics such as the form in Appendix B.

4. Other subjects different from geometry should be used following this basic format.

5. Since the primary purpose is to improve instruction, one could give the teachers involved a thorough training in interaction analysis before beginning the study.

Questions for Further Study

This study seems to answer a few of the questions proposed in Chapter II i.e. 4, can Flanders' ten category method of interaction analysis be used successfully in the classroom as a scientific approach to measuring teacher

effectiveness?; 5, can the level of instruction be raised through the use of interaction analysis?; and 6, can a teacher's behavior be affected by a conference? Also, this study and previous research seem to suggest that the answer to #1 is yes.

Therefore the two important questions for further study are:

1. Does the verbal behavior of teachers observed by Flanders' method of interaction analysis lend itself to any typical consistency?

2. After determining the relationship between the teacher and student behavior, how does this attribute to the amount of learning, or what manner would the teacher be graded by his supervisors to determine his accountability?

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APPENDICES

APPENDIX A-1

NOTICE OF OBSERVATION

Date:_____

Math Teacher:_____

I mentioned to you at the beginning of the school year that I would be looking at all geometry classes as my experiment for my dissertation. I will be in your geometry class _____ at _____ period.

What I will be doing, is noting the verbal discourse that takes place in your geometry classroom, use Flanders' Method of Interaction Analysis to analyze this verbal behavior. This will require me to tape the discourse. These visits will in no way constitute your evaluation, by me, here as a teacher. I will always let you know when I am coming for this purpose, and I will always talk to you after I have analyzed the discourse.

Note: If you have a test planned for this day, let me know and I will come a different day.

Willie E. Williams
Chairman
Dept. of Mathematics

APPENDIX A-2

CONFERENCE SHEET I

FLANDERS INTERACTION ANALYSIS SYSTEM

What are the things that go on between teacher and students in a classroom setting that determine the "climate" of that relationship? How has the teacher used his influence to affect classroom interaction? What changes should a teacher make to produce a classroom atmosphere of the kind desired: Interaction Analysis, the system suggested by this program, can provide answers to each of these questions.

Interaction Analysis looks at only one aspect of teaching: the pedagogical moves which the teacher makes during his conduct of a class and their relationship to what the students do in responding to or provoking those moves. Looking at student-teacher interaction is important, for interaction is one of the best reflections of classroom climate, and it is also a frequent cause of a positive or negative climate.

This program presents a technique which permits a close examination of what both teacher and students do in terms of frequency (e.g., How much time did the teacher spend in lecturing?) as well as in terms of sequence, (e.g., What happened after the teacher asked a question; or what did the teacher do to provoke that student comment?)

ASSUMPTIONS. Classroom activities which have been selected for this system are based on the assumption that there are three broad kinds of things which go on in almost any classroom:

1. Teacher actions which either encourage or restrict students.
2. Student actions, either in response to the teacher or self-initiated.
3. Silence or confusion.

Interaction Analysis assumes that the verbal behavior of teacher and students is the most important indicator of the affective tone of the classroom. While there are certainly

a multitude of other indications, research using this system has tended to verify this highly important point. Because of this verbal emphasis, the system is especially useful to the individual teacher in self-assessment, since there is no need for an outside observer to "code" what goes on in the classroom. The teacher need only start his tape recorder and proceed with his class. He can listen to, code, and analyze his class by playing the tape in the quiet of an empty classroom, an office, or his own home.

INTERACTION ANALYSIS, THEN, DEALS WITH CLASSROOM TALK. For purposes of indentification, student talk is divided into two categories--one which is induced by teacher questions, the other which is volunteered by the students and unsolicited by the teacher. Many other kinds of division are possible; however, in the interest of simplicity and to provide the most meaningful analysis, these two broad categories were decided upon.

Teacher talk, on the other hand, probably needs a much broader investigation, since it is the teacher's influence and it's effect which are of primary interest. If a teacher is to examine his own verbal behavior in the classroom, he will be interested specifically in what he did to bring about a student response and what he did following a student's comments. (19: p. 9)

TOTAL SYSTEM

Actor	Behavior	Category	Description
Teacher	Encouraging or Indirect	1	Accepting student feelings
		2	Praising
		3	Accepting and/or using student ideas
		4	Asking questions
	Restricting or Direct	5	Lecturing
		6	Giving Directions
		7	Criticizing of justifying authority
Student	Responding	8	Student Responds
	Initiating	9	Student initiates response
	Silence or Confusion	10	Silence or confusion

APPENDIX A-3

INITIAL CONFERENCE SHEET II

Teacher_____Date_____Visit_____

I/D Ratio_____i/d Ratio_____Percent of Teacher-talk_____

Percent of Student-talk_____. Percent of Silence and/or

_____.

COMMENTS:

APPENDIX A-4

CONFERENCE SHEET III

Teacher_____Date_____ Visit_____

Remarks:

	1st time	2nd time	3rd time
Percent of Teacher Talk			
Percent of Student Talk			
% of S.T. self initiated			
Percent of Silence and/or confusion			
*I/D Ratio			
**i/d Ratio			

QUESTIONS THAT MAY BE USEFUL TO YOU AS A CLASSROOM TEACHER

Special Note: Average percentages reflect current practice, not the best or most desired practice.

1. Do I do too much of the talking in the classroom? (Average about 60%).
2. Am I typically a direct or indirect teacher? I/D less than 1.00, direct; and I/D greater than or equal to 1.00, indirect.
3. How do I react to student verbal behavior?
4. How much time do I spend in lecturing? (Average about 40%).
5. Do I spend enough time in the extension of student ideas?
6. Do students tend to resist my influence?
7. Do I accept, clarify, and use student emotion?
8. How effectively do I use praise: (Average between 1% and 2% of total talk.)
9. How effective am I in communicating subject-matter to my pupils? (Average between 35% and 40% in lecture).
10. How effectively do I use criticism in my teaching? (Average twice as much criticism as praise).
11. Is there adequate pupil participation in my classroom? (Average about 24% of total verbal behavior).

NOTE: $*I/D = \frac{\text{Categories } 1 + 2 + 3 + 4}{\text{Categories } 5 + 6 + 7}$ This focuses on the relative number of indirect and direct teacher statements.

$**i/d = \frac{\text{Categories } 1 + 2 + 3}{\text{Categories } 6 + 7}$ This is called a revised I/D ratio and is employed to find the kind of emphasis given to motivation and control in a particular classroom. The i/d ratio eliminates the effects of categories 4 and 5, asking questions and lecturing, and gives evidence about whether the teacher is direct or indirect in his approach to motivation and control.

SEE ATTACHED SHEET (Your verbal interaction analysis on my last visit)

Note: Diagonal cells of the matrix are called "steady-state cells," all other cells are transitional cells representing movement from one category to another. Heavy loading in the diagonal cells indicate extended uses of categories 1-10.

APPENDIX B

NON VERBAL RECORD SHEET

Teacher_____Date_____Visit____Class Size___

Course: Geometry. What was topic of lesson_____

General Room Condition_____

Instructional Aids_____

Class formation (groups, units, etc.)_____

Preparation of teacher_____Content presentation_____

Other materials_____Chalkboard diagrams_____

Distractions_____Time in settling down to work_____

Passing out/collecting materials (time)_____.

OTHER BEHAVIOR

TEACHER

I. Stands
   a. Behind desk
   b. At chalkboard
   c. With book in hand
   d. Other

II. Moves About
   a. Sometime
   b. Most of time
   c. Never

III. Looks at notes (plans)
   a. Sometime
   b. Most of time
   c. Never

IV. Smiles or laughs
   a. Sometime
   b. Most of time
   c. Never

STUDENT

I. How answered most of time
   a. Right
   b. Wrong

II. Looks around (unattentatively)
   a. None
   b. Some
   c. Frequently

III. Ignores Instructor
   a. None
   b. Some
   c. Frequently

IV. Slumps
   a. None
   b. Some
   c. Frequently

TEACHER

V. Demonstrates
   a. Instructional aids
   b. Gestures
   c. At chalkboard
   d. Other

VI. Uses chalkboard
   a. Key term (idea)
   b. Key diagram

STUDENT

V. Yawns, stretches
   a. None
   b. Some
   c. Frequently

VI. Sleeps or dozes
   a. None
   b. Some
   c. Frequently

VII. Group Answers
   a. None
   b. Some
   c. Frequently

APPENDIX C-1

VERBAL CATEGORIES OF FLANDERS INTERACTION ANALYSIS

Indirect Teacher Behavior

Category 1, Acceptance of Feeling. The teacher accepts feelings when he says he understands how the children feel, that they have the right to have these feelings, and that he will not punish the children for their feelings. These kinds of statements often communicate to children both acceptance and clarification of the feeling.

Also included in this category are statements that recall past feeling, refer to enjoyable or uncomfortable feelings that are present, or predict happy or sad events that will occur in the future.

In our society people often react to expressions of negative feelings by offering negative feelings in return. Acceptance of these emotions in the classroom is quite rare; probably because teachers find it difficult to accept negative emotional behavior. However, it may be just as difficult for them to accept positive feelings. Feelings expressed by students may also be ignored by the teacher if he considers the classroom to be a place where people are concerned primarily with ideas rather than feelings.

Category 2, Praise or Encouragement. Included in this category are jokes that release tension, but not those that threaten students or are made at the expense of individual students. Often praise is a single word: "good," "fine," or "right." Sometimes the teacher simply says, "I like what you are doing." Encouragement is slightly different and includes statements such as, "Continue," "Go ahead with what you are saying," "Uh huh; go on; tell us more about your idea."

Category 3, Accepting Ideas. This category is quite similar to Category 1; however, it includes only acceptance of student ideas, not acceptance of expressed emotion. When a student makes a suggestion, the teacher may paraphrase the student's statement, restate the idea more simply, or summarize what the student has said. The teacher may also say, "Well, that's an interesting point of view. I see what you mean." Statements belonging in Category 3 are particularly difficult to recognize; often the teacher will shift from using the student's idea to stating the teacher's own idea.

Statements belonging in Category 3 can be identified by asking the question, "Is the idea that the teacher is now stating the student's or is it the teacher's?" If it is the student's idea, then this category is used; if it is the teacher's, another category must be employed.

Category 4, Asking Questions. This category includes only questions which the teacher expects an answer from the

pupils. If a teacher asks a question and then follows it immediately with a statement of opinion, or if he begins lecturing, obviously the question was not meant to be answered. A rhetorical question is not categorized as a question. An example of another kind of question that should not be classified in Category 4 is the following: "What in the world do you think you are doing out of your seat, John?" With proper intonation the question is designed to get John back in his seat; if such is the case, it must be categorized as criticism of the student's behavior (Category 7.)

Questions that are meant to be answered are of several kinds. There are questions that are direct in the sense that there is a right and wrong answer. The question, "What are 2 and 2?" is a question that limits the freedom of the student to some extent. Although he can refuse to answer, give the wrong answer, or make a statement of another kind, in general, this kind of question focuses the student's answer more than does a question such as, "What do you think we ought to do now?" Questions, then, can be either narrow and restrict the student in his answer, or they can be very broad and give the student a great deal of freedom in answering. All questions, however broad or narrow, which require answers and are not commands or criticism, fall into Category 4.

Direct Teacher Behavior

Category 5, Lecture. Lecture is the form of verbal interaction that is used to give information, facts, opinions, or ideas to children. The presentation of material may be used to introduce, review, or focus the attention of the class on an important topic. Usually information in the form of lecture is given in fairly extended time periods, but it may be interspersed with children's comments, question, and encouraging praise.

Whenever the teacher is explaining, discussing, giving opinion, or giving facts or information, Category 5 is used. Rhetorical questions are also included in this category. Category 5 is the one most frequently used in classroom observation.

Category 6, Giving Directions. The decision about whether or not to classify the statement as a direction or command must be based on the degree of freedom that the student has in response to teacher direction. If he says, "John, go to the board and write your name," he is giving a direction or command. When he says, "John, I want you to tell me what you have done with your reader," he is still giving a direction.

Category 7, Criticizing or Justifying Authority. A statement of criticism is one that is designed to change student behavior from nonacceptable to acceptable. The teacher

is saying, in effect, "I don't like what you are doing. Do something else." Another group of statements included in this category are those that might be called statements of defense or self-justification. These statements are particularly difficult to detect when a teacher appears to be explaining a lesson or the reasons for doing a lesson to the class. If the teacher is explaining himself or his authority, defending himself against the student, or justifying himself, the statement falls in this category.

Other kinds of statements that fall in this category are those of extreme self-reference or those in which the teacher is constantly asking the children to do something as a special favor to the teacher.

Categories 1 through 4, those of indirect teacher influence, and categories 5 through 7, those of direct teacher influence, have been described. They are all categories of teacher talk. Whenever the teacher is talking, the statements must be categorized in one of the first seven categories. If the observer decides that with a given statement the teacher is restricting the freedom of children, the statement is tallied in Categories 5, 6, or 7. If, on the other hand, the observer decides that the teacher is expanding freedom of children, the category used is either 1, 2, 3, or 4.

There are three additional categories for use in classroom interaction:

Category 8, Student Talk-Response. This category is used when the teacher has initiated the contact or has solicited student statements, when the student answers a question asked by the teacher, or when he responds verbally to a direction the teacher has given. Anything that the student says that is clearly in response to initiation by the teacher belongs in Category B.

Category 9, Student Talk-Initiation. In general, if the student raises his hand to make a statement or to ask a question when he has not been prompted to do so by the teacher, the appropriate category is nine.

Distinguishing between Categories 8 and 9 is often difficult. Predicting the general kind of answer that the student will give in response to a question from the teacher is important in making this distinction. If the answer is one that is of a type predicted by the observer (as well as the teacher and class), then the statement comes under Category 8. When in response to a teacher-question the student gives an answer different from that which is expected for that particular question, then the statement is categorized as a nine.

Category 10, Silence or Confusion. This category includes anything else not included in the other categories. Periods of confusion in communication, when it is difficult to determine who is talking, are classified in this category.

A summary of these categories, with brief definitions for the use of the observer will follow.

APPENDIX C-2

SUMMARY OF CATEGORIES FOR
INTERACTION ANALYSIS

TEACHER TALK	INDIRECT INFLUENCE	1. *ACCEPTS FEELING: accepts and clarifies the feeling tone of the students in a nonthreatening manner. Feelings may be positive or negative. Predicting or recalling feelings is included. 2. *PRAISES OR ENCOURAGES: praises or encourages student action or behavior. Jokes that release tension, but not at the expense of another individual; nodding head, or saying "um hm" or "go on" are included. 3. *ACCEPTS OR USES IDEAS OF STUDENTS: clarifying, building, or developing ideas suggested by a student. As teacher brings more of his own ideas into play, shift to Category 5. 4. *ASKS QUESTIONS: asking a question about content or procedure with the intent that a student answer.
	DIRECT INFLUENCE	5. *LECTURING: giving facts or opinions about content or procedures; expressing his own ideas, asking rhetorical questions. 6. *GIVING DIRECTIONS: directions, commands, or orders with which a student is expected to comply. 7. *CRITICIZING OR JUSTIFYING AUTHORITY: statements intended to change student behavior from nonacceptable pattern; bawling someone out; stating why the teacher is doing what he is doing; extreme self-reference.

STUDENT TALK	8. *STUDENT TALK - RESPONSE: talk by students in response to teacher. Teacher initiates the contact or solicits student statement. 9. *STUDENT TALK - INITIATION: talk by students, which they initiate. If "calling on" student is only to indicate who may talk next, observer must decide whether student wanted to talk. If he did, use this category. 10. *SILENCE OR CONFUSION: pauses, short periods of silence, and periods of confusion in which communication cannot be understood by the observer.

*There is NO scale implied by these numbers. Each number is classificatory; it designates a particular kind of communication event. To write these numbers down during observation is to enumerate--not to judge a position on a scale.

APPENDIX C-3

PROCEDURE FOR CATEGORIZING TEACHER-PUPIL INTERACTION

The Flanders' system of interaction analysis was originally used as a research tool and continues to serve this function. As such, it is employed by a trained observer in order to collect reliable data regarding classroom behavior as a part of a research project.

As it is described in this by Flanders, the system is meant to be used as an in-service training device for teachers. It may be employed by a teacher either as he observes someone else teach or as he categorizes a tape recording of his own classroom behavior. In either case the method is the same.

Every three seconds the observer writes down the category number of the interaction he has just observed. He records these number of the interaction he has just observed. He records these numbers in sequence in a column (row). He will write approximately 20 numbers per minute; thus, at the end of a period of time, he will have several long columns (rows) of numbers. The observer preserves this sequence of numbers that he has recorded. It is important to keep the tempo as steady as possible, but it is

even more crucial to be accurate. He may also wish to write down marginal notes from time to time, which can be used to explain what has been happening in the classroom.

No matter whether he is using a live classroom or a tape recording for his observations, it is best for the observer to spend 5 to 10 minutes getting oriented to the situation before he actually begins to categorize. He then has a feeling for the total atmosphere in which the teacher and pupils are working. After he has begun to get the feeling of the classroom interaction, he begins to record the interaction.

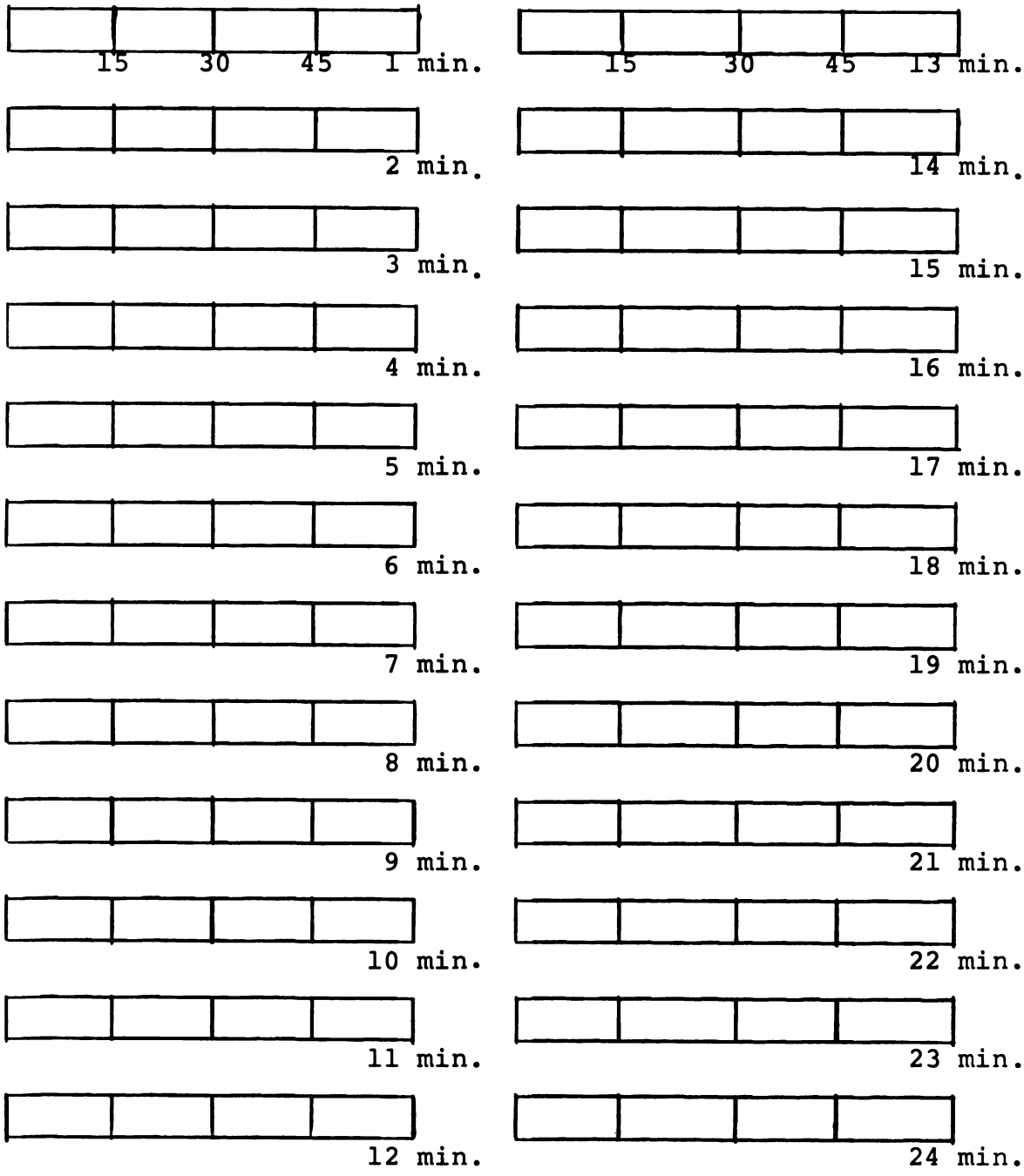
The observer stops classifying whenever the classroom activity is changed so that observing is inappropriate as, for instance, when there are various groups working around the classroom, or when children are working on workbooks or doing silent reading. He will usually draw a line under the recorded numbers, make a note of the new activity, and resume categorizing when the total class discussion continues. At all times the observer notes the kind of class activity he is observing. The reading group in the elementary school is obviously different from an informal discussion period, a review of subject matter, a period of supervised seat work, teacher-directed discussion, introduction of new material, or evaluation of a unit that has been completed. Such diverse activities may be expected to show

different types of teacher-pupil interactions even when guided by the same teacher. A shift to new activity should also be noted.

APPENDIX D-1

ANALYSIS SHEET

Teacher_____Date_____Class size____Week____ Page____



APPENDIX D-2

10 x 10 DATA MATRIX

Teacher_____Date_____Class size_____Week____

I/D ratio___i/d ratio___% Teacher talk___% Student talk___

% Silence or Confusion____

DATA MATRIX

Category	1	2	3	4	5	6	7	8	9	10	Total
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											